Producer Delivery Patterns in New England Milk Markets

Marketing Research Report No. 672

UNITED STATES DEPARTMENT OF AGRICULTURE
Agricultural Marketing Service Economic Research Service
Maine and Vermont Agricultural Experiment Stations Cooperating

July 1964

CONTENTS

For sale by the Superintendent of Documents, Government Printing Office
Washington, D.C., 20402 - Price 65 cents

ACKNOWLEDGMENTS

The New England Milkshed Price Committee, which is composed of representatives from New England producer cooperatives, milk handlers, and State Colleges of Agriculture, proposed this special study.

Members of the study committee were Stewart Johnson, University of Connecticut; Homer B. Metzger, University of Maine; E. L. Tipton, Cooperative Dairy Economics Service; Fred C. Webster, Chairman, University of Vermont; and William C. Welden, H. P. Hood and Sons.

Alden C. Manchester, Economic Research Service, and Robert W. March, Agricultural Marketing Service, were study committee members from the U.S. Department of Agriculture.

Richard D. Aplin, Boston; Robert W. Cherry, Southeastern New England; and Donald O. Hammerberg, Connecticut, were the Federal Milk Order Market Administrators who, along with many members of their staffs, cooperated.

George F. Dow, University of Maine, and Thomas W. Dowe, University of Vermont, were the Directors of the cooperating Agricultural Experiment Stations.

Robert L. Rowell, University of Massachusetts, was the Director of the Research Computing Center where the data were processed.

In addition, there were many others whose services contributed to the study, not the least of whom were the 3,547 dairy farmers whose names and records remain anonymous.

SUMMARY

This report describes the annual and seasonal milk delivery patterns for 3,547 farms. The farms are a 20 percent random sample of all farms which delivered milk to the five New England Federal order markets on July 1, 1959. Deliveries of milk were the primary data used and cover a three-year period, July 1, 1959 to June 30, 1962.

In general, analysis of these data indicated that changes described by group averages did not describe the changes for most individual farms. Of even greater importance is the fact that, during the three years, about 25 percent of the farms reversed their direction of change in level of annual average daily delivery of milk and about 70 percent had two or more significantly different seasonal patterns.

Additional data obtained indicated other changes made by these farms during the three-year period:

1. Fifteen percent changed producer name.

2. Twenty-five percent changed handler; twenty-five percent changed plant; and forty-three percent changed handler, plant or both one or more times.

3. Twelve percent changed market one or more times.

4. Twenty-three percent left the five New England markets.

Analysis of the 806 farms which left the New England Federal order markets showed:

1. At least 86 percent stopped producing milk.

2. Fifty percent were small farms (average daily delivery below 245 pounds). (Of all small farms present in the first year, 51 percent had left at the end of the three years.)

3. For farms of the same size, a higher proportion of nearby than of distant farms left the market.

Annual delivery patterns were first described by group averages. The patterns found were:

1. The average daily delivery for farms delivering milk in the third year was 18 percent higher than the average for farms delivering in the first year.

2. About two-thirds of the 18 percent increase in average daily delivery was due to a 12 percent increase in the deliveries of farms operating for 36 months, and the rest was due to small farms leaving the market. Although the average delivery per farm increased 18 percent, total deliveries for all farms increased only 3 percent.

3. Small farms (below 245 pounds per day) which continued delivery for three years had the highest percentage increase in average daily delivery, 24 percent. Percentage increases for other size groups ranged from 8 to 15 percent.

The patterns described by the level of annual average daily milk delivery on individual farms over the three-year period were given most attention. The patterns found and the proportion of farms following the pattern are illustrated by the following:

1. Fifty-six percent of the farms were in the same size group in year three that they had been in year one. Twenty-two percent were in a higher group in year three than they were in year one. Nine percent were in a lower group, and 13

percent had stopped delivery. These general patterns (the same, up, down and stopped) were observed for all sizes of farms.

2. The year-to-year analysis showed that only 50 percent of the farms were in the same size category in all three years.

3. The analysis of percentage change in average daily delivery from year one to year two, and the percentage change from year two to year three, revealed the most instability among farms in the maintenance of a constant average level from year to year. The analysis was made only for the 2,656 farms that delivered for all 36 months. Nine percent did not change more than 5 percent from year one to year two, and did not change more than five percent from year two to year three. The remaining 91 percent changed more than five percent either once or twice. Twenty-two percent of the farms changed either up or down by more than five percent from year one to year two, and in addition changed more than five percent in the opposite direction from year two to year three. All size groups showed this degree of instability in average daily delivery from year to year.

Seasonal patterns of delivery were determined for each year for all farms in the market, for distant and nearby farms, and for farms of different sizes. There was variation between groups in the shape of patterns, and there also was variation from year to year in the shape of patterns for each group.

As was true for patterns of annual average daily delivery, most attention with respect to seasonal patterns was given to the experience of individual farms. Because of the difficulties involved in trying to describe patterns of change for individual farm seasonal fluctuation, the analyses dealt primarily with the degree of stability shown by individual farms in maintaining a seasonal pattern. The 2,656 farms delivering for 36 months were used for analysis. First, the year to year amount of seasonal fluctuation was analyzed. In the next two analyses, both amount and shape of seasonal fluctuation were examined.

1. Seventy-six percent of the farms had either more or less seasonal fluctuation in the second year, in the third year, or in both years, than they had in the first year. (The amount of seasonal fluctuation was measured by the coefficient of variation for monthly deliveries in each year. Twenty-four percent of the farms were in the same size group of the coefficient of variation in all three years.)

2. An intra-class correlation analysis of the three seasonal patterns for each farm showed that 75 percent of the farms had a coefficient of less than .8.

3. Sixty-nine percent of the farms had a statistically significant difference among the "best-fits" to the three seasonal patterns on their farms.

4. The precision with which seasonal patterns could be forecast for individual farms was measured by the seasonal pattern coefficient of variation. The size distribution of the coefficient indicated that 21 out of 2,656 could be forecast with no more than 8 percentage points error for two months of the year. The forecast would be the average pattern of three years.

Among all sizes of farms in both the distant and nearby areas there was great variation in the shape of seasonal patterns. In other words, even though a group of farms in an area may have had an average seasonal pattern of a particular shape, the average was actually made up of patterns of many different shapes. The analysis of stability of individual farm patterns had already indicated that considerable change took place from year to year during the three year period.

PRODUCER DELIVERY PATTERNS IN NEW ENGLAND MILK MARKETS

By Sargent Russell[1]

INTRODUCTION

Total market deliveries and averages for annual, monthly, or daily periods covering all farms are well known. Much of the thinking about milk marketing is done in terms of these totals and averages. Market response to price, equity of transportation charges, and general market regulations may be satisfactorily studied with such data.

Often proposals are made to establish levels of production for individual farms. To analyze such proposals, use of market totals and averages may not be satisfactory. If rules and regulations formulated from marketwide situations are applied to individual producers, the application will have varied effect unless all individual producers are doing similar things.

The New England Milkshed Price Committee felt that more information about the activity of individual producers would be useful. The primary emphasis was to be on how change in level of production and change in seasonality of production took place on individual farms. This in turn implied determining how consistent individual farms were either in maintaining a level of production or in changing the level.

Funds for the study were provided by the Agricultural Marketing Service and the Economic Research Service of the U.S. Department of Agriculture.

Study supervision and administration, in addition to that of the New England Milkshed Price Committee, was provided by the Agricultural Experiment Stations of Maine and Vermont under a cooperative agreement with the U.S. Department of Agriculture. The Research Computer Center at the University of Massachusetts made their computer facilities available.

SCOPE AND METHODS OF ANALYSIS

Scope and Objectives

The five New England Federal order markets were chosen for study. The first month for which producer records were available in all of these markets was April 1959. The three-year period July 1, 1959, to June 30, 1962, was selected.

The objectives stated at the beginning of the study were:

1. To describe the variations in patterns of annual production among individual New England milk producers. To describe the annual production changes from year to year of individual producers.

2. To describe the variations among individual New England milk producers in seasonal patterns of production and the variation of individual producers in their own

[1] Sargent Russell, an associate professor of food and agricultural economics, University of Massachusetts, was on leave of absence from the University while working on this report.

seasonal patterns from year to year. To describe the variations in seasonal patterns for groups of producers within a larger group, and the variation in seasonal pattern from year to year for the same producers.

3. To determine the number and characteristics of farms leaving New England milk markets and the number and characteristics of farms shifting among New England milk markets.

Selection of Producers

The sample was selected by taking the record of every fifth producer who was delivering milk to a New England Federal order market on July 1, 1959.[2] The arrangement of records from which selection was made varied between markets. In most cases the records were arranged by plants. Because of this arrangement, the selection of records resulted in the same proportion of records from each plant and therefore the same proportion from each handler. Departure from this pattern occurred in the Connecticut and Southeastern New England markets where an alphabetized file of producers was used as the source from which to make selection.

Once a producer was selected the farm, rather than the producer,[3] was followed (insofar as it was possible to do so) for three years. If the farm of a selected producer was sold to another producer who continued to deliver milk to a New England Federal order market, the continuing record of the farm itself was used. This procedure was modified in the case of a producer owning more than one farm. In such a case, if the producer dropped one farm, that farm was no longer followed and the delivery record used was for only the farm or farms retained. If a selected producer added a farm, his delivery records including that addition were used, but previous deliveries from the added farm were disregarded.

Records for producers who shifted to a non-Federal or non-New England Federal market were not obtained after they left the market, but records for producers who shifted between New England markets were used for the entire period. Information on what happened to producers who stopped delivering to New England Federal markets was obtained from handlers. (The market administrator's office does not audit this information.)

Reliability of Sample

A comparison between the number of farms selected in the sample and one-fifth of all farms as reported in "Federal Milk Order Market Statistics" for July 1, 1959, is shown in table 1. In two of the five markets the number selected was below what was to be expected, and in three markets the number selected was above. The maximum deviation was 8 percent. For the five markets the sample is 1 percent larger than would be expected.

Comparison of the average daily delivery for the sample farms with that for all farms in the five Federal order markets is given in table 2. In three markets the average daily delivery for the sample farms was higher than the average daily delivery of all farms as reported in "Federal Milk Order Market Statistics." The five-market average for sample farms was 4 percent higher than the five-market average for all farms. The

[2] In each of the markets, the market administrator's office has a 5 x 8 inch record card for each producer. In some cases there is more than one card for a producer -- because of split accounts, more than one farm unit, or delivery from two or more bulk tanks. In such cases the cards were pulled together as one record, but because a producer sometimes appeared more than once he was counted more than once and the actual number of producers studied is somewhat more than the taking of every fifth record would indicate. (Table 1)

[3] The terms "producer" and "farm" as of one point in time have the same meaning. Over time, as used in this study, a farm may be run by more than one producer. In this study, at least 83 percent of the farms were operated by one producer. (Table 11)

Table 1.--Total and sample farms by Federal order market, July 1, 1959

Market	Total farms[1]	One-fifth of total farms	Farms[2] selected for sample	Sample as percentage of one-fifth of total farms
	Number	Number	Number	Percent
Boston	10,807	2,161	2,149	99
Connecticut	3,032	606	657	108
Southeastern New England	2,067	413	415	100
Springfield	928	185	184	99
Worcester	696	139	142	102
Total	17,530	3,504	3,547	101

[1] Federal Milk Order Market Statistics, 1960 supplement to Statistical Bulletin No. 248, Milk Marketing Orders Division, Agricultural Stabilization and Conservation Service, U.S. Dept. Agr., Dec. 1961, p. 28.

[2] There is a slight difference between the use of the words "farms" and "producers." As of a given point in time both mean the same, but over time a "farm," as used in the study, may change hands and be operated by different "producers."

Table 2.--Average daily milk delivery for all producers and for sample farms, by Federal order market, July 1959

Market	Average daily delivery		
	Total farms[1]	Sample farms	Sample as percentage of total farms
	Pounds	Pounds	Percent
Boston	505	530	105
Connecticut	789	785	99
Southeastern New England	706	729	103
Springfield	525	549	105
Worcester	586	571	97
Weighted average all markets	582	604	104

[1] Federal Milk Order Market Statistics, 1960 Supplement to Statistical Bulletin No. 248, Milk Marketing Orders Division, Agricultural Stabilization and Conservation Service, U.S. Dept. Agr., Dec. 1961, p. 32.

difference is statistically significant. In other words, average daily delivery was higher for farms in the sample than was true for all farms in the five markets. This means that the proportion of large farms in the sample is higher than the proportion of large farms among all farms in the market. Since much of the analysis is based on farms of different sizes, this simply means that there are a few more larger farms to analyze than might have been expected.

This comparison of the sample farms with all producers shows that the number in the sample is slightly higher than expected and that the average size of sample farms is slightly greater than expected. As explained in the method of selecting the sample, this is not surprising since the larger farms were more likely than small farms to have more than one record card. This bias of more larger farms is not considered to be important, since most analyses take size of farm into consideration.

Information Tabulated From Producer Records

The primary information drawn from all records was quantity of milk delivered to handlers for a 36-month period. In most cases, deliveries were recorded semimonthly to the last pound. For the study, the last two digits were dropped, so that only full hundreds of pounds of milk delivered were copied from the records.

In addition to delivery records, the following information was also tabulated:

Bulk Tanks

All markets had information on the number of bulk tanks in use and the dates on which such tanks were first used, and this information was recorded. When information on the size of the bulk tank was available, it was recorded to the nearest hundred gallons.

Cooperative Membership

An attempt was made to record the cooperative to which a producer belonged on July 1, 1959, and on June 30, 1962. This, however, was complicated by the fact of multiple membership, and the fact that--since membership in operating cooperatives was recorded under handler--all operating cooperatives were placed in a single cooperative membership group. The number of changes in cooperative membership status were simply counted.

Handler and Plant

The name of the handler and the location of the plant to which the producer delivered on July 1, 1959, and on June 30, 1962, were recorded. The number of handler changes was tabulated as a count (one producer dealing with five handlers had nine handler changes). Plant changes recorded were those only in which there was a change from one plant under a given handler to another plant under the same handler. Plant changes resulting from handler changes were not counted as plant changes.

The Connecticut Milk Producers Association method of shifting farmers' milk between handlers presented a special problem which was handled by omitting the count of handler and plant changes.

Temporary Stop

Every interruption in producer delivery (whether it was for a few days or up to two years) was recorded, along with the principal reason for the interruption. These temporary stops were counted and the total number of weeks involved was recorded.

Transfers

When a change occurs in the producer record name (as from a man to a man-and-wife partnership, or one man to another) the Market Administrator's office makes a notation as to the type of transfer involved, and these notations were recorded.

Markets

The particular New England Federal order market to which delivery was being made on July 1, 1959, was recorded, and the number of months of unbroken delivery to that

market noted. If delivery shifted to a second New England Federal market, the new market and the number of months of unbroken delivery to it were tabulated. A second or third shift in market (whether it involved a new market or simply a return to the old) was recorded in the same way. Any successive shifts in market were noted on a supplementary list of records but not on the punch card. The total number of changes in market was recorded.

If the producer left the New England Federal markets and did not return, his leaving and the reasons for it were noted. A producer who left the New England markets but returned before June 30, 1962, was treated as a temporary stop. His reasons for leaving were obtained from the handlers by the Administrator's office but their reasons are not audited.

Number of Farms, Special Farms, and Nature of Ownership

The number of farm units in the record was indicated by multiple cards for a producer. However, split accounts (payments to father and to son or to partners) and two or more bulk tanks, in which cases there would be two or more producer cards, were counted as one farm.

When the market administrator's office had noted that a farm was operated by a cattle dealer or by a producer-handler who shipped excess milk to a handler (prior to September 1960), or when a farm shifted out of the New England market temporarily, retailed part of his milk, or shipped part of his milk to a nonregulated handler, this special characteristic of the farm was recorded.

The nature of the ownership of the farm was interpreted from the name appearing on the producer record. Since no investigation of the names appearing is made, the nature of ownership as interpreted, although recorded, would need to be used with care.

Location

The location of the farm was recorded by State, by county, and by "location differential" zone. These zones are "nearby" (46-cent location payment), "intermediate" (23-cent location payment), and "distant" (no location payment).

The primary record was photographically reproduced and checked. Coding and other adjustments took an average of about four minutes per record. The code sheets were checked when completed. The coded information and the delivery data were key punched, and 100 percent verified by a key-punching service.

Analysis of Individual Farm Data

Most arithmetic analyses of data (all mentioned in this section) were handled by an electronic computer. To insure that all analysis for any record was associated with the correct record, two identifying numbers appeared on every card. One was the farm record number and the other was the card number identifying the material on the card. Both the producer number and card number were checked in all runs through the computer and in all tabulations.

The following is a list of the determinations which are available for each record, and a description of how each determination was made:

Average Daily Delivery per Month (3 cards)

The deliveries in each month were summed and a constant "1" added (to compensate for not rounding when data were taken from the record). This sum was multiplied by the reciprocal of the number of days in the month (5 significant figures) and a constant .05 added to round to the nearest 0.1 hundreds of pounds per day.

Average Daily Delivery Bimonthly (2 cards)

Adding the average daily deliveries for July and August, September and October, and each succeeding two months before rounding, multiplying by .5, and adding .05, the average daily delivery by bimonthly periods was determined to the nearest 0.1 hundreds of pounds.

Average Daily Delivery Quarterly (1 card)

The unrounded figures for each successive three months in the year were added together, multiplied by .33333, and rounded to the nearest 0.1 hundreds of pounds by adding .05.

July-August to May Relationship (1 card)

The bimonthly average daily delivery of July and August was subtracted from the following May average daily delivery in each year. This change was divided by the May figure and rounded to the nearest whole percent by multiplying by 100 and adding .5. (In reporting this, the change is subtracted from 100 so that the final result shows July-August as a percent of the following May.)

Monthly Percents of Annual Average (3 cards)

The average daily delivery for each month in each year was divided by each year's annual average and rounded to the nearest whole percent by multiplying by 100 and adding .5.

Annual Change Analysis (1 card)

The annual average daily delivery for each of three years and the average daily delivery for three years combined was calculated from the sum of four quarterly figures (the year is July through June), multiplying the sum by .25 for each year, and the three annual averages summed and multiplied by .33333 for the three-year average.

Using the nearest whole percent, year two was expressed as a percent of year one, year three as a percent of year two, and year three as a percent of year one.

The coefficient of seasonal variation for each of three years was obtained by expressing the standard deviation of months in each year (the deviation of each month's average daily delivery from the average daily delivery of the year--this deviation squared then summed for all months, in turn divided by 11 [12 months minus one] and take the square root) as a percent of the annual average daily delivery. It is a measure of the amount of variation in monthly daily deliveries.

The type of percentage change occurring in the three years was determined by dividing the change in percents (percent year two of year one subtracted from percent year three of year two) by the percentage point deviation from 100 that year three was as a percent of year one.

The determinations described above are available for all records. Some of them are meaningless, however. For example, if a producer shipped less than 10 months, July-August as a percent of May would be almost infinite, because there would be a minus amount divided by practically zero (the computer said an error had been made). For this same producer the first year and the three-year average daily delivery would not be averages of full-time delivery.

To obtain an average level of deliveries for all farms which more nearly describes average level of farm operation, an average of deliveries during the time deliveries actually were made was calculated. For the 36-month study group, this was the three-year average described above. For a farm which left the New England Federal order

markets, average daily deliveries for the months while the farm was in the market were totaled and divided by the number of months it was in the market.

For those farms which had deliveries for 36 months, the following additional determinations were made:

Bimonthly Percent of Annual Average (1 card)

The bimonthly average daily deliveries mentioned above were multiplied by the reciprocal of the respective annual averages times 100 plus .5 and recorded to the nearest whole percent.

Quarterly Percent of Annual Average (1 card)

Using quarterly average daily deliveries, these percentages were obtained in the same way as the bimonthly figures.

Three-Year Average Monthly, Average Bimonthly, and Average Quarterly Percents of Annual Average (2 cards)

The corresponding monthly, bimonthly, and quarterly percents of annual average for the three years were added together and multiplied by .33333.

Up to this point, note that the average daily deliveries for monthly, bimonthly, and quarterly periods have been expressed as percentages of annual average daily delivery and that these figures in turn have been averaged for the three years.

Monthly, Bimonthly, and Quarterly Percent of Trend and Three-Year Average Monthly, Bimonthly, and Quarterly (6 cards)

At this point a second set of calculations was performed resulting in a set of analyses similar to those given above. Monthly, bimonthly, and quarterly average daily deliveries were expressed as a percent of "trend" in deliveries. The "trend" was obtained by calculating a centered 12-month moving average of the 36 months. From this a "trend" value for each of the center 24 months was obtained. A "trend" value for each of the six months on both ends was determined by a straight line extrapolation. Half of the difference between the annual average delivery levels of the first two years was assumed to take place in the first six months of the first year on a straight-line basis, and half of the difference between the annual average levels of the last two years was assumed to take place in the last six months of the third year. Each month was then expressed as a percent of trend. Bimonthly and quarterly percents of trend were calculated by averaging the monthly percents. The three-year average monthly, bimonthly, and quarterly figures were obtained by averaging corresponding periods for the three years.[4]

Analysis of Seasonal Variation (1 card)

Two analyses were made of the monthly percents of annual average and monthly percents of trend for the three years. The first analysis fitted a sine-cosine curve to each year and to the average of the three years. Using analysis of variance, there was a test for significant difference among the best-fit sine-cosine curves for the three years.

What is calculated in the analysis of variance is essentially the following:

1. The total sum of squares for all months in all years.

2. The sum of squares for the best fit to the three-year average seasonal. In essence, this is the variation explained by the best fit to the three-year average seasonal pattern.

[4] The adjustment for trend was examined to see if it changed the conclusions of the analyses made. Since it did not and since the trend as calculated has inadequacies, it was not used in presenting study results.

3. The sum of squares for the scatter of the actual three-year average seasonal around the best fit to the three-year average seasonal.

4. The sum of squares for the deviation of individual years best fits from the best fit to the three-year average seasonal. This is an interaction sum of squares. It measures the amount of variation of individual year best fits from the best fit to the three-year average.

5. Residual or error sum of squares. This is the total minus sum of squares for best fit to the three-year average minus sum of squares for scatter of the actual three-year average seasonal around the best fit to the three-year average minus the sum of squares for interaction (variation of individual year best fits from best fit to the three-year average). In other words, from the total sum of squares there is subtracted the sum of squares for the actual average seasonal (this is the sum of squares for best fit to the three-year average plus scatter of the actual average seasonal around the best fit to the three-year average) and also subtracted is any sum of squares explained by best fits to the individual years which is not explained by the best fit to the average seasonal.[5]

The F test for significant differences among best fits of individual years is the ratio of the interaction to the residual.

The second analysis was the determination of intraclass correlation.[6] Essentially this is the ratio of variance which is common to the seasonal patterns in all three years to the total variance of the individual year patterns.

High and Low Months (2 cards)

All months in each year for each producer were scanned to determine the highest month and the lowest month. In addition, the three-year average monthly percents of annual average and of trend were scanned to determine the highest month and lowest month.

Selection of Study Farms

For intensive analysis the records were refined in respect to three things: (1) time in the five New England Federal order markets; (2) completeness with which delivery records reflected production; and (3) length of any temporary stop in deliveries. If a farm had uninterrupted delivery of milk for 36 months, the reported deliveries of milk represented all of its production, and if the total time lost on temporary stops was not over 26 weeks, the farm went into the study group. The reason for including the 114 farms with temporary stops was that the causes for stopping were oriented to farm operation. These reasons were: milk excluded from the market by the handler because it was considered unfit; cows were all dry at one time; sale of herd and purchase of new herd; the barn had burned; farm use of milk; and unknown. Some of these reasons may be questionable, but there is some element of operator decision. Drawing the line at 26 weeks was an arbitrary decision on what constitutes a "temporary" stop.

A second study group was set up which included all farms which were not delivering to the New England Federal order markets on June 30, 1962, which were not delivering in some other market, and for which deliveries represented all production up to the time of leaving the market. This group was not limited by the length of temporary stops.

In addition to the two study groups, there is a third group: farms that left to deliver elsewhere. Each of these three groups contained farms with partial records where deliveries did not reflect total production. In other words, there were 67 records where the farm delivered for 36 months but part of the milk produced was sold at retail or to a

[5] C. I. Bliss, Periodic Regression in Biology and Climatology, Conn. Agri. Expt. Stat. Bulletin 615, June 1958.
[6] G. W. Snedecor, Statistical Methods, Iowa State University Press, 5th Edition, pp. 282-285.

nonregulated handler. There were 16 farms with deliveries representing partial production which left the New England markets and stopped production, and there were 19 with deliveries of partial production which left the market but continued delivery outside the New England Federal markets.

Consideration for refinement was also given to farms where whole farm units had been added or dropped. This is a way farms change size, but information on all farms which bought or sold land was not available. Therefore, even in those cases where it was known that a unit was added or dropped, the farms were not omitted from analysis. Final classification of farms into complete production record and partial record for each of the three groups resulted in an unwieldy number of groups for analysis.

Therefore, primary emphasis in the analysis of farm growth and seasonality was given to those farms where deliveries represented the total production of the farm for 36 months. For analysis of farms which left the New England markets, primary emphasis was given to those which stopped deliveries and for which recorded deliveries represented total production.

The primary concern, it is emphasized, was with patterns of annual change and of seasonality, and characteristics of farms which went out of milk production. Only secondarily was there concern in making inferences about market patterns. In other words, the first interest was in the behavior of individuals. The behavior of the entire market can be described better by market totals.

For those farms where only partial records were available, individual behavior could not be described. Farms which left the market but continued delivering elsewhere were not the farms which had gone out of production. There were 3,547 farms selected, representing one out of five which were delivering milk on July 1, 1959. How the 3,547 were classified for analysis is shown in table 3, in which the 2,656 study farms which had 36 months of complete delivery are shown classified by temporary stop and by location, distant or nearby. There were 1,648 study farms in the distant zone[7] and 1,008 in the nearby zone[7] (nearby includes intermediate). There were 674 study farms which left the market by stopping milk production within the 36-month period but delivery records represented complete production for the period when deliveries were being made.

Table 4 summarizes table 3 showing the proportion of distant and nearby farms for all sample farms and for study farms. Table 5 shows the proportion of farms which left the market for all farms and for study farms. There is no significant difference between all farms and study farms in the proportions of distant and nearby. There is a statistically significant[8] difference between all farms and study farms in the proportion which left the market. This is to be expected because the percent of all farms which left the market includes not only farms which left the market and stopped production but also farms which left and continued delivery elsewhere. The latter group was not included for study farms in determining the percent which left the market. There is no significant difference between distant and nearby study farms in the proportions which left the market.[9]

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[7] The definition of "zone" is given on p. 5.

[8] When "significant" is used in respect to statistics of this report it means that the difference being discussed has a 5 in 100 or less probability of having occurred due to chance in sampling.

[9] This aspect is discussed later and the conclusion is reached that the proportion of nearby farms leaving the market may be higher when a correction is made for size of farm.

Table 3.--Distribution of all sample farms by length of milk delivery period, by completeness of record, and by farm location, 1959-1962[1]

Temporary stop	DISTANT FARMS					
	36-month deliveries		Left market			
	Complete record	Partial record	Stopped deliveries		Continued elsewhere	
			Complete record	Partial record	Complete record	Partial record
	----------Farms----------					
Weeks						
0	1,551	20	381	6	66	11
1-9	72	7	25	1	2	3
10-19	16	4	15		2	
20-26	9		7		1	
Over 26	13	9	7			1
Total	1,661	40	435	7	71	15
	NEARBY FARMS					
0	991	15	233	7	25	4
1-9	10	5	2	2	1	
10-19	4	4	2			
20-26	3		1			
Over 26	5	3	1			
Total	1,013	27	239	9	26	4
Study farms	2,656		674			
Nonstudy farms	[2] 18	67		16	97	19
All farms	2,674	67	674	16	97	19

[1] Throughout this study 1959-1962 refers to July 1, 1959, to June 30, 1962.
[2] Farms with a temporary stop over 26 weeks.

Table 4.--Distribution of all sample farms and study farms by location and by length of milk delivery period, 1959-1962[1]

Farm location	Total	Percent of total	36-month deliveries		Left market	
			Number	% of total	Number	% of total
	ALL FARMS					
Distant.....	2,229	63	1,701	62	528	66
Nearby.....	1,318	37	1,040	38	278	34
Total.....	3,547	100	2,741	100	806	100
	STUDY FARMS					
Distant.....	2,083	63	1,648	62	435	65
Nearby.....	1,247	37	1,008	38	239	35
Total.....	3,330	100	2,656	100	674	100

[1] In this and following tables, note the number of observations for which percentages are computed. A sampling error due to chance in selecting observations of plus or minus 5 percentage points may occur when the number of observations is 100. For fewer observations, the error may be greater. For 2,500 observations the sampling error may be as much as 2 percentage points. Also, in computing percentages, figures were generally rounded to the nearest whole percent, but in all cases were made to add to 100.

Table 5.--Distribution of all sample farms and study farms by length of milk delivery period and by farm location, 1959-1962

Delivery record	Total	Percent of total	Distant Farms		Nearby Farms	
			Number	% of total	Number	% of total
	ALL FARMS					
36-month deliveries.....	2,741	77	1,701	76	1,040	79
Left market.....	806	23	528	24	278	21
Total.....	3,547	100	2,229	100	1,318	100
	STUDY FARMS					
36-month deliveries.....	2,656	80	1,648	79	1,008	81
Left market.....	674	20	435	21	239	19
Total.....	3,330	100	2,083	100	1,247	100

DESCRIPTION OF FARMS[10]

In this section some of the descriptive information available from the producer record cards is summarized. It provides background characteristics and introduces some of the dynamics of producer activity. Data are presented for 3,547 farms (2,741 were in the market 36 months; 806 left the market) and for 3,330 study farms (2,656 were in the market 36 months; 674 left the market). The 3,547 are classified by the average daily delivery in 36 months based on the actual time deliveries were made. The 3,330 study farms are also classified by the same average daily delivery but in addition are separated into "distant" and "nearby."

Since description of farms lends more to an appreciation of the total market situation, primary emphasis in explanations is given to the 3,547 sample farms. The reader may want to judge whether the study farms have characteristics similar to all farms.

State Location

Table 6 presents the State location of farms. The location distribution of farms (percent of all farms from each State on July 1, 1959) shows that Vermont led with 44 percent. The percent of farms in each State which left the market during the three-year

Table 6.--Location of all farms by length of milk delivery period, and by size of daily delivery, 1959-1962

Average daily delivery	Vt.	Mass.	Conn.	N.Y.	Me.	N.H.	R.I.	Total
	FARMS IN MARKET 36 MONTHS							
Pounds	Number							
0-244	188	48	38	17	40	20	6	357
245-494	398	102	115	37	90	51	14	807
495-994	442	137	155	91	81	49	25	980
995-1,994	197	66	100	92	23	14	11	503
1,995 & over	27	23	13	27		1	3	94
Total	1,252	376	421	264	234	135	59	2,741
	FARMS LEAVING MARKET							
0-244	146	48	28	29	74	44	9	378
245-494	89	27	36	33	38	16	7	246
495-994	51	16	23	19	9	11	2	131
995-1,994	12	7	8	13	2	1	1	44
1,995 & over	2		2	2			1	7
Total	300	98	97	96	123	72	20	806
All farms	1,552	474	518	360	357	207	79	3,547
Percent of total	44	13	15	10	10	6	2	100
Percent of total leaving market	19	21	19	27	34	35	25	23

[10] Farms covered by this report are categorized as follows: (1) All farms that were delivering milk at any time or at specified times to the five New England Federal order markets are referred to as "total farms in five New England markets," or simply as "total farms." (2) All farms in the sample are referred to as "all farms," or "sample farms." (3) The farms which were selected for study, as defined earlier, are referred to as "study farms."

Table 7.--Location of study farms by length of milk delivery period, and by size of daily delivery, 1959-1962

Average daily delivery	Vt.	Mass.	Conn.	N.Y.	Me.	N.H.	R.I.	Total
	DISTANT FARMS IN MARKET 36 MONTHS							
Pounds	Number							
0-244	184	1		14	36	12		247
245-494	382	2		32	88	40		544
495-994	423			45	78	37		583
995-1,994	187	1		24	21	12		245
1,995 & over	23			6				29
Total	1,199	4		121	223	101		1,648
	NEARBY FARMS IN MARKET 36 MONTHS							
0-244	1	42	37	2		6	6	94
245-494	8	95	112	5	2	8	14	244
495-994	7	132	152	43	1	11	25	371
995-1,994	4	63	97	63		2	11	240
1,995 & over	3	20	12	20		1	3	59
Total	23	352	410	133	3	28	59	1,008
	DISTANT FARMS LEAVING MARKET							
0-244	138	1		17	60	15		231
245-494	85	1		17	26	5		134
495-994	43			3	7	4		57
995-1,994	9	1			1	1		12
1,995 & over	1							1
Total	276	3		37	94	25		435
	NEARBY FARMS LEAVING MARKET							
0-244	3	44	27	2	1	14	9	100
245-494		25	33	3			7	68
495-994	2	12	21	8		1	1	45
995-1,994		6	8	8			1	23
1,995 & over	1		1				1	3
Total	6	87	90	21	1	15	19	239
Total study farms	1,504	446	500	312	321	169	78	3,330
Farms leaving	282	90	90	58	95	40	19	674
Percent leaving	19	20	18	19	30	24	24	20

period is also shown. These latter percents need to be interpreted with care. It appears that dropout was heaviest in Maine and New Hampshire. In both of these States the proportion of farms below 500 pounds average daily delivery was high (about 65 percent compared to about 45 percent in nearby States). Since, as will be seen later, dropout was heaviest among small farms, it is not surprising that dropout in Maine and New Hampshire was proportionately high. Among larger farms, dropout was less in Maine and New Hampshire than was true for nearby States.

State location of study farms is shown in table 7. In the summary of all study farms shown on the bottom of table 7, the proportion of farms by States which left is different than the proportions by States for all farms. This indicates that the farms with partial records and farms which continued elsewhere were proportionately higher in some States particularly in New Hampshire, than was true in other States.

Zone Location

All farms are classified by zone for payment of a location differential. The differential for the nearby zone is 46 cents, for the intermediate zone 23 cents, and for the distant zone no payment. Since the classification of farms into "distant" and "nearby" is extensively used in this study, there may be interest in the detail of this characteristic as shown in table 8. The intermediate farms are included for study with the nearby farms.

Table 8.--Zone location of all farms and study farms by length of delivery period, and by size of daily delivery, June 30, 1962

Average daily delivery	Distant zone		Intermediate zone		Nearby zone		Total	
Pounds	All farms	Study farms	All farms	Study farms	All farms	Study farms	All farms	Study farms
	FARMS IN MARKET 36 MONTHS							
0-244	258	247			99	94	357	341
245-494	554	544	5	5	248	239	807	788
495-994	601	583	[1] 11	[1] 11	368	360	980	954
995-1,994	257	245	[1] 12	[1] 11	234	229	503	485
1,995 & over	31	29	2	2	61	57	94	88
Total	1,701	1,648	30	29	1,010	979	2,741	2,656
	FARMS LEAVING MARKET							
0-244	265	231	13	[2] 8	100	92	378	331
245-494	167	134	4	1	75	67	246	202
495-994	72	57	3	1	56	44	131	102
995-1,994	21	12			23	23	44	35
1,995 & over	3	1	1	1	3	2	7	4
Total	528	435	21	11	257	228	806	674

[1] Includes 2 farms shifted from distant to intermediate zone.
[2] Includes 1 farm shifted from distant to intermediate zone.

Special Farms

There were several reasons why the Producer Record Sections in the market administrators' offices noted special features of farms. The main reason, however, was to account for highly irregular deliveries (changes from month to month which cannot be explained by "normal" variation). But all special characteristics may not have been accounted for. A cattle dealer's herd, for example, might have been so large that changes in level of deliveries were covered up. The characteristics noted in table 9 account for most of the 36-month farms where delivery records were not complete and which were therefore omitted from intensive study.

Table 9.--Special farms among all farms by length of delivery period and by size of daily delivery, 1959-1962

Average daily delivery	FARMS IN MARKET 36 MONTHS					
	Regular	Special farms				All types
		Supplying Unregulated plant	Part retail sales	Cattle dealer	Other	
Pounds	----------Farms----------					
0-244	347	6	3		1	357
245-494	792	10	2		3	807
495-994	957	14	4	2	3	980
995-1,994	486	10	6	1		503
1,995 & over	89	3	1	1		94
Total	[1] 2,671	43	16	4	7	2,741
	FARMS LEAVING MARKET					
0-244	360	5	11	1	1	378
245-494	237	3	4		2	246
495-994	123	2	5		1	131
995-1,994	44					44
1,995 & over	6		1			7
Total	[2] 770	10	21	1	4	806

[1] This total minus 18 farms with temporary stopover 26 weeks plus 3 of the cattle dealer farms equals 2,656 study farms.

[2] This total minus 97 farms with complete records who continued delivery elsewhere plus the 1 cattle dealer farm equals 674 study farms.

Producing Units per Farm

What constitutes a separate farm unit is vague. The Producer Record Sections in the market administrators' offices indicated more than one farm unit when the producer was delivering milk from more than one location. This was not indicated, however, when there were two or more bulk tanks on the same farm. Since farms may be combined and deliver from one location, the number of units as shown is a poor indicator of the extent to which multiple farm units existed. From the data it appeared that at least 2 percent of all farms had more than one farm unit (tables 10 and 11).

Table 10.--Number of producing units per farm of all farms by length of milk delivery period and by size of daily delivery, 1959-1962

Average daily delivery	FARMS IN MARKET 36 MONTHS					
	1 unit	2 units	3 units	4 units	5 units	Total
Pounds	----------Farms----------					
0-244	357					357
245-494	805	2				807
495-994	973	7				980
995-1,994	486	16	1			503
1,995 & over	68	20	4	1	1	94
Total	2,689	45	5	1	1	2,741
	FARMS LEAVING MARKET					
0-244	376	2				378
245-494	246					246
495-994	129	2				131
995-1,994	44					44
1,995 & over	6		1			7
Total	801	4	1			806

Table 11.--Number of producing units per farm of study farms, by length of milk delivery period, and by size of daily delivery, 1959-1962

Average daily delivery	DISTANT FARMS IN MARKET 36 MONTHS					
	1 unit	2 units	3 units	4 units	5 units	Total
Pounds	----------Farms----------					
0-244	247					247
245-494	542	2				544
495-994	578	5				583
995-1,994	231	13	1			245
1,995 & over	20	8			1	29
Total	1,618	28	1		1	1,648
	NEARBY FARMS IN MARKET 36 MONTHS					
0-244	94					94
245-494	244					244
495-994	369	2				371
995-1,994	238	2				240
1,995 & over	44	10	4	1		59
Total	989	14	4	1		1,008

Table 11.--Number of producing units per farm of study farms, by length of milk delivery period, and by size of daily delivery, 1959-1962--(continued)

Average daily delivery	DISTANT FARMS LEAVING MARKET					
	1 unit	2 units	3 units	4 units	5 units	Total
	Farms					
	DISTANT FARMS LEAVING MARKET					
0-244	229	2				231
245-494	134					134
495-994	56	1				57
995-1,994	12					12
1,995 & over			1			1
Total	431	3	1			435
	NEARBY FARMS LEAVING MARKET					
0-244	100					100
245-494	68					68
495-994	45					45
995-1,994	23					23
1,995 & over	3					3
Total	239					239

Farm Transfers

Payments by a handler for milk are made to a person or persons. If a new name occurs it may represent a new producer on a new farm or it may represent a new producer name for a farm from which deliveries were previously received. Since the records for this study do not include new farms entering the market after July 1, 1959, all of the producer name changes encountered involved only name changes for farms where milk had previously been delivered. The Producer Record Sections in the market administrators' offices noted the reason for producer name changes.

A tabulation of the reasons given for changes is shown in tables 12 and 13. Of the 3,547 farms studied there were 525 or 15 percent with one or more name changes. Of these, 395 were recorded as "family transfer" and most of these (no tabulation was made) involved a change in name from an individual to a man-and-wife. There were 67 cases of two or more changes in producer name.

Change of name or farm transfer is an indicator of dynamics. The figure, 15 percent, may be high, low or normal. In any case, it indicates that a portion of farms in each year come under the direction of a new producer. It would take a more careful examination of each transfer to find out whether or not the name change actually changed the management of the farm.

Table 12.--Farm transfers of all farms by length of milk delivery period and by size of daily delivery, 1959-1962[1]

Average daily delivery	No transfer	Family transfer	Farm purchased	Farm rented	Other	Total
	FARMS IN MARKET 36 MONTHS					
Pounds	Farms					
0-244	312	37 (4)	8 (1)			357
245-494	687	97 (9)	18 (5)	3	2 (1)	807
495-994	789	131 (10)	55 (9)	2	3	980
995-1,994	421	65 (9)	15 (3)	1	1 (1)	503
1,995 & over	74	13 (1)	4 (2)	2	1	94
Total	2,283	343 (33)	100 (20)	8	7 (2)	2,741
Percent	83	13	4	(2)	(2)	100
	FARMS LEAVING MARKET					
0-244	360	16	2 (1)			378
245-494	216	23 (4)	5	1	1	246
495-994	114	12 (2)	4 (1)		1	131
995-1,994	42	1 (1)			1	44
1,995 & over	7					7
Total	739	52 (7)	11 (2)	1	3	806
Percent	92	7	1	(2)	(2)	100

[1] Figures in parentheses indicate the number of farms for which more than one transfer occurred.

[2] Less than 0.5 percent.

Table 13.--Farm transfers of study farms by length of milk delivery period, and by size of daily delivery, 1959-1962[1]

Average daily delivery	No transfer	Family transfer	Farm purchased	Farm rented	Other	Total
	DISTANT FARMS IN MARKET 36 MONTHS					
Pounds	Farms					
0-244	216	24 (3)	7 (1)			247
245-494	447	78 (7)	16 (5)	2	1 (1)	544
495-994	445	92 (8)	44 (8)		2	583
995-1,994	191	42 (7)	11 (2)		1 (1)	245
1,995 & over	20	7 (1)	1		1	29
Total	1,319	243 (26)	79 (16)	2	5 (2)	1,648

Table 13.--Farm transfers of study farms by length of milk delivery period, and by size of daily delivery, 1959-1962[1]--(continued)

Average daily delivery	NEARBY FARMS IN MARKET 36 MONTHS					
	No transfer	Family transfer	Farm purchased	Farm rented	Other	Total
	Farms					
0-244	81	12 (1)	1			94
245-494	225	17 (2)	1	1		244
495-994	322	38 (2)	8 (1)	2	1	371
995-1,994	219	18 (1)	2	1		240
1,995 & over	49	5	3 (2)	2		59
Total	896	90 (6)	15 (3)	6	1	1,008
	DISTANT FARMS LEAVING MARKET					
0-244	219	10	2 (1)			231
245-494	113	15 (4)	4	1	1	134
495-994	45	9 (2)	2		1	57
995-1,994	11	1 (1)				12
1,995 & over	1					1
Total	389	35 (7)	8 (1)	1	2	435
	NEARBY FARMS LEAVING MARKET					
0-244	95	5				100
245-494	63	5				68
495-994	43	1	1 (1)			45
995-1,994	22				1	23
1,995 & over	3					3
Total	226	11	1 (1)		1	239

[1] Figures in parentheses indicate the number of farms for which there was more than one transfer.

Handler and Plant Changes

There are many reasons why farms shift either from one handler to another or from one plant to another of the same handler. Some of these reasons are producer oriented and some are handler oriented.

Among the 3,547 farms about a quarter changed handler[11] one or more times in the three-year period. (The 309 farms not classified[12] did not change handler.) Looking only at plant changes, again about one-quarter of the farms shifted plants one or more times. (The 309 farms not classified did considerable plant shifting.) Taking both handler and plant into consideration, 43 percent of the farms either shifted handler or plant or both at least once (table 14).

Handler and plant shifting was more prevalent in the distant zone than in the nearby zone (table 15).

[11] The word "handler" refers to the first receiver who takes the responsibility for movement of the milk from the farm into marketing channels. A single handler may have more than one plant or station where milk is received.

[12] The 309 farms not classified shipped to a single handler who supervised the distribution of the milk. Some of the milk went to plants of this handler and some went to other processors, but since the other processors did not have primary responsibility for distribution they have been classified as plants of the first receiver. The 309 farms were not classified as to number of plant changes because the changes were a combination of primary receiver plant change and intrahandler shifting of milk.

Table 14.--Handler and plant changes of all farms by length of milk delivery period and by size of daily delivery, 1959-1962

Average daily delivery	FARMS IN MARKET 36 MONTHS																	
	Number of Handler Changes																Not Classified	Total
	None				One				Two				Three or More					
	Number of Plant Changes																	
	0	1	2	3 or more	0	1	2	3 or more	0	1	2	3 or more	0	1	2	3 or more		
Pounds																		
0-244.....	197	20	3	1	70	9	9		19	1			3	6		1	18	357
245-494.....	416	94	11	2	139	23	9	1	36	1			11		2		62	807
495-994.....	524	115	4	1	145	17	12	2	37	1	1		13	3			105	980
995-1,994.....	281	45	3	2	70	4	4	1	20	2	1		6	1			63	503
1,995 & over...	41	10	1		15	1			3				5				18	94
Total.....	1,459	284	22	6	439	54	34	4	115	5	2		38	10	2	1	266	2,741
	FARMS LEAVING MARKET																	
0-244.....	273	16			58	7	1		11				1	1			10	378
245-494.....	175	17	1		24	6			2				4	2			15	246
495-994.....	87	7	2		18		1		3	1							12	131
995-1,994.....	26	3		1	5				4								5	44
1,995 & over...	6																1	7
Total.....	567	43	3	1	105	13	2		20	1			5	3			43	806

Table 15.--Handler and plant changes of study farms by length of milk delivery period, and by size of daily delivery, 1959-1962

Average daily delivery	DISTANT FARMS IN MARKET 36 MONTHS																Not Classified	Total
	Number of Handler Changes																	
	None				One				Two				Three or More					
	Number of Plant Changes																	
	0	1	2	3 or more	0	1	2	3 or more	0	1	2	3 or more	0	1	2	3 or more		
Pounds																		
0-244.....	143	19	3	1	51	9	9		4	1			6	1				247
245-494.....	298	92	11	2	87	22	8		18	1			3		2			544
495-994.....	335	110	4	1	82	17	10	2	18	1	1		1	1				583
995-1,994.....	153	41	2	2	26	3	3	1	11	2				1				245
1,995 and over.	14	8	1		4								2					29
Total.....	943	270	21	6	250	51	30	3	51	5	1	--	12	3	2			1,648
	NEARBY FARMS IN MARKET 36 MONTHS																	
0-244.....	47				15				11				3				18	94
245-494.....	106	2			48	1	1	1	15				8				62	244
495-994.....	176	5			57				18				12				103	371
995-1,994.....	120	3			39		1		8		1		5				63	240
1,995 and over.	25	1			10				3				1			1	18	59
Total.....	474	11			169	1	2	1	55		1		29			1	264	1,008

Table 15.--Handler and plant changes of study farms by length of milk delivery period, and by size of daily delivery, 1959-1962--(Continued)

Average daily delivery	DISTANT FARMS LEAVING MARKET																Not Classified	Total
	-Number of Handler Changes-																	
	None				One				Two				Three or More					
	-Number of Plant Changes-																	
	0	1	2	3 or more	0	1	2	3 or more	0	1	2	3 or more	0	1	2	3 or more		
Pounds	DISTANT FARMS LEAVING MARKET																	
0-244.....	164	16			37	7	1		5					1				231
245-494.....	94	15	1		15	5							2	2				134
495-994.....	38	6	2		8	1			1	1								57
995-1,994.....	6	2		1	2				1									12
1,995 and over.	1																	1
Total.....	303	39	3	1	62	13	1		7	1			2	3				435
Pounds	NEARBY FARMS LEAVING MARKET																	
0-244.....	69				14				6				1				10	100
245-494.....	43	1			6	1			2				1				14	68
495-994.....	28				6												11	45
995-1,994.....	13	1			2				2								5	23
1,995 and over.	2																1	3
Total.....	155	2			28	1			10				2				41	239

Market Changes

A market change was a move from one New England Federal order market to another New England Federal order market. A farm could change a second time by going to a third New England market or by going back to its original market.

Twelve percent of the 3,547 farms changed market one or more times (tables 16 and 17). The level of market shifting was significantly higher for distant farms (at 18 percent) than it was for nearby farms (at 3 percent).

Table 16.--Changes between markets of all farms by length of milk delivery period, and by size of daily delivery, 1959-1962

Average daily delivery	FARMS IN MARKET 36 MONTHS					
	No changes	1 change	2 changes	3 changes	4 or more changes[1]	Total
Pounds	----------Farms----------					
0-244	312	10	24	10	1	357
245-494	705	27	43	21	11	807
495-994	839	61	48	13	19	980
995-1,994	[2] 441	30	19	4	9	503
1,995 & over	79	6	4	2	3	94
Total	2,376	134	138	50	43	2,741
Percent	86	5	5	2	2	100
	FARMS LEAVING MARKET					
0-244	347	18	10	2	1	378
245-494	226	6	10	3	1	246
495-994	118	7	5		1	131
995-1,994	38	4	1	1		44
1,995 & over	7					7
Total	736	35	26	6	3	806
Percent	92	4	3	1	([3])	100

[1] Seven changes were the largest number reported.
[2] Includes 1 farm shipping to 2 markets simultaneously.
[3] Less than 0.5 percent.

The object of the description of farms has been to provide some detail on the characteristics of all farms sampled, to compare all farms with the study farms, and to indicate some of the dynamics. All farms were examined as two groups: those which were in the market 36 months, and those which left the market. Within each of these groups there was also a size classification based on the time actual deliveries were made during the three-year period.

This presentation brought out the main reason for eliminating farms among the 36-month group--that the eliminated farms were "special," that is, the delivery records were incomplete because part of the milk produced was not delivered to the Federal markets. Farm transfers, handler and plant changes, and market shifts were more

Table 17.--Changes between markets of study farms by length of milk delivery period, and by size of daily delivery, 1959-1962

Average daily delivery	No changes	1 change	2 changes	3 changes	4 or more changes	Total
	DISTANT FARMS IN MARKET 36 MONTHS					
Pounds	Farms					
0-244	204	10	22	10	1	247
245-494	451	23	42	19	9	544
495-994	458	51	46	10	18	583
995-1,994	193	23	19	4	6	245
1,995 & over	18	4	4	2	1	29
Total	1,324	111	133	45	35	1,648
	NEARBY FARMS IN MARKET 36 MONTHS					
0-244	92		2			94
245-494	235	4	1	2	2	244
495-994	362	4	2	3		371
995-1,994	234	4			2	240
1,995 & over	56	2			1	59
Total	979	14	5	5	5	1,008
	DISTANT FARMS LEAVING MARKET					
0-244	205	14	9	2	1	231
245-494	116	5	9	3	1	134
495-994	47	6	3		1	57
995-1,994	9	1	1	1		12
1,995 & over	1					1
Total	378	26	22	6	3	435
	NEARBY FARMS LEAVING MARKET					
0-244	98	2				100
245-494	67		1			68
495-994	45					45
995-1,994	21	2				23
1,995 & over	3					3
Total	234	4	1			239

prevalent among the 36-month farms than among the farms leaving the market. But this might well have been due to the fact that farms which left the market were observed for less than 36 months. The distant study farms showed more change than the nearby study farms for these three aspects.

FARMS WHICH LEFT THE MARKET

During the three-year period of the study, 806 farms or 23 percent of the total number left the five New England Federal order markets. This is considerably higher than the 12 percent drop in the total number of farms shipping to these markets as shown by Federal Milk Order Market Statistics (table 18), because in the study, only farms shipping on July 1, 1959, were followed while the Market Statistics includes farms added after July 1, 1959.

The proportion of farms in the study which dropped out each year was not constant. In the first two years 7 percent dropped out and in the third year 11 percent. A comparable difference occurred in the Market Statistics data--3, 2, and 8 percent, respectively, for the three years (table 18).

Although the State location of farms which left the market is shown in tables 6 and 7, for simplicity the location of farms leaving the market is classified into distant and nearby, and limited for intensive analysis to the "study-group" farms. For all farms selected, 24 percent of the distant farms and 21 percent of the nearby farms left the Federal order markets from July 1, 1959, to June 30, 1962 (table 5). The difference of 3 percentage points is not significant. For the study farms, 21 percent of distant farms and 19 percent of nearby farms stopped producing milk. The difference is not significant.

Table 18.--Number of total and sample farms shipping milk in July, 1959-1962

Year	Shipping during July		Decrease			
	Total farms[1]	Sample farms	Total farms	Sample farms	Total farms	Sample farms
	Number				Percent	
1959	17,530	3,547	493	238	3	7
1960	17,037	3,309	265	227	2	7
1961	16,772	3,082	1,302	341	8	11
1962	15,470	2,741				
Total 3 years			2,060	806	12	23

[1] Federal Milk Order Market Statistics, 1960 and 1961 Supplements to Statistical Bulletin No. 248 and Statistical Bulletin No. 335, Milk Marketing Orders Division, Agricultural Marketing Service, U.S. Department of Agriculture.

Size

Using first-year average daily delivery, the size of farms leaving the market is shown in table 19. In this three-year period, half of the farms delivering an average of less than 245 pounds of milk per day in the first year left the market. Also, more than half of those leaving the market averaged less than 245 pounds of milk. There is some bias in this analysis[13] because average daily delivery in this case is simply total deliveries for the year divided by 365 days. There is no question, however, that it was primarily small farms which went out of production.

Table 19.--Number of all farms and number of study farms in first year and number which had left market by June 30, 1962, by size of daily milk delivery

Average daily delivery	ALL FARMS		
	First year total	Left market	
Pounds	Number	Number	Percent
0-244	841	426	51
245-494	1,072	220	21
495-744	642	81	13
745-994	431	35	8
995-1,494	348	26	7
1,495-1,994	122	12	10
1,995-2,994	61	6	10
2,995 & over	30		
Total	3,547	806	23
	DISTANT STUDY FARMS		
0-244	536	257	48
245-494	687	114	17
495-744	392	35	9
745-994	228	19	8
995-1,494	160	8	5
1,495-1,994	51	1	2
1,995-2,994	24	1	4
2,995 & over	5		
Total	2,083	435	21
	NEARBY STUDY FARMS		
0-244	215	110	51
245-494	324	62	19
495-744	226	32	14
745-994	186	9	5
995-1,494	175	16	9
1,495-1,994	64	8	12
1,995-2,994	33	2	6
2,995 & over	24		
Total	1,247	239	19

[13] Correction for this bias can be made using the data in table 6.

Location

In comparing distant and nearby farms for the proportion in each size category which left the market a paradox arises. Among study farms a higher proportion of distant farms than of nearby farms stopped deliveries. In spite of this, in each size category (except the 745-994 group) the proportion of farms stopping deliveries was higher for nearby farms than for distant farms. In the 995 and over categories, the proportion of nearby farms stopping deliveries is significantly higher than the proportion of distant farms stopping. The paradox of a higher overall proportion of distant farms leaving but lower proportion in each size group is explained by the fact that the proportion of small farms was higher among distant farms than among nearby farms. It was for small farms that the proportion which stopped deliveries was highest.

Thus, the data show that farms which left were primarily small and that, although the proportion which stopped initially appears to be about the same in both the distant and nearby areas (no significant difference), a higher proportion of nearby than of distant farms stopped in most size groups. The latter, at least, was true for farms delivering 995 pounds or more milk per day.

Reasons for Leaving

The reason why a farm left the market was noted by the market administrators' offices and these reasons have been grouped into what is shown in table 20. "Left farm" includes reasons such as death, sickness, farm combination, sale of farm, moving, and stopping dairy farming. The other reasons are as shown. The terms "shifted to non-Federal handler" and "plant became non-Federal" refer only to shifts from New England Federal order markets. Shifts out of the New England area to the New York Federal order market would appear in these categories.

The largest proportion of those who left the New England market went out of dairying. At least 63 percent who left may be presumed to have sold the dairy herd and continued living at the farm.

The reasons for leaving among the 674 study farms do not include "shifted to non-Federal handlers," "plant became non-Federal," and "retail milk." These farms were presumed to have continued deliveries elsewhere. For the study farms there was a significantly higher proportion of nearby farms than of distant farms where the owner left the farm when milk deliveries stopped (table 21).

Table 20.--Reasons 806 of all farms left market by size of daily milk delivery, 1959-1962

Average daily delivery	Sold herd or cows dry	Left farm	Excluded[1]	Shifted to non-Federal handler[2]	Plant became non-Federal[2]	Started retailing milk	Barn burned	Unknown	Total leaving market
Pounds	Farms								
0-244.....	255	29	18	10	22	7		37	378
245-494.....	150	27	3	16	21	4	2	23	246
495-994.....	78	18		16	5	3	3	8	131
995-1,994....	21	11	1	6	3			2	44
1,995 & over.	3			2		1	1		7
Total....	507	85	22	50	51	15	6	70	806
Percent..	63	10	3	6	6	2	1	9	100

[1] Handler refused to accept milk because of low quality.
[2] Producer or plant shifted to a market other than the five New England Federal order markets.

Table 21.--Reasons 674 study farms left market by size of daily milk delivery, 1959-1962

Average daily delivery	Sold herd or cows dry	Left farm	Excluded[1]	Barn burned	Unknown	Total leaving market
	DISTANT STUDY FARMS					
Pounds	Farms					
0-244.....	184	15	11		21	231
245-494.....	104	15	2	1	12	134
495-994.....	41	10		2	4	57
995-1,994.....	9	1	1		1	12
1,995 & over.....				1		1
Total.....	338	41	14	4	38	435
Percent.....	78	9	3	1	9	100
	NEARBY STUDY FARMS					
0-244.....	65	14	6		15	100
245-494.....	43	12	1	1	11	68
495-994.....	33	8			4	45
995-1,994.....	12	10			1	23
1,995 & over.....	3					3
Total.....	156	44	7	1	31	239
Percent.....	66	18	3	(2)	13	100

[1] Handler refused to accept milk because of low quality.
[2] Less than 0.5 percent.

ANNUAL AVERAGE DAILY DELIVERIES

At this point an important facet of farm characteristics, level of average daily delivery, is presented using an average based on the total delivery in each year divided by the total days in the year. Up to this point average daily delivery was used based on the total delivery for three years divided by the days when delivery was made. This shift facilitates discussion of the dynamics of change.

Tables 22, 23, and 24 present a detailed description of the size distribution of all farms included in the study. These tables demonstrate for all farms the decline in the number and proportion of small farms and in the amount and proportion of milk delivered by small farms. Table 25 presents the proportion of farms and proportion of total delivery in each size category for distant and for nearby farms which are used for study. There is a significant difference between distant and nearby farms in the size distribution of farms. Distant farms included a higher proportion of small farms than nearby farms (45 percent below 495 pounds compared to 32 percent in the nearby area). This, of course, went along with considerably higher average daily delivery in the nearby area than in the distant area (table 26).

By reasoning it is possible to determine from the material in table 26 that part of the marketwide increase in average daily delivery was due to growth in farms which continue to deliver milk and part to small farms stopping delivery. In the three-year period, about two-thirds of the marketwide increase in average daily delivery resulted from increase in average size of farm operation and one-third from cessation of operation by smaller farms. In other words, those farms which continued delivery over the entire three-year period showed an average increase of about 12 percent. This is two-thirds of the total increase in average daily delivery of 18 percent. A more detailed analysis of changes in annual average daily delivery follows:

Table 22.--Number and total daily milk delivery of all farms by length of delivery period, and size of daily delivery, 1959-1960

Average daily delivery	NUMBER OF FARMS							
	Study farms				Nonstudy farms			
	36 months		Left market		36 mos.	Left market	Total	Pct. of total delivering
	Distant	Nearby	Distant	Nearby				
Pounds	----------	----------	----------	Farms	----------	----------	----------	----------
0-4.....				1		1	2	
5-244.....	279	105	257	109	31	58	839	24
245-494.....	573	262	114	62	17	44	1,072	30
495-744.....	357	194	35	32	10	14	642	18
745-994.....	209	177	19	9	10	7	431	12
995-1,494...	152	159	8	16	11	2	348	10
1,495-1,994.	50	56	1	8	4	3	122	3
1,995-2,994.	23	31	1	2	1	3	61	2
2,995 & over	5	24			1		30	1
Total...	1,648	1,008	435	239	85	132	3,547	100
	TOTAL DAILY DELIVERY							
	----------	----------	----------	Pounds	----------	----------	----------	----------
0-4.....								
5-244.....	47,100	17,600	31,400	13,300	3,900	7,600	120,900	5
245-494.....	209,100	95,900	40,200	21,900	6,500	15,000	388,600	18
495-744.....	217,000	119,200	20,200	18,700	6,000	8,500	389,600	18
745-994.....	179,000	151,900	15,800	7,500	8,600	5,900	368,700	17
995-1,494...	183,000	193,600	9,700	18,800	12,700	2,500	420,300	19
1,495-1,994.	84,100	94,200	1,600	13,700	7,100	5,200	205,900	9
1,995-2,994.	51,600	73,900	2,400	4,600	2,800	7,200	142,500	7
2,995 & over	24,800	108,300			7,300		140,400	7
Total...	995,700	854,600	121,300	98,500	54,900	51,900	2,176,900	100

Table 23.--Number and total daily milk delivery of all farms by length of delivery period, and by size of daily delivery, July 1, 1960-June 30, 1961

Average daily delivery	NUMBER OF FARMS							
	Study farms				Nonstudy farms			
	36 months		Left market		36 mos.	Left market	Total	Pct. of total delivering
	Distant	Nearby	Distant	Nearby				
Pounds	Farms							
0-4.....			118	70	3	51	242	
5-244.....	261	83	187	78	19	37	665	20
245-494.....	540	265	86	46	21	23	981	30
495-744.....	377	185	27	22	9	12	632	19
745-994.....	199	173	9	9	11	1	402	12
995-1,494...	177	164	6	9	12	4	372	11
1,495-1,994.	64	76	2	3	5	3	153	5
1,995-2,994.	24	36		2	4	1	67	2
2,995 & over	6	26			1		33	1
Total...	1,648	1,008	435	239	85	132	3,547	100
	TOTAL DAILY DELIVERY							
	Pounds							
0-4.....								
5-244.....	44,700	13,900	23,400	10,000	2,300	5,100	99,400	4
245-494.....	197,400	95,700	30,900	15,900	7,700	7,600	355,200	16
495-744.....	230,300	114,000	15,800	12,900	5,500	7,700	386,200	18
745-994.....	172,300	149,300	7,600	7,800	9,800	700	347,500	16
995-1,494...	209,300	197,400	8,000	10,600	14,700	4,900	444,900	20
1,495-1,994.	108,900	129,200	3,100	5,300	8,200	5,300	260,000	12
1,995-2,994	55,000	86,100		4,500	9,600	2,400	157,600	7
2,995 & over	29,800	126,700			7,000		163,500	7
Total...	1,047,700	912,300	88,800	67,000	64,800	33,700	2,214,300	100

Table 24.--Number and total daily milk delivery of all farms by length of delivery period, and by size of daily delivery, July 1, 1961-June 30, 1962

Average daily delivery	NUMBER OF FARMS							
	Study farms				Nonstudy farms			
	36 months		Left market		36 mos.	Left market	Total	Pct. of total delivering
	Distant	Nearby	Distant	Nearby				
Pounds	Farms							
0-4.....			230	152		83	465	
5-244.....	237	91	157	50	17	37	589	19
245-494.....	485	236	33	23	17	7	801	26
495-744.....	399	178	9	5	14		605	20
745-994.....	205	183	3	2	10	1	404	13
995-1,494...	212	169	3	5	15	3	407	13
1,495-1,994.	64	81		2	5	1	153	5
1,995-2,994.	39	41			5		85	3
2,995 & over	7	29			2		38	1
Total...	1,648	1,008	435	239	85	132	3,547	100
	TOTAL DAILY DELIVERY							
	Pounds							
0-4.....								
5-244.....	41,000	15,000	15,600	5,100	2,100	4,300	83,100	4
245-494.....	177,500	86,300	11,100	8,000	6,100	2,600	291,600	13
495-744.....	245,800	109,000	5,500	3,300	8,500		372,100	16
745-994.....	175,200	158,200	2,400	1,700	8,800	800	347,100	15
995-1,494...	252,000	203,100	3,800	5,900	17,700	3,600	486,100	22
1,495-1,994.	111,100	137,800		3,800	8,400	1,900	263,000	12
1,995-2,994.	89,200	97,900			12,300		199,400	9
2,995 & over	35,300	144,700			11,300		191,300	9
Total...	1,127,100	952,000	38,400	27,800	75,200	13,200	2,233,700	100

Table 25.--Percent of study farms and of their total daily milk delivery by size of daily delivery, 1959-1962

Average daily delivery	PERCENT OF FARMS					
	Distant farms			Nearby farms		
	First year	Second year	Third year	First year	Second year	Third year
Pounds						
5-244	17	16	15	10	8	9
245-494	35	33	30	26	26	23
495-744	22	23	24	19	18	18
745-994	13	12	12	18	17	18
995-1,494	9	11	13	16	16	17
1,495-1,994	3	4	4	6	8	8
1,995-2,994	1	1	2	3	4	4
2,995-& over	(1)	(1)	(1)	2	3	3
Total	100	100	100	100	100	100
	PERCENT OF TOTAL DAILY DELIVERY					
5-244	5	4	4	2	2	2
245-494	21	19	16	11	10	9
495-744	22	22	22	14	13	11
745-994	18	17	15	18	16	17
995-1,494	19	20	22	22	22	21
1,495-1,994	8	10	10	11	14	15
1,995-2,994	5	5	8	9	9	10
2,995 & over	2	3	3	13	14	15
Total	100	100	100	100	100	100

[1] Less than 0.5 percent.

Table 26.--Average daily milk delivery by total farms in five New England markets, by all sample farms, and by study farms, 1959-1962

Farm group	AVERAGE DAILY DELIVERY			
	First year	Second year	Third year	Increase first to third year
	Pounds			Percent
Total farms in five New England markets[1]	610	654	718	18
All sample farms delivering milk[2]	614	670	725	18
Study farms				
Distant	604	636	684	13
Nearby	848	905	944	11

[1] Federal Milk Order Market Statistics, 1960 and 1961 Supplements to Statistical Bulletin No. 248 and Statistical Bulletin No. 335, Milk Marketing Orders Division, Agricultural Marketing Service, U.S. Department of Agriculture.

[2] Average of all sampled farms which delivered during at least part of the year.

Average Change by Size of Farms

One way of examining the change in level of annual average daily delivery relative to initial size of farms is to see what average change took place for farms which started at a given level. This examination per farm is presented in table 27 for all farms observed. Only the number and average of farms which made deliveries in each year are shown. The same presentation is made for the 1,648 distant study farms in table 28, and for the 1,008 nearby study farms in table 29. As is to be expected, the amount of increase in average daily delivery from one year to the next was closely related to the initial size of the individual farm. When the percent of increase is examined, the largest percentage increase occurred on the smallest farms but showed relative uniformity on all other size farms. That is, there was no consistent difference in the percentage increase in level

Table 27.--Number and average daily milk delivery per farm of all farms delivering milk by size of first year average daily delivery, 1959-1962

Average daily delivery	First year		Second year	
	Number delivering	Av. delivery per farm	Number delivering	Av. delivery per farm
Pounds		Pounds		Pounds
5-244	839	144	651	174
245-494	1,072	363	1,037	372
495-744	642	607	631	626
745-994	431	856	426	885
995-1,494	348	1,208	348	1,260
1,495-1,994	122	1,688	121	1,712
1,995-2,994	61	2,336	61	2,393
2,995 & over	30	4,679	30	5,037
Total or average	[1] 3,545	614	3,305	670

Average daily delivery	Third year		Increase 1st-3rd year	
	Number delivering	Av. delivery per farm	Pounds	Percent
Pounds		Pounds		
5-244	564	184	40	28
245-494	962	396	33	9
495-744	598	666	59	10
745-994	418	925	69	8
995-1,494	335	1,333	125	10
1,495-1,994	118	1,775	87	5
1,995-2,994	57	2,595	259	11
2,995 & over	30	5,340	661	14
Total or average	3,082	725	111	18

[1] Two farms delivered milk for such a short period that their first year average was 0.

related to initial size of farm other than that farms below 245 pounds per day showed the greatest increase. The average amount of increase from year one to year three was greater for nearby farms than for distant farms, 96 pounds compared to 80, but the percentage increase was less, 11 percent compared to 13 percent.

Table 28.--Number and average daily milk delivery per farm of distant study farms by size of first year average daily delivery, 1959-1962

Average daily delivery	Average delivery per farm				Increase first-third year	
	Farms	First year	Second year	Third year		
Pounds	Number	Pounds	Pounds	Pounds	Pounds	Percent
5-244.....	279	169	189	208	39	23
245-494.....	573	365	385	421	56	15
495-744.....	357	608	643	689	81	13
745-994.....	209	857	903	958	101	12
995-1,494.....	152	1,204	1,257	1,344	140	12
1,495-1,994.....	50	1,683	1,716	1,860	177	11
1,995-2,994.....	23	2,242	2,296	2,445	203	9
2,995 & over.....	5	4,956	5,346	5,698	742	15
Total.....	1,648	604	636	684	80	13

Table 29.--Number and average daily milk delivery per farm of nearby study farms by size of first year average daily delivery, 1959-1962

Average daily delivery	Farms	Average delivery per farm			Increase first-third year	
		First year	Second year	Third year		
Pounds	Number	Pounds				Percent
5-244.....	105	168	196	212	44	26
245-494.....	262	366	390	407	41	11
495-744.....	194	615	659	695	80	13
745-994.....	177	858	899	929	71	8
995-1,494.....	159	1,218	1,297	1,348	130	11
1,495-1,994.....	56	1,682	1,761	1,792	110	7
1,995-2,994.....	31	2,383	2,597	2,746	363	15
2,995 & over.....	24	4,510	4,890	5,167	657	15
Total.....	1,008	848	905	944	96	11

First to Third Year Change

A second analysis of change in level of annual average daily delivery shows average level distribution for 3,547 farms in the first year and the size distribution in the third year for the same farms (table 30). The analysis reveals first, that the drop to no delivery was greatest for small farms (as has already been noted); and, second, that in all size categories there were some farms that increased and some that decreased average delivery.

Table 30.--Number and percent of third year average daily milk delivery for all farms by first year average daily delivery, 1959-60 and 1961-62

First year average daily delivery	Total farms delivering	Third year average daily delivery (pounds)								
		0-4	5-244	245-494	495-744	745-994	995-1,494	1,495-1,994	1,995-2,994	2,995 & over
Pounds	NUMBER OF FARMS DELIVERING									
0-4.....	2	2								
5-244.....	839	275	439	110	10	1	4			
245-494.....	1,072	110	126	619	199	12	6			
495-744.....	642	44	14	59	347	157	20	1		
745-994.....	431	13	8	8	44	208	146	3	1	
995-1,494.....	348	13	2	4	4	23	218	71	12	1
1,495-1,994...	122	4		1	1	3	13	72	28	
1,995-2,994...	61	4						5	43	9
2,995 & over..	30							1	1	28
Total.....	3,547	465	589	801	605	404	407	153	85	38
	PERCENT OF FARMS DELIVERING									
0-4.....	100	100								
5-244.....	100	33	52	13	1	(1)	1			
245-494.....	100	10	12	58	18	1	1			
495-744.....	100	7	2	9	54	25	3	(1)		
745-994.....	100	3	2	2	10	48	34	1	(1)	
995-1,494.....	100	4	1	1	1	7	63	20	3	(1)
1,495-1,994...	100	3		1	1	2	11	59	23	
1,995-2,994...	100	7						8	70	15
2,995 & over..	100							3	3	94

[1] Less than 0.5 percent.

At the bottom of table 30 the percentage distribution in the third year of farms which had a given first year level is shown. In this form it appears that a larger proportion of large farms showed increase than was true of small farms. One reason why this appears is that a larger proportion of small farms went out of dairying entirely. Tables 31 and 32, which deal with the study farms that delivered over the entire three-year period, show that the tendency for a larger proportion of large farms than of small farms to show increases was less evident.

An important consideration in all these analyses is to note the unequal sizes used for average daily delivery. However, the main point is not which size category is changing most. The main point is that for all size levels, some farms increased average delivery and some decreased.

Table 31.-- Number and percent of third year average daily milk delivery for distant study farms by first year average daily delivery, 1959-60 and 1961-62

First year average daily delivery	Total farms delivering	Third year average daily delivery (pounds)								
		0-4	5-244	245-494	495-744	745-994	995-1,494	1,495 1,994	1,995-2,994	2,995 & over
Pounds	NUMBER OF FARMS DELIVERING									
0-4.....										
5-244.....	279		203	72	4					
245-494.....	573		33	388	146	5	1			
495-744.....	357		1	24	225	91	16			
745-994.....	209			1	23	99	85	1		
995-1,494.....	152				1	9	106	32	4	
1,495-1,994...	50					1	4	30	15	
1,995-2,994...	23							1	20	2
2,995 & over	5									5
Total	1,648		237	485	399	205	212	64	39	7
	PERCENT OF FARMS DELIVERING									
0-4.....										
5-244.....	100		73	26	1					
245-494.....	100		6	68	25	1	(1)			
495-744.....	100		(1)	7	63	26	4			
745-994.....	100			(1)	11	47	41	(1)		
995-1,494.....	100				1	6	70	21	2	
1,495-1,994...	100					2	8	60	30	
1,995-2,994...	100							4	87	9
2,995 & over	100									100

[1] Less than 0.5 percent.

Table 32.-- Number and percent of third year average daily milk delivery for nearby study farms by first year average daily delivery, 1959-60 and 1961-62

First year average daily delivery	Total farms delivering	Third year average daily delivery (pounds)								
		0-4	5-244	245-494	495-744	745-994	995-1,494	1,495-1,994	1,995-2,994	2,995 & over
Pounds	NUMBER OF FARMS DELIVERING									
0-4.....										
5-244.....	105	75	26	2	1	1				
245-494.....	262	16	192	47	6	1				
495-744.....	194		14	112	63	4	1			
745-994.....	177		3	16	100	57	1			
995-1,494.....	159		1	1	11	103	37	6		
1,495-1,994...	56				2	3	39	12		
1,995-2,994...	31						2	22	7	
2,995 & over..	24						1	1	22	
Total	1,008	91	236	178	183	169	81	41	29	
	PERCENT OF FARMS DELIVERING									
0-4.....										
5-244.....	100	71	25	2	1	1				
245-494.....	100	6	74	18	2	(1)				
495-744.....	100		7	58	32	2	1			
745-994.....	100		2	9	56	32	1			
995-1,494.....	100		1	1	7	64	23	4		
1,495-1,994...	100				4	5	70	21		
1,995-2,994...	100						6	71	23	
2,995-& over..	100						4	4	92	

[1] Less than 0.5 percent.

Year-to-Year Changes

The third and most detailed examination of change in level of average daily delivery is a year-to-year size distribution of farms as shown in table 33 for 3,547 farms, table 34 for 1,648 distant study farms, and table 35 for 1,008 nearby study farms. In these tables the initial classification was first-year average level of delivery. For example, in the first year 245-494 pound group the number of farms was 1,072. Next the farms in each of the first-year groups were subclassified using the second-year average level of delivery. Of the original 1,072 in the first year 245-494 group, in the second year 35 delivered no milk; 103 delivered from 5-244 pounds; 805 delivered from 245-494 pounds; etc. The final classification was third-year average daily delivery which appears across the top of the table.

Reading across from the second-year total shows that, for the same 1,072 farms, in the third year 110 delivered no milk; 126 delivered 5-244 pounds; 619 delivered 245-494; etc. To the right of the second-year classification and below the third-year classification, it is evident how many of the 1,072 farms took each of the 81 possible paths leading from the first-year level of 245-294 pounds to the third-year levels. For example, there were 35 which delivered no milk in the second or third year; 48 which dropped from

Table 33.--Average daily milk delivery of all farms cross-classified in 3 years, 1959-1962

Average daily delivery	Total	Third year average daily delivery (pounds)								
		0-4	5-244	245-494	495-744	745-994	995-1,494	1,495-1,994	1,995 2,994	2,995 & over
Pounds	- - - -	- - - -	- - - -	- - - -	- - - -	-Farms-	- - - -	- - - -	- - - -	- - - -
First year total...	3,547	465	589	801	605	404	407	153	85	38
Second year										
0-4..............	242	238	2	1					1	
5-244............	665	154	443	66	2					
245-494..........	981	43	123	666	142	4	3			
494-744..........	632	20	17	59	416	114	6			
745-994..........	402	4	3	5	42	250	96	2		
995-1,494........	372	3	1	3	3	33	284	43	2	
1,494-1,994......	153	2		1		2	18	98	32	
1,995-2,994......	67	1				1		10	50	5
2,995 and over...	33									33
First year 5-244...	[1] 841	277	439	110	10	1	4			
Second year										
0-4..............	190	188	1	1						
5-244............	542	89	410	42	1					
245-494..........	103		26	67	8	1	1			
495-744..........	3		1		1		1			
745-994..........	2		1				1			
995-1,494........	1						1			
1,495-1,994......										
1,995-2,994......										
2,995 and over...										
First year 245-494.	1,072	110	126	619	199	12	6			
Second year										
0-4..............	35	35								
5-244............	103	48	32	23						
245-494..........	805	26	89	576	110	3	1			
495-744..........	121	1	5	19	88	8				
745-994..........	6			1	1	1	3			
995-1,494........	1						1			
1,495-1,994......	1						1			
1,995-2,994......										
2,995 and over...										
First year 495-744	642	44	14	59	347	157	20	1		
Second year										
0-4..............	11	11								
5-244............	15	12	1	1	1					
245-494..........	60	13	5	20	22					
495-744..........	452	7	8	38	309	87	3			
745-994..........	99	1			15	69	13	1		
995-1,494........	4						4			
1,495-1,994......	1					1				
1,995-2,994......										
2,995 and over...										

Table 33.--Average daily milk delivery of all farms cross-classified in 3 years, 1959-62--Continued

Average daily delivery	Total	Third year average daily delivery (pounds)								
		0-4	5-244	245-494	495-744	745-994	995-1,494	1,495-1,994	1,995-2,994	2,995 & over
Pounds		- - - - - - - - - - - - - - -				-Farms-	- - - - - - - - - - - - - - -			
First year 745-994..	431	13	8	8	44	208	146	3	1	
Second year										
0-4...............	5	3	1						1	
5-244.............	4	4								
245-494...........	8	2	3	2	1					
495-744...........	47	3	3	2	18	19	2			
745-994...........	270	1	1	4	24	171	68	1		
995-1,494.........	97				1	18	76	2		
1,495-1,994.......										
1,995-2,994.......										
2,995 and over....										
First year 995-1,494	348	13	2	4	4	23	218	71	12	1
Second year										
0-4...............										
5-244.............	1	1								
245-494...........	4	1		1	1		1			
495-744...........	7	7								
745-994...........	25	2	1		2	9	11			
995-1,494.........	253	1	1	3	1	14	195	37	1	
1,495,1,994.......	55	1					11	34	9	
1,995-2,994.......	3								2	1
2,995 and over....										
First year 1,495-1,994............	122	4		1	1	3	13	72	28	
Second year										
0-4...............	1	1								
5-244.............										
245-494...........										
495-744...........	1	1								
745-994...........										
995-1,494.........	16	2			1	1	7	4	1	
1,495-1,994.......	89			1		1	6	63	18	
1,995-2,994.......	15					1		5	9	
2,995 and over....										
First year 1,995-2,994............	61	4						5	43	9
Second year										
0-4...............										
5-244.............										
245-494...........	1	1								
495-744...........	1	1								
745-994...........										
995-1,494.........										
1,495-1,994.......	7	1						1	5	
1,995-2,994.......	47	1						4	38	4
2,995 and over....	5									5

Table 33.--Average daily milk delivery of all farms cross-classified in 3 years, 1959-1962--Continued

Average daily delivery	Total	Third year average daily delivery (pounds)								
		0-4	5-244	245-494	495-744	745-994	995-1,494	1,495-1,994	1,995-2,994	2,995 & over
Pounds	Farms									
First year 2,995 and over.........	30							1	1	28
Second year										
0-4..............										
5-244............										
245-494..........										
495-744..........										
745-994..........										
995-1,494........										
1,495-1,994......										
1,995-2,994......	2							1	1	
2,995 and over...	28									28

[1] Includes two farms which averaged 0-4 pounds in the first year.

Table 34.--Average daily milk delivery of distant study farms cross-classified in 3 years, 1959-1962

Average daily delivery	Total	Third year average daily delivery (pounds)							
		5-244	245-494	495-744	745-994	995-1,494	1,495-1,994	1,995-2,994	2,995 & over
Pounds		Farms							
First year total.....	1,648	237	485	399	205	212	64	39	7
Second year									
5-244.....	261	208	53						
245-494.....	540	29	409	99	1	2			
495-744.....	377		23	280	70	4			
745-994.....	199			20	119	60			
995-1,494.....	177				15	142	20		
1,494-1,994.....	64					4	43	17	
1,995-2,994.....	24						1	22	1
2,995 & over.....	6								6
First year 5-244.....	279	203	72	4					
Second year									
5-244.....	222	192	30						
245-494.....	56	11	42	3					
495-744.....	1			1					
745-994.....									
995-1,494.....									
1,495-1,994.....									
1,995-2,994.....									
2,995 & over.....									
First year 245-494.....	573	33	388	146	5	1			
Second year									
5-244.....	38	16	22						
245-494.....	459	17	357	83	1	1			
495-744.....	76		9	63	4				
745-994.....									
995-1,494.....									
1,495-1,994.....									
1,995-2,994.....									
2,995 & over.....									
First year 495-744.....	357	1	24	225	91	16			
Second year									
5-244.....	1		1						
245-494.....	23	1	10	12					
495-744.....	274		13	204	54	3			
745-994.....	56			9	37	10			
995-1,494.....	3					3			
1,495-1,994.....									
1,995-2,994.....									
2,995 & over.....									

Table 34.--Average daily milk delivery of distant study farms cross-classified in 3 years, 1959-1962--Continued

Average daily delivery	Total	Third year average daily delivery (pounds)							
		5-244	245-494	495-744	745-994	995-1,494	1,495-1,994	1,995-2,994	2,995 & over
Pounds		----------Farms----------							
First year 745-994.....	209	1	23	99	85	1			
Second year									
5-244.....									
245-494.....	1		1						
495-744.....	26	1	12	12	1				
745-994.....	133		10	78	45				
995-1,494.....	49			9	39	1			
1,495-1,994.....									
1,995-2,994.....									
2,995 & over.....									
First year 995-1,494....	152		1	9	106	32	4		
Second year									
5-244.....									
245-494.....	1				1				
495-744.....									
745-994.....	10		1	4	5				
995-1,494.....	118			5	97	16			
1,495-1,994.....	22				3	16	3		
1,995-2,994.....	1						1		
2,995 & over.....									
First year 1,495-1,994..	50			1	4	30	15		
Second year									
5-244.....									
245-494.....									
495-744.....									
745-994.....									
995-1,494.....	7			1	3	3			
1,495-1,994.....	38				1	26	11		
1,995-2,994.....	5					1	4		
2,995 & over.....									
First year 1,995-2,994..	23					1	20	2	
Second year									
5-244.....									
245-494.....									
495-744.....									
745-994.....									
995-1,494.....									
1,495-1,994.....	4					1	3		
1,995-2,994.....	18						17	1	
2,995 & over.....	1							1	

Table 34.--Average daily milk delivery of distant study farms cross-classified in 3 years, 1959-1962--Continued

Average daily delivery	Total	Third year average daily delivery (pounds)							
		5-244	245-494	495-744	745-994	995-1,494	1,495-1,994	1,995-2,994	2,995 & over
Pounds		Farms							
First year 2,995 & over..	5							5	
Second year									
5-244.....									
245-494.....									
495-744.....									
745-994.....									
995-1,494.....									
1,495-1,994.....									
1,995-2,994.....									
2,995 & over.....	5							5	

Table 35.--Average daily milk delivery of nearby study farms cross-classified in 3 years, 1959-1962

Average daily delivery	Total	Third year average daily delivery (pounds)							
		5-244	245-494	495-744	745-994	995-1,494	1,495-1,994	1,995-2,994	2,995 & over
Pounds	- - - - - - - - - - - - - Farms - - - - - - - - - - - - -								
First year total.....	1,008	91	236	178	183	169	81	41	29
Second year									
5-244.....	83	75	8						
245-494.....	265	16	211	35	2	1			
495-744.....	185		15	127	43				
745-994.....	173		1	16	121	33	2		
995-1,494.....	164		1		14	126	21	2	
1,495-1,994.....	76				2	9	51	14	
1,995-2,994.....	36				1		7	25	3
2,995 & over.....	26								26
First year 5-244.....	105	75	26	2	1	1			
Second year									
5-244.....	79	71	8						
245-494.....	26	4	18	2	1	1			
495-744.....									
745-994.....									
995-1,494.....									
1,495-1,994.....									
1,995-2,994.....									
2,995 & over.....									
First year 245-494.....	262	16	192	47	6	1			
Second year									
5-244.....	4	4							
245-494.....	222	12	186	23	1				
495-744.....	33		6	23	4				
745-994.....	3			1	1	1			
995-1,494.....									
1,495-1,994.....									
1,995-2,994.....									
2,995 & over.....									
First year 495-744.....	194		14	112	63	4	1		
Second year									
5-244.....			--						
245-494.....	14		5	9					
495-744.....	139		9	98	32				
745-994.....	39			5	30	3	1		
995-1,494.....	1					1			
1,495-1,994.....	1				1				
1,995-2,994.....									
2,995 & over.....									

Table 35.--Average daily milk delivery of nearby study farms cross-classified in 3 years, 1959-1962--(continued)

Average daily delivery	Total	Third year average daily delivery (pounds)							
		5-244	245-494	495-744	745-994	995-1,494	1,495-1,994	1,995-2,994	2,995 & over
Pounds	Farms								
First year 745-994.....	177		3	16	100	57	1		
Second year.....									
5-244.....									
245-494.....	2		2						
495-744.....	13			6	7				
745-994.....	120		1	10	85	23	1		
995-1,494.....	42				8	34			
1,495-1,994.....									
1,995-2,994.....									
2,995 & over.....									
First year 995-1,494.....	159		1	1	11	103	37	6	
Second year.....									
5-244.....									
245-494.....	1			1					
495-744.....	--								
745-994.....	11				5	6			
995-1,494.....	117		1		6	89	20	1	
1,495-1,994.....	30					8	17	5	
1,995-2,994.....									
2,995 & over.....									
First year 1,495-1,994...	56				2	3	39	12	
Second year.....									
5-244.....									
245-494.....									
495-744.....									
745-994.....									
995-1,494.....	4					2	1	1	
1,495-2,994.....	43				1	1	34	7	
1,995-2,994.....	9				1		4	4	
2,995 & over.....									
First year 1,995-2,994...	31						2	22	7
Second year.....									
5-244.....									
245-494.....									
495-744.....									
745-994.....									
995-1,494.....									
1,495-1,994.....	2							2	
1,995-2,994.....	25						2	20	3
2,995 & over.....	4								4

Table 35.--Average daily milk delivery of nearby study farms cross-classified in 3 years, 1959-1962--(continued)

Average daily delivery	Total	Third year average daily delivery (pounds)							
		5-244	245-494	495-744	745-994	995-1,494	1,495-1,994	1,995-2,994	2,995 & over
Pounds	Farms								
First year 2,995 & over..	24						1	1	22
Second year									
5-244.....									
245-494.....									
495-744.....									
745-994.....									
995-1,494.....									
1,495-1,994.....									
1,995-2,994.....	2						1	1	
2,995 & over.....	22								22

the first-year level of 245-494 to the 5-244 level in the second year and no milk level in the third year; 32 which dropped to the 5-244 level in both the second and third years; 23 which dropped to the 5-244 level in the second year but went back up to the 245-494 level in the third year.

One thing which became apparent from these tables was that about 20-30 percent of the farms shifted out of the initial size group from one year to the next and this continued into the next year. After two years, therefore, only about 50 percent of those in an initial size group were in the same group.

Another aspect of change which also became apparent was that, in the dynamic ebb and flow of individual farms, the underlying movement of the mass made itself felt. The distribution of all farms in the first year, then in the second year (totals category at top of table), and finally in the third year, shows the number of small farms decreasing and the number of large farms increasing.

In tables 36, 37, and 38 the data of tables 33, 34, and 35 are reexamined. This time the farms in each size category of a given year are examined for size category in the following year. The distribution for the following year is the percent of those in a given size group of the first year which went into the size categories of the following year. For example, in table 33 there are 665 farms shown in the 5-244 pound category of the second year. In the following year 154, or 23 percent, delivered no milk; 443, or 67 percent, were still in the 5-244 pound category; 66, or 10 percent, were in the 245-494 pound category; and 2, or less than .5 percent, were in the 495-744 pound category. The percentages appear in table 36 in the section for second or third year distribution on the line for the 5-244 pound category.

The change occurring in one year was, of course, less than that which occurred in two years, as shown in tables 29, 30, and 31. A comparison of the percentage distribution from one year to another, that is, a comparison of the year one to year two distribution with the year two to year three distribution, showed variation.

Table 36.--Percentage distribution of each previous year size category of all farms by size of average daily milk delivery in the following year, 1959-62

Average daily delivery	Total	Average daily delivery (pounds)								
		0-4	5-244	245-494	495-744	745-994	995-1,494	1,495-1,994	1,995-2,994	2,995 & over
Pounds		PERCENT IN SECOND YEAR								
First year										
0-4	100	100								
5-244	100	23	65	12	(1)	(1)	(1)			
245-494	100	3	10	75	11	1	(1)	(1)		
495-744	100	2	2	9	71	15	1	(1)		
745-994	100	1	1	2	11	63	22			
995-1,494	100		(1)	1	2	7	73	16	1	
1,495-1,994	100	1			1		13	73	12	
1,995-2,994	100			2	2			11	77	8
2,995-& over	100								7	93
		PERCENT IN THIRD YEAR								
Second year										
0-4	100	99	1	(1)					(1)	
5-244	100	23	67	10	(1)					
245-494	100	4	13	68	15	(1)	(1)			
495-794	100	3	3	9	66	18	1			
795-994	100	1	1	1	11	62	24	(1)		
995-1,494	100	1	(1)	1	1	9	76	11	1	
1,495-1,994	100	1		1		1	12	64	21	
1,995-2,994	100	1				1		15	75	8
2,995 & over	100									100

[1] Less than 0.5 percent

Table 37.--Percentage distribution of each previous year size category of distant study farms by size of average daily milk delivery in the following year 1959-62

Average daily delivery	Total	Average daily delivery (pounds)								
		0-4	5-244	245-494	495-744	745-994	995-1,494	1,495-1,994	1,995-2,994	2,995 & over
Pounds		PERCENT IN SECOND YEAR								
First year										
0-4.....										
5-244.....	100		80	20	([1])					
245-494.....	100		7	80	13					
495-744.....	100		([1])	6	77	16	1			
745-994.....	100			([1])	12	64	24			
995-1,494.....	100			1		7	77	14	1	
1,495-1,994.....	100						14	76	10	
1,999-2,994.....	100							17	79	4
2,995 & over.....	100									100
		PERCENT IN THIRD YEAR								
Second year										
0-4.....										
5-244.....	100		80	20						
245-494.....	100		5	76	19	([1])	([1])			
495-744.....	100			6	74	19	1			
745-994.....	100				10	60	30			
995-1,494.....	100					8	81	11		
1,495-1,994.....	100						6	67	27	
1,999-2,994.....	100							4	92	4
2,995 & over.....	100									100

[1] Less than 0.5 percent

Table 38.--Percentage distribution of each previous year size category of nearby study farms by size of average daily milk delivery in the following year, 1959-62

Average daily delivery	Total	Average daily delivery (pounds)								
		0-4	5-244	245-494	495-744	745-994	995-1,494	1,495-1,994	1,995-2,994	2,995 & over
Pounds	PERCENT IN SECOND YEAR									
First year										
0-4.....										
5-244.....	100		75	25						
245-494.....	100		2	85	12	1				
495-744.....	100			7	71	20	1	1		
745-994.....	100			1	7	68	24			
995-1,494.....	100			1		7	73	19		
1,495-1,994.....	100						7	77	16	
1,999-2,994.....	100							6	81	13
2,995 & over.....	100								8	92
	PERCENT IN THIRD YEAR									
Second year										
0-4.....										
5-244.....	100		90	10						
245-494.....	100		6	80	13	1	(1)			
495-744.....	100			8	69	23				
745-994.....	100			1	9	70	19	1		
995-1,494.....	100			1		8	77	13	1	
1,495-1,994.....	100					3	12	67	18	
1,999-2,994.....	100					3		19	70	8
2,995 & over.....	100									100

[1] Less than 0.5 percent.

Percentage Change Year to Year

The fourth and final analysis of change in annual level of delivery uses only those farms which made deliveries over the 36-month period (distant and nearby study farms). The farms in each zone were sorted into size groups on the basis of the first year's average daily delivery. Next a check was made on the percentage that the average daily delivery in the second year was of the average daily delivery in the first year. Each of these subgroups was then examined to see what percent third year delivery was of the second year (tables 39 and 40).

For example, in the distant zone there were 279 farms (table 39) which had a first year average daily delivery of under 245 pounds. Of these 279 there were 53 which showed little change from year one to year two (percent year two of year one category 95-104). From year two to year three the levels of average daily delivery among these 53 farms changed so that year three as a percent of year two ranged from below 75 percent to over 125 percent. Only 13 of the 53 which were stable from year one to year two were also stable (95-104) from year two to year three.

Many points could be discussed based on tables 39 and 40. One is that in both changes, year one to year two and year two to year three, the proportion of farms which were stable in the level of deliveries (percent 95-104) was considerably less than half. In other words, from year to year most farms changed more than 5 percent. A second point is an appreciable amount of reversing in direction of change. For example, in the distant farms size category 495-744 there were 32 farms (out of 357) which increased 5 percent or more from year one to year two but dropped over 5 percent from year two to year three. In the same group 47 dropped over 5 percent from year one to year two but increased 5 percent or more from year two to year three. In other words, 79 or 22 percent of the farms in this group reversed themselves from one year to the next.

The tables also point out that variability in change was not limited to a particular zone nor to a particular size group. Differences between zones or size groups or both in the proportion of farms showing given percentage changes could be investigated. The main point is, however, there was no one pattern of change. The most predominant pattern was an increase in both of the year-to-year changes, but even in this the percent of increase was highly variable from one year to another among the farms which increased in both years.

Table 39.--Percent of previous year's average daily milk delivery in two years for distant study farms by average daily delivery in the first year, 1959-1962

First year average daily delivery and second year delivery percent of first year	Total	Third year delivery percent of 2nd year						
		Below 75	75-84	85-94	95-104	105-114	115-124	125 & over
Total farms		Farms						
First year delivery.....	1,648	31	64	192	446	435	240	240
Second year delivery percent of first year								
Below 75.....	40	2	2	3	4	3	4	22
75-84.....	85	3	6	5	23	20	11	17
85-94.....	234	10	13	21	50	60	37	43
95-104.....	455	6	11	49	143	124	80	42
105-114.....	435	3	14	59	120	137	52	50
115-124.....	196	2	3	31	60	50	27	23
125 & over.....	203	5	15	24	46	41	29	43
5-244 lbs. 1st year delivery.....	279	10	18	45	60	48	34	64
Second year delivery percent of 1st year								
Below 75.....	10	1		1	1		1	6
75-84.....	19	1	2		5	7	2	2
85-94.....	43	4	4	3	8	9	4	11
95-104.....	53	2	2	9	13	9	9	9
105-114.....	52	1	1	11	15	9	6	9
115-124.....	33		1	9	7	7	4	5
125 & over.....	69	1	8	12	11	7	8	22
245-494 lbs. 1st year delivery....	573	9	31	60	144	133	98	98
Second year delivery percent of 1st year								
Below 75.....	16		1	1	2	1	2	9
75-84.....	35		3	2	11	6	5	8
85-94.....	85	2	7	11	14	18	15	18
95-104.....	164	4	7	17	48	37	35	16
105-114.....	137	1	7	16	39	39	16	19
115-124.....	61		1	8	12	14	12	14
125 & over.....	75	2	5	5	18	18	13	14
495-744 lbs. 1st year delivery....	357	7	7	37	106	109	50	41
Second year delivery percent of 1st year								
Below 75.....	7	1		1	1	2	1	1
75-84.....	13		1	1	3	4	1	3
85-94.....	54	2	1	2	14	13	10	12
95-104.....	91			10	31	28	14	8
105-114.....	115		3	12	33	42	14	11
115-124.....	45	2		8	13	15	5	2
125 & over.....	32	2	2	3	11	5	5	4

Table 39.--Percent of previous year's average daily milk delivery in two years for distant study farms by average daily delivery in the first year, 1959-1962--(continued)

First year average daily delivery and second year delivery percent of first year	Total	Third year delivery percent of 2nd year						
		Below 75	75-84	85-94	95-104	105-114	115-124	125 & over
	Farms							
745-994 lbs. First year delivery..	209	2	6	26	70	55	27	23
Second year delivery percent of first year								
Below 75	3							3
75-84	8	1		1	2	1	1	2
85-94	26	1	1	3	6	10	5	
95-104	69		1	8	25	16	12	7
105-114	54		3	7	15	18	4	7
115-124	32		1	4	17	6	3	1
125 & over	17			3	5	4	2	3
995-1,494 lbs. 1st year delivery	152	1	2	17	46	60	17	9
Second year delivery percent of first year								
Below 75	3		1					2
75-84	3					1	1	1
85-94	20	1		2	7	8	2	
95-104	47		1	4	15	22	4	1
105-114	55			8	15	20	8	4
115-124	18			2	8	5	2	1
125 & over	6			1	1	4		
1,495-1,994 lbs. First year delivery	50	1		3	13	22	8	3
Second year delivery percent of first year								
Below 75	1							1
75-84	5	1		1	1	1		1
85-94	3				1	1		1
95-104	22				8	9	5	
105-114	12			2	2	7	1	
115-124	3				1	1	1	
125 & over	4					3	1	
1,995 & over lbs. First year delivery	28	1		4	7	8	6	2
Second year delivery percent of first year								
Below 75								
75-84	2				1		1	
85-94	3					1	1	1
95-104	9			1	3	3	1	1
105-114	10	1		3	1	2	3	
115-124	4				2	2		
125 & over								

Table 40.--Percent of previous year's average daily delivery in two years for nearby study farms by average daily delivery in the first year, 1959-1962

First year average daily delivery and second year delivery percent of first year	Total	Third year delivery percent of 2nd year						
		Below 75	75-84	85-94	95-104	105-114	115-124	125 & over
				-Farms-				
Total farms								
First year delivery	1,008	25	43	163	323	257	107	90
Second year delivery percent of first year								
Below 75	25	1		5	7	3	2	7
75-84	24	1	2	5	6	5	3	2
85-94	120	3	5	17	37	33	13	12
95-104	299	9	20	43	98	77	33	19
105-114	289	3	5	53	100	76	29	23
115-124	153		5	25	51	43	17	12
125 and over	98	8	6	15	24	20	10	15
5-244 lbs. first year delivery	105	8	10	19	23	18	9	18
Second year delivery percent of first year								
Below 75	5			1	2			2
75-84	3			1		2		
85-94	10		1	1	3	3		2
95-104	25	3	6	6	6	2		2
105-114	15	1		2	7	1	3	1
115-124	18		2	2	2	7	4	1
125 and over	29	4	1	6	3	3	2	10
245-494 lbs. first year delivery	262	6	19	51	66	64	31	25
Second year delivery percent of first year								
Below 75	4		--	1	1			2
75-84	9		1	2	3	1	2	
85-94	41	1	1	7	11	14	3	4
95-104	81	3	8	13	21	21	11	4
105-114	65	2	2	15	17	13	7	9
115-124	31		2	8	6	7	5	3
125 and over	31		5	5	7	8	3	3
495-744 lbs. first year delivery	194	1	5	35	61	42	33	17
Second year delivery percent of first year								
Below 75	5			1	2		1	1
75-84	4				2		1	1
85-94	22		2	5	2	5	6	2
95-104	55		2	10	16	15	8	4
105-114	57			10	20	14	8	5
115-124	36		1	7	11	6	8	3
125 and over	15	1		2	8	2	1	1

Table 40.--Percent of previous year's average daily delivery in two years for nearby study farms by average daily delivery in the first year, 1959-1962--Continued

First year average daily delivery and second year delivery percent of first year	Total	Third year delivery percent of 2nd year						
		Below 75	75-84	85-94	95-104	105-114	115-124	125 and over
				Farms				
745-994 lbs. first year delivery...	177	3	3	27	70	50	12	12
Second year delivery percent of first year								
Below 75	7	1		2	1	1	1	1
75-84	2			1				1
85-94	20			4	8	6	1	1
95-104	58	2	1	4	23	16	7	5
105-114	52		2	11	20	15	1	3
115-124	32			4	17	10		1
125 and over	6			1	1	2	2	
995-1,494 lbs. first year delivery.	159	5	4	15	65	43	14	13
Second year delivery percent of first year								
Below 75	1							1
75-84	5	1		1	1	2		
85-94	18	1	1		9	3	3	1
95-104	49	1	3	5	22	11	4	3
105-114	56			6	23	17	6	4
115-124	20			3	7	7		3
125 and over	10	2			3	3	1	1
1,495-1,994 lbs. first year delivery	56	2	1	8	20	19	3	3
Second year delivery percent of first year								
Below 75	1				1			
75-84								
85-94	8	1			4	1		2
95-104	17			2	6	7	1	1
105-114	25		1	5	8	9	2	
115-124	2				1	1		
125 and over	3	1		1		1		
1,995 and over lbs. first year delivery	55		1	8	18	21	5	2
Second year delivery percent of first year								
Below 75	2					2		
75-84	1		1			--		
85-94	1					1		
95-104	14			3	4	5	2	
105-114	19			4	5	7	2	1
115-124	14			1	7	5		1
125 and over	4				2	1	1	

Total Farms in Five New England Markets

There are many difficulties in dealing with an analysis of seasonality. The primary difficulty is finding a single measure to describe a seasonal pattern. Even if a measure were found, it can be shown that there is no one pattern, even on the average for a market or for a group of farms, which persists unchanged. For example, when the average daily delivery by months of producers in the five New England markets is expressed as a percentage of the average for the year (using July to June to correspond with this study), in the three-year period May varied from 116 to 121 percent of the annual level and there were differences in the percentages of all of the other months for the three year period (table 41, figure 1). This variation is often considered to be random and it is assumed that a basic or general pattern persists. The problem then becomes one of determining whether or not the assumption is correct.

In this section on seasonality these two problems--finding a measure to describe seasonal, and testing for a change in the general pattern--are dealt with in several ways. The primary emphasis is on the description of individual behavior, but comparisons of groups are also made.

Table 41.--Average daily milk delivery each month of total farms in five New England markets as a percentage of the annual average daily delivery, in each of three years, 1959-1962[1]

Year	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June
	Percent of annual average daily delivery											
First.....	96	89	92	92	89	93	96	99	105	112	121	116
Second.....	94	91	91	92	91	94	96	98	106	110	117	120
Third.....	95	90	92	94	90	93	98	99	105	111	116	117

[1] Federal Milk Order Market Statistics, 1960 and 1961 Supplements to Statistical Bulletin No. 248 and Statistical Bulletin No. 335, Milk Marketing Orders Division, Agricultural Marketing Service, U.S. Department of Agriculture.

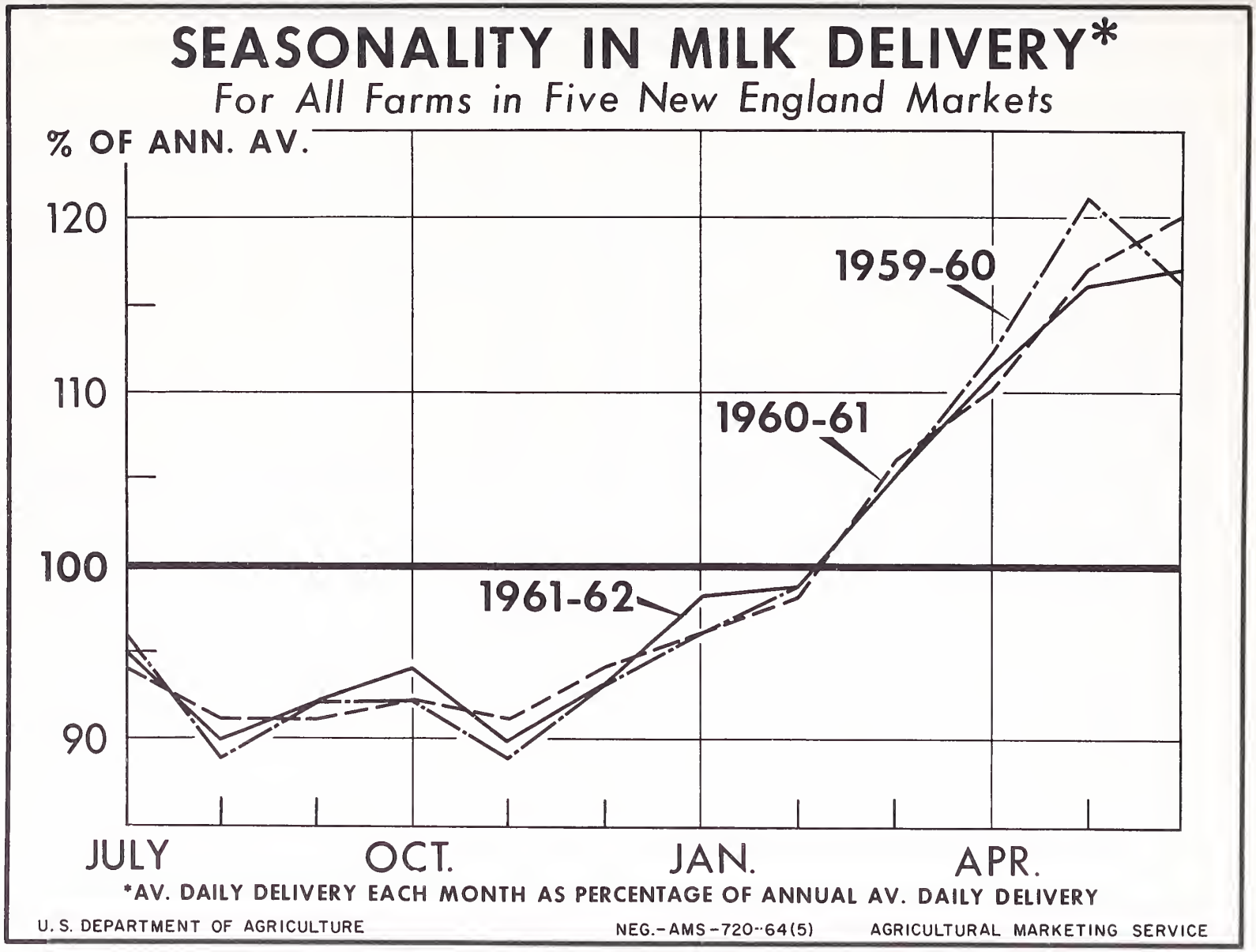
SEASONALITY IN MILK DELIVERY*
For All Farms in Five New England Markets
% OF ANN. AV.
120
110
100
90
1959-60
1960-61
1961-62
JULY
OCT.
JAN.
APR.
*AV. DAILY DELIVERY EACH MONTH AS PERCENTAGE OF ANNUAL AV. DAILY DELIVERY
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Figure 1

Size Groups

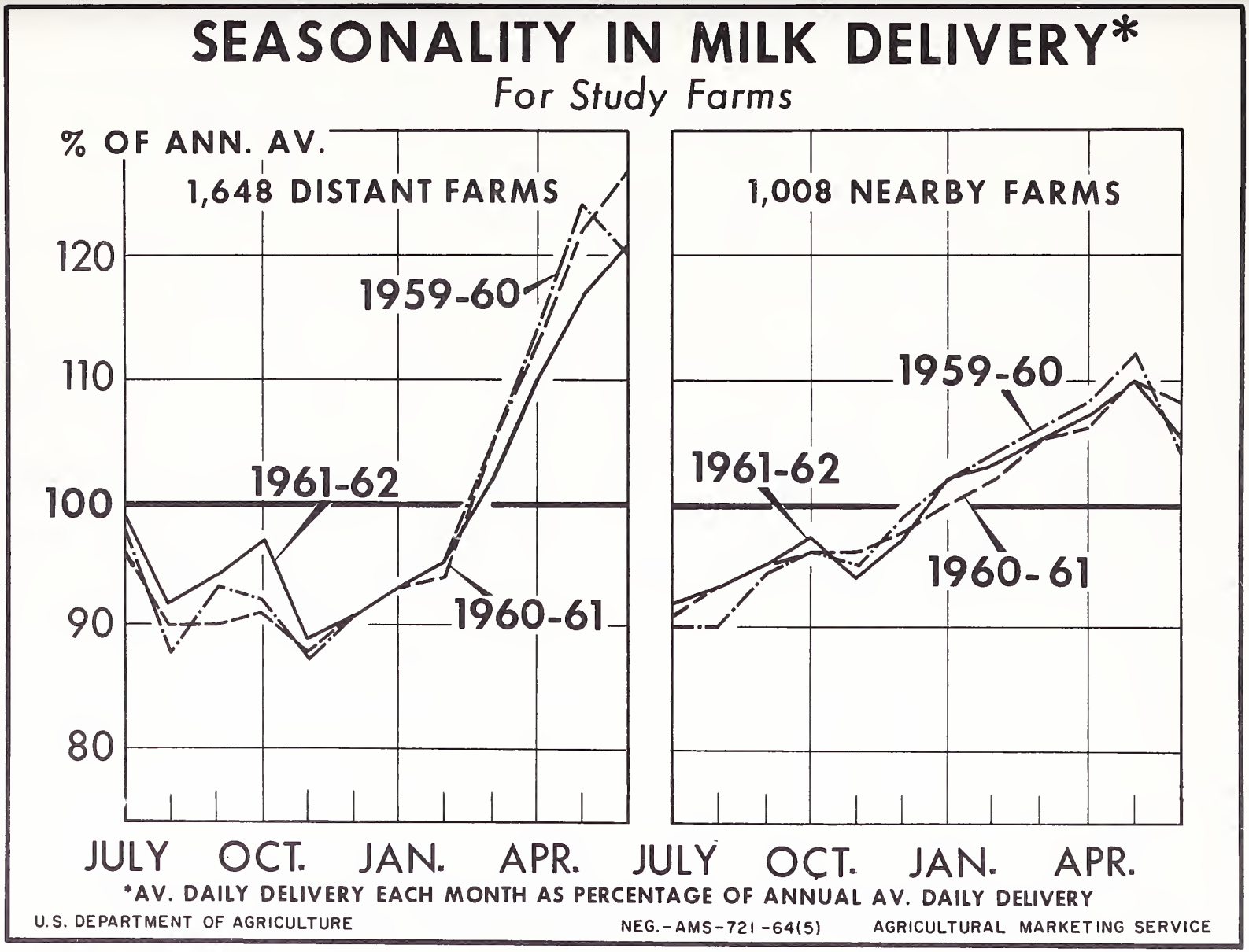
Generally, when the size of group examined becomes smaller, seasonal patterns become less consistent. For example, table 42 and figure 2 show more variation from year to year in the annual patterns of distant producers than there was in the year-to-year patterns for the five markets. Nearby producers, on the other hand, were about as consistent as the entire market. Also, the "general" pattern of distant producers was different than the "general" pattern of nearby producers.

Differences in the "general" patterns of groups of producers can be further illustrated by looking at the patterns of groups determined by size of milk delivery. (Size of delivery is the three-year average.) They show more "general" patterns. Large farms (995 pounds and over per day) have the lowest average delivery in July and August and reach a peak of production in May, compared to the usual November low and June high (table 43 and figures 3-6). The patterns of smaller groups within nearby producers were more variable from year to year than the pattern of the average of all nearby producers.

These data show that seasonal patterns vary from year to year (even for large groups), and that within large groups there are many subgroups with "general" patterns.

Table 42.--Average daily milk delivery each month of distant and nearby study farms as a percentage of the annual average daily delivery in each of 3 years, 1959-1962

Farm location & year	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June
	Percent of annual average daily delivery											
1,648 distant farms												
First.....	98	88	93	92	87	91	93	95	105	114	124	120
Second.....	96	90	90	91	88	91	93	94	105	113	122	127
Third.....	99	92	94	97	89	91	93	95	102	110	117	121
1,008 nearby farms												
First.....	90	90	94	96	95	99	102	104	106	108	112	104
Second.....	91	93	95	96	96	98	100	102	105	106	110	108
Third.....	92	93	95	97	94	97	102	103	105	107	110	105


SEASONALITY IN MILK DELIVERY*
For Study Farms
% OF ANN. AV.
1,648 DISTANT FARMS
1,008 NEARBY FARMS
120
110
100
90
80
1959-60
1961-62
1960-61
1959-60
1961-62
1960-61
JULY
OCT.
JAN.
APR.
JULY
OCT.
JAN.
APR.
*AV. DAILY DELIVERY EACH MONTH AS PERCENTAGE OF ANNUAL AV. DAILY DELIVERY
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AGRICULTURAL MARKETING SERVICE

Figure 2

Table 43.--Average daily milk delivery each month of distant and nearby study farms by size groups as a percentage of the annual average daily delivery in each of 3 years, 1959-1962

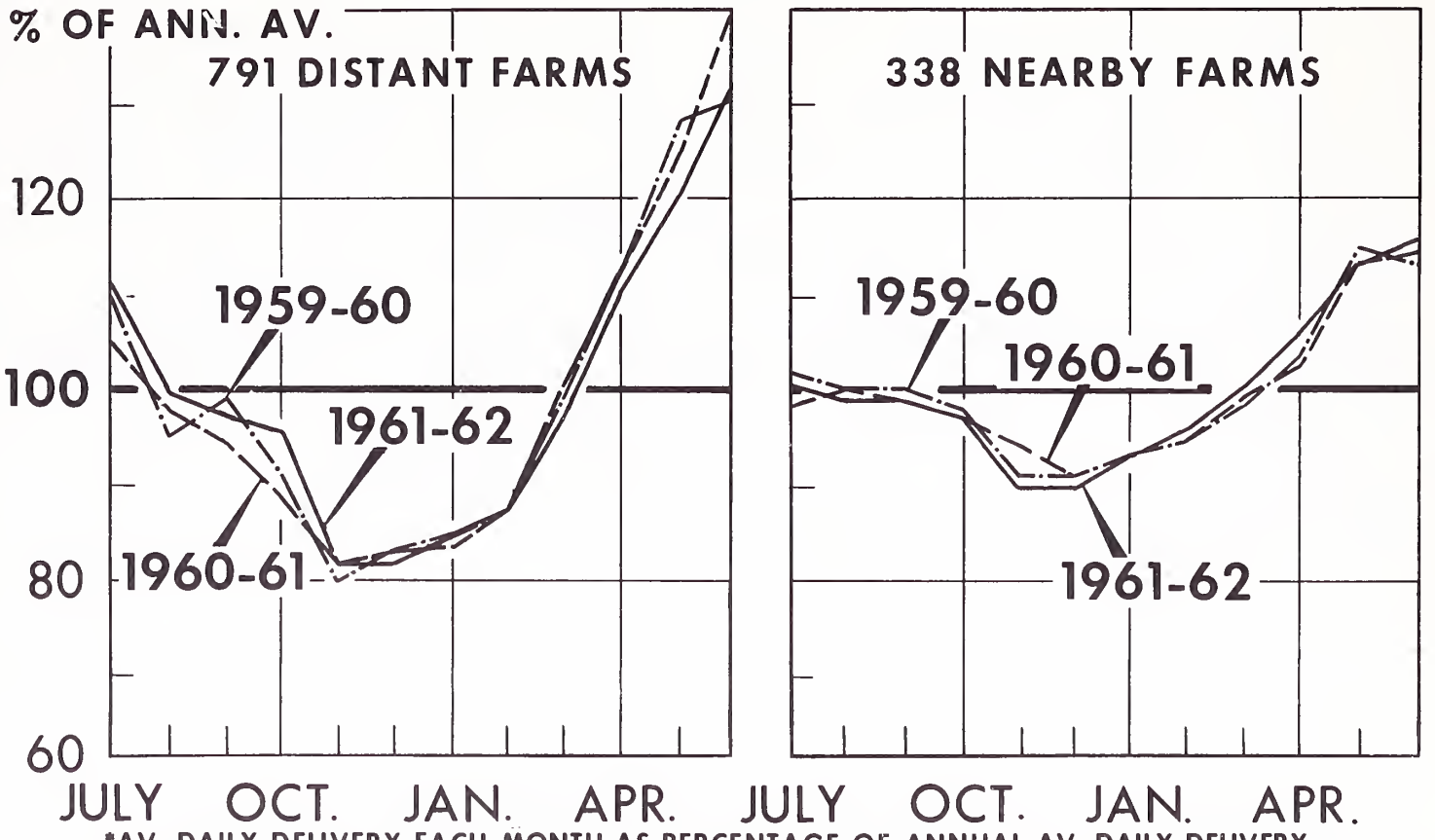
Average daily delivery, farm location and year	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June
	Percent of annual average daily delivery											
Less than 495 pounds:												
791 distant farms												
First	110	96	99	91	80	83	85	87	99	112	128	130
Second	106	98	95	89	82	83	84	87	100	112	125	139
Third	111	100	98	96	82	82	85	87	97	110	120	132
338 nearby farms												
First	102	100	100	98	91	91	93	95	98	104	115	113
Second	98	100	99	97	94	91	93	95	99	103	114	117
Third	101	99	99	97	90	90	93	96	100	106	114	115
495-994 pounds:												
583 distant farms												
First	100	90	94	92	86	90	91	93	104	114	124	122
Second	97	92	91	91	87	90	91	92	105	114	122	128
Third	101	94	96	97	89	90	91	93	101	110	116	122
371 nearby farms												
First	94	93	94	94	93	97	99	102	104	109	114	107
Second	93	94	95	95	94	95	98	100	104	106	113	113
Third	95	93	95	96	92	94	100	101	104	108	113	109
995-1,994 pounds:												
245 distant farms												
First	92	84	91	92	90	95	98	99	108	116	122	113
Second	90	84	87	92	92	95	98	99	109	114	120	120
Third	93	87	91	96	91	96	98	100	107	112	115	114
240 nearby farms												
First	87	88	93	96	95	100	105	107	109	108	110	102
Second	88	92	94	96	97	100	102	104	107	106	109	105
Third	91	92	94	96	94	99	104	105	107	107	109	102
1,995 & over:												
29 distant farms												
First	80	71	85	94	98	105	107	108	110	115	119	108
Second	82	78	85	94	97	103	103	104	110	112	118	114
Third	84	76	88	100	100	101	107	104	106	110	115	109
59 nearby farms												
First	84	86	94	98	98	103	107	107	108	107	108	100
Second	87	89	94	97	99	102	105	106	107	106	106	102
Third	87	90	93	100	99	103	108	107	106	105	105	97

Figure 3

Av. Daily Deliveries Under 495 Lb.

SEASONALITY IN MILK DELIVERY*

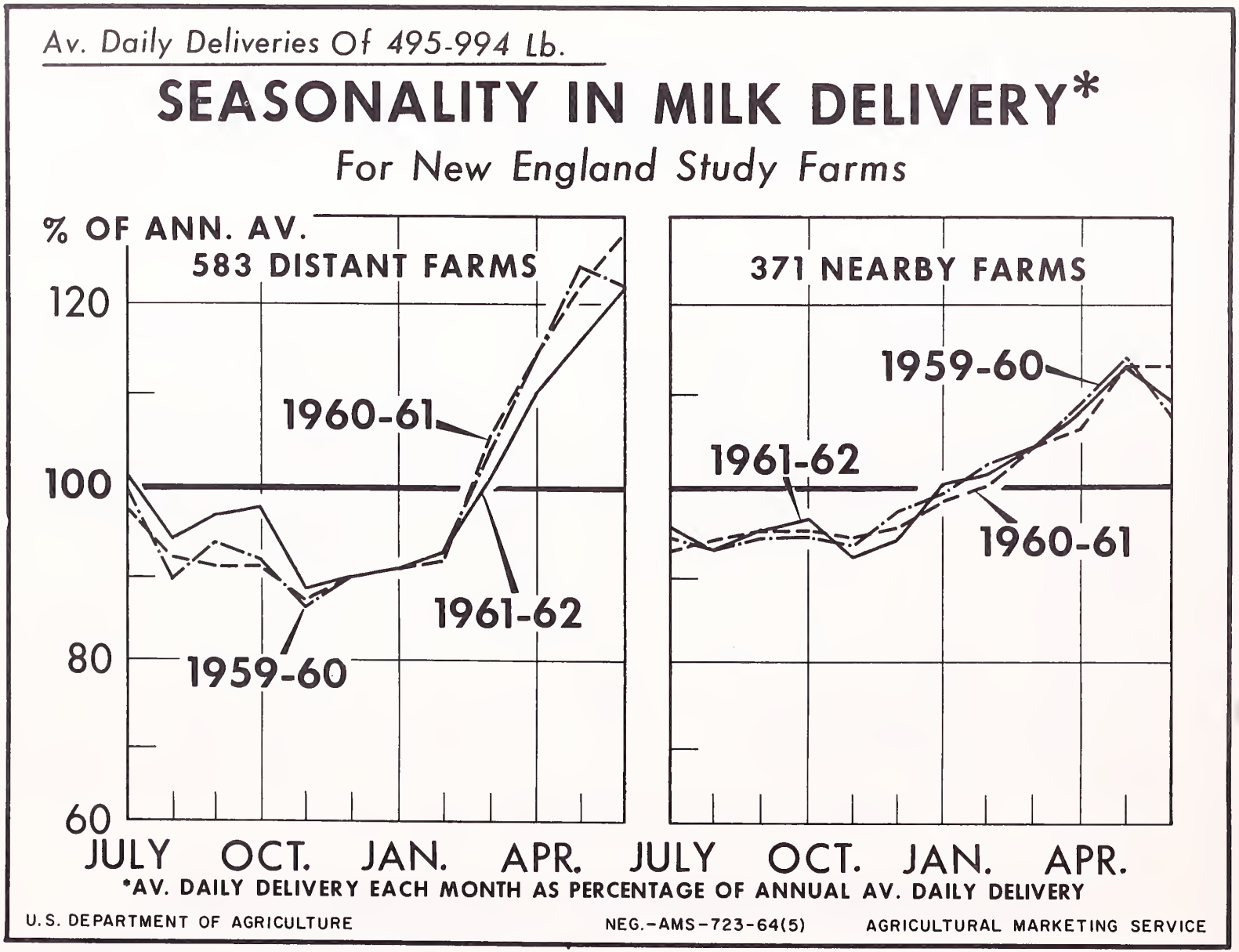
For New England Study Farms



*AV. DAILY DELIVERY EACH MONTH AS PERCENTAGE OF ANNUAL AV. DAILY DELIVERY

U. S. DEPARTMENT OF AGRICULTURE NEG.-AMS-722-64(5) AGRICULTURAL MARKETING SERVICE

Figure 4


Av. Daily Deliveries Of 495-994 Lb.
SEASONALITY IN MILK DELIVERY*
For New England Study Farms
% OF ANN. AV.
583 DISTANT FARMS
371 NEARBY FARMS
120
100
80
60
1960-61
1961-62
1959-60
1959-60
1961-62
1960-61
JULY
OCT.
JAN.
APR.
JULY
OCT.
JAN.
APR.
*AV. DAILY DELIVERY EACH MONTH AS PERCENTAGE OF ANNUAL AV. DAILY DELIVERY
U.S. DEPARTMENT OF AGRICULTURE
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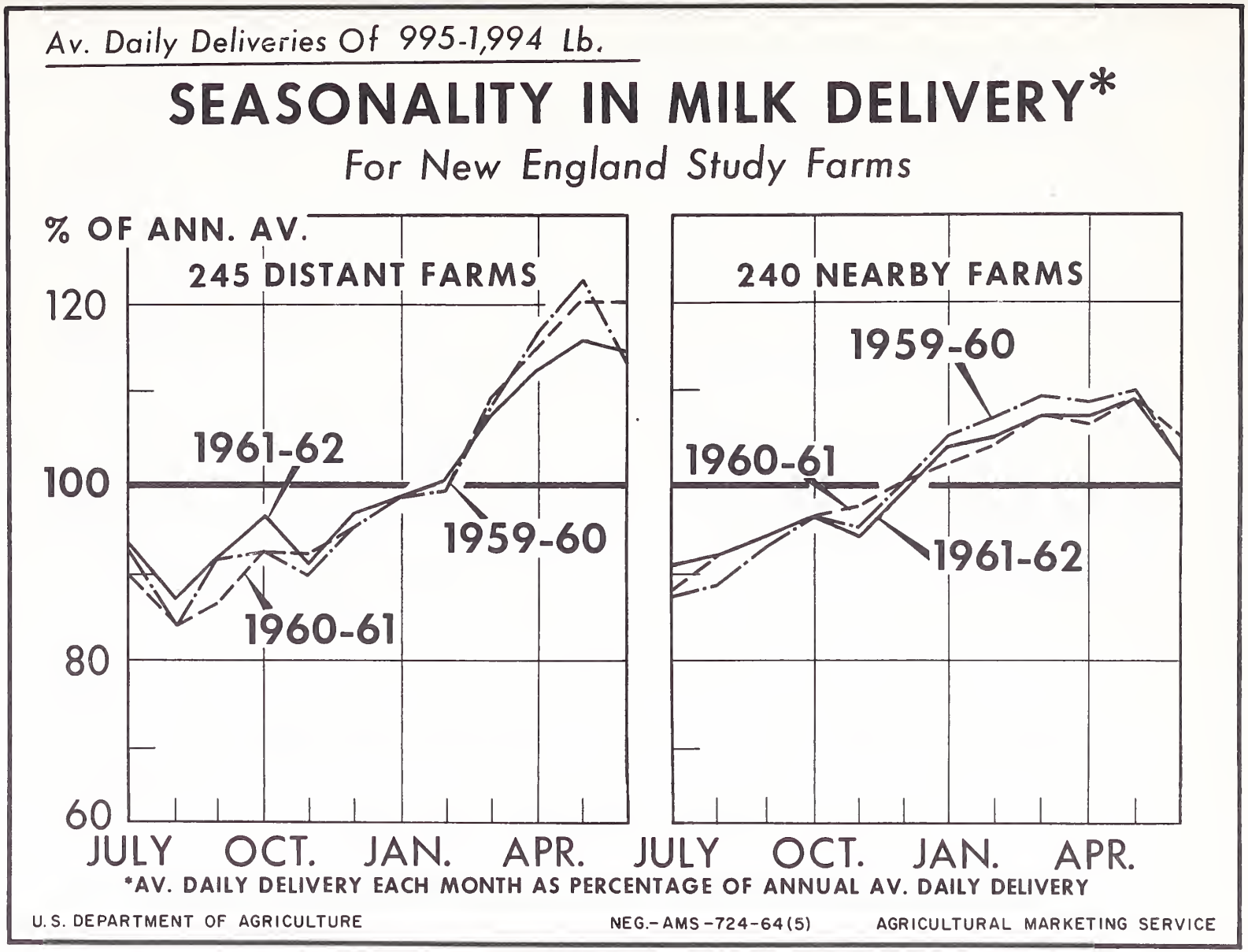
Av. Daily Deliveries Of 995-1,994 Lb.
SEASONALITY IN MILK DELIVERY*
For New England Study Farms
% OF ANN. AV.
245 DISTANT FARMS
240 NEARBY FARMS
120
100
80
60
1961-62
1959-60
1960-61
1959-60
1960-61
1961-62
JULY
OCT.
JAN.
APR.
JULY
OCT.
JAN.
APR.
*AV. DAILY DELIVERY EACH MONTH AS PERCENTAGE OF ANNUAL AV. DAILY DELIVERY
U.S. DEPARTMENT OF AGRICULTURE
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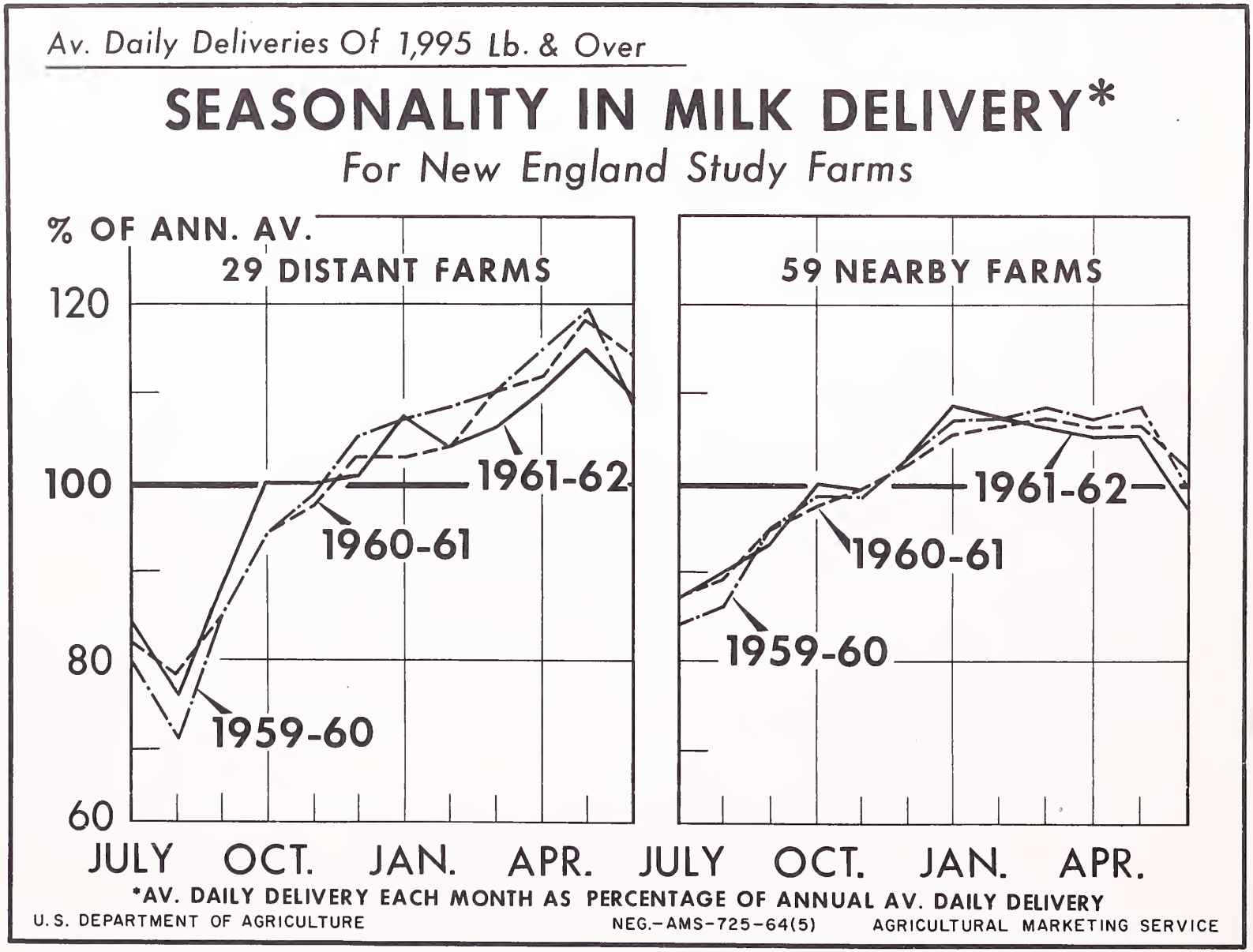
AGRICULTURAL MARKETING SERVICE

Figure 5


Av. Daily Deliveries Of 1,995 Lb. & Over
SEASONALITY IN MILK DELIVERY*
For New England Study Farms
% OF ANN. AV.
29 DISTANT FARMS
59 NEARBY FARMS
120
100
80
60
1961-62
1960-61
1959-60
JULY
OCT.
JAN.
APR.
*AV. DAILY DELIVERY EACH MONTH AS PERCENTAGE OF ANNUAL AV. DAILY DELIVERY
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AGRICULTURAL MARKETING SERVICE

Figure 6

INDIVIDUAL FARM SEASONALITY

Different groups of farms within an area have different seasonal patterns and these patterns are not reproduced exactly from year to year. From this, it can be assumed that individual farms will have many seasonal patterns. This still leaves the question of how consistent individual farms have been from year to year in their own patterns.

One way of determining consistency of individual farms with themselves is to examine the consistency in the total amount of seasonal variation from year to year. The total variation may or may not be occurring in the same general pattern.

Amount of Seasonal Variation

Total variation in seasonal pattern can be measured by the standard deviation of monthly deliveries within the year. To make possible comparison of total variation from one year to another (if total deliveries vary from year to year) and from farm to farm (to account for differences in size of farm) the standard deviation is expressed as a percentage of the average level of delivery for the year. The standard deviation of deliveries as a percentage of annual average delivery is called the coefficient of variation.

A coefficient of variation of 10-19 (average for the group about 15) means that the difference in average daily deliveries between the lowest month and the highest month was about 45 percent of the average for the year. In other words, the highest month might be 123 percent of the average for the year and the lowest month about 78 percent of the average for the year. The average pattern for all these producers (the 946 in the 10-19 group) would show less variation than what was true of each one individually.

In tables 44, 45, 46, 47, 48, and 49 the coefficients of variation for six groups of farms for three years are presented. The six groups are three sizes, small (below 495 pounds average daily delivery over three years), medium (495-994 pounds), and large (995 pounds and over), each by distant and nearby.

In the tables, the class intervals for the coefficients of variation occur three times. The class intervals for the first year are labeled first year (notice that a total section occurs at the top). The class intervals for the second year are repeated within each class interval of the first year. The third-year class intervals of the coefficients of variation are given across the top of the page. Since there are six class intervals, there are 6 x 6 x 6 or 216 places where an individual farm could be in this distribution.

Table 44, which is the presentation for 791 small distant farms, shows the figure 791 at the top left-hand position. The first-year class intervals, to the right of total for each of the first-year class intervals, shows how these 791 farms were distributed in the first year. For example, there were 10 farms in the 1-9 class, 160 farms in the 10-19 class, 260 farms in the 20-29 class, etc.

The numbers to the right of the second-year class intervals under the subheading "second year," reading down in the total section at the top of the page, show how all of these 791 farms were distributed in the second year. There were six in the 1-9 class, 163 in the 10-19 class, 255 in the 20-29 class, etc. Across the top of the body of the table, to the right of Total, is the record of how the 791 farms were distributed in the third year. This time there were 15 in the 1-9 class, 164 in the 10-19 class, 280 in the 20-29 class, etc.

The body of the table (below the total section) shows how individual farms operated. For example, in the first year there were 260 farms for which the coefficient of variation was 20-29. Under the subheading second year, for these same 260, is the record that the distribution in the second year went from below 10 to over 50. That is, there was one in the 1-9 class, 56 in the 10-19 class, 114 in the 20-29 class, etc. Next, under

Table 44.--Coefficient of variation (seasonal) of small distant study farms cross-classified in 3 years, 1959-1962

Coefficient of variation	Total	Third year coefficient of variation (percent)					
		1-9	10-19	20-29	30-39	40-49	50 & over
	- - - - - - -	- - - -	- - - -	-Farms-	- - - -	- - - -	- - - -
First year total............	791	15	164	280	173	101	58
Second year							
1- 9......................	6						
10-19.....................	163						
20-29.....................	255						
30-39.....................	162						
40-49.....................	128						
50 and over...............	77						
First year 1-9 total........	10	1	6	3			
Second year							
1-9.......................							
10-19.....................	7	1	5	1			
20-29.....................	2		1	1			
30-39.....................							
40-49.....................	1			1			
50 and over...............							
First year 10-19 total......	160	9	66	63	18	3	1
Second year							
1- 9......................	5	1	4				
10-19.....................	76	7	42	22	4	1	
20-29.....................	65	1	16	36	10	1	1
30-39.....................	11		3	5	3		
40-49.....................	2		1			1	
50 and over...............	1				1		
First year 20-29 total......	260	4	62	120	49	17	8
Second year							
1- 9......................	1			1			
10-19.....................	56	3	16	26	9	1	1
20-29.....................	114	1	34	57	19	2	1
30-39.....................	58		11	25	13	6	3
40-49.....................	24		1	7	6	8	2
50 and over...............	7			4	2		1
First year 30-39 total......	180		20	60	59	30	11
Second year							
1- 9......................	--						
10-19.....................	14		4	5	4	1	
20-29.....................	57		9	24	15	5	4
30-39.....................	50		4	19	19	8	
40-49.....................	45			9	18	14	4
50 and over...............	14		3	3	3	2	3

Table 44.--Coefficient of variation (seasonal) of small distant study farms cross-classified in 3 years, 1959-1962--Continued

Coefficient of variation	Total	Third year coefficient of variation (percent)					
		1-9	10-19	20-29	30-39	40-49	50 & over
	- - - - - - - - - - - - Farms - - - - - - - - - - - - - -						
First year 40-49 total.....	103	1	8	27	28	26	13
Second year							
1- 9.....							
10-19.....	6	1	1	2	1	1	
20-29.....	13		1	6	6		
30-39.....	33		5	9	8	10	1
40-49.....	32			7	9	11	5
50 and over.....	19		1	3	4	4	7
First year 50 and over total	78		2	7	19	25	25
Second year							
1- 9.....							
10-19.....	4		1		1	2	
20-29.....	4			2		1	1
30-39.....	10		1	1	3	2	3
40-49.....	24				11	12	1
50 and over.....	36			4	4	8	20

Table 45.-- Coefficient of variation (seasonal) of medium distant study farms cross-classified in 3 years, 1959-62

Coefficient of variation	Total	Third year coefficient of variation (percent)					
		1-9	10-19	20-29	30-39	40-49	50 & over
	Farms						
First year total.....	583	26	236	193	86	30	12
Second year							
1-9.....	21						
10-19.....	197						
20-29.....	206						
30-39.....	111						
40-49.....	34						
50 & over.....	14						
First year 1-9 total.....	13	1	10	2			
Second year							
1-9.....	5	1	4				
10-19.....	8		6	2			
20-29.....							
30-39.....							
40-49.....							
50 & over.....							
First year 10-19 total.....	185	20	100	56	7	1	1
Second year							
1-9.....	7	2	5				
10-19.....	112	15	74	18	4		1
20-29.....	56	2	20	31	2	1	
30-39.....	9	1		7	1		
40-49.....							
50 & over.....	1		1				
First year 20-29 total.....	218	5	94	76	35	6	2
Second year							
1-9.....	8	1	6	1			
10-19.....	62	1	42	15	4		
20-29.....	109	3	40	42	22	2	
30-39.....	35		5	17	9	2	2
40-49.....	4		1	1		2	
50 & over.....							
First year 30-39 total.....	113		24	43	35	8	3
Second year							
1-9.....	1		1				
10-19.....	13		7	3	1	2	
20-29.....	27		11	11	5		
30-39.....	52		4	22	22	4	
40-49.....	16			6	7	1	2
50 & over.....	4		1	1		1	1

Table 45.--Coefficient of variation (seasonal) of medium distant study farms cross-classified in 3 years, 1959-1962--Continued

Coefficient of variation	Total	Third year coefficient of variation (percent)					
		1-9	10-19	20-29	30-39	40-49	50 & over
	Farms						
First year 40-49 total.....	36		4	15	7	10	
Second year							
1-9.....							
10-19.....	1		1				
20-29.....	13		1	11	1		
30-39.....	12		2	4	2	4	
40-49.....	9				4	5	
50 & over.....	1					1	
First year 50 & over total..	18		4	1	2	5	6
Second year							
1-9.....							
10-19.....	1		1				
20-29.....	1		1				
30-39.....	3		1	1	1		
40-49.....	5		1		1	2	1
50 & over.....	8					3	5

Table 46.--Coefficient of variation (seasonal) of large distant study farms cross-classified in 3 years, 1959-1962

Coefficient of variation	Total	Third year coefficient of variation (percent)					
		1-9	10-19	20-29	30-39	40-49	50 & over
	Farms						
First year total.....	274	25	132	82	26	8	1
Second year							
1-9.....	17						
10-19.....	111						
20-29.....	102						
30-39.....	30						
40-49.....	11						
50 & over.....	3						
First year 1-9 total.....	13	1	11	1			
Second year							
1-9.....	4	1	3				
10-19.....	9		8	1			
20-29.....							
30-39.....							
40-49.....							
50 & over.....							
First year 10-19 total.....	111	18	60	33			
Second year							
1-9.....	11	3	7	1			
10-19.....	61	14	36	11			
20-29.....	36		17	19			
30-39.....	2	1		1			
40-49.....	1			1			
50 & over.....							
First year 20-29 total.....	93	5	49	32	7		
Second year							
1-9.....	2	1	1				
10-19.....	33	2	24	7			
20-29.....	46	2	21	18	5		
30-39.....	11		3	6	2		
40-49.....	1			1			
50 & over.....							
First year 30-39 total.....	41	1	10	11	14	4	1
Second year							
1-9.....							
10-19.....	6		4	1	1		
20-29.....	18	1	6	6	5		
30-39.....	10			3	6	1	
40-49.....	5			1	2	2	
50 & over.....	2					1	1

Table 46.--Coefficient of variation (seasonal) of large distant study farms cross-classified in 3 years, 1959-1962--Continued

Coefficient of variation	Total	Third year coefficient of variation (percent)					
		1-9	10-19	20-29	30-39	40-49	50 & over
	Farms						
First year 40-49 total.....	13		1	3	5	4	
Second year							
1-9.....							
10-19.....	1				1		
20-29.....	2		1	1			
30-39.....	5			2	2	1	
40-49.....	4				2	2	
50 & over.....	1					1	
First year 50 & over total...	3		1	2			
Second year							
1-9.....							
10-19.....	1			1			
20-29.....							
30-39.....	2		1	1			
40-49.....							
50 & over.....							

Table 47.--Coefficient of variation (seasonal) of small nearby study farms cross-classified in 3 years, 1959-1962

Coefficient of variation	Total	Third year coefficient of variation (percent)					
		1-9	10-19	20-29	30-39	40-49	50 & over
	Farms						
First year total.....	338	23	148	103	38	17	9
Second year							
1-9.....	19						
10-19.....	165						
20-29.....	97						
30-39.....	35						
40-49.....	16						
50 & over.....	6						
First year 1-9 total.....	25	2	18	5			
Second year							
1-9.....	4	1	3				
10-19.....	17	1	13	3			
20-29.....	3		2	1			
30-39.....							
40-49.....							
50 & over.....	1			1			
First year 10-19 total.....	141	15	77	38	7	3	1
Second year							
1-9.....	12	1	10	1			
10-19.....	88	12	52	21	2	1	
20-29.....	31	2	12	12	3	1	1
30-39.....	6		2	3	1		
40-49.....	4		1	1	1	1	
50 & over.....							
First year 20-29 total.....	105	4	38	37	15	9	2
Second year							
1-9.....	3		3				
10-19.....	47	2	21	17	5	1	1
20-29.....	35	2	11	11	8	3	
30-39.....	13		2	5	1	4	1
40-49.....	7		1	4	1	1	
50 & over.....							
First year 30-39 total.....	41		10	17	9	3	2
Second year							
1-9.....							
10-19.....	9		4	3	1		1
20-29.....	21		4	8	6	2	1
30-39.....	8			5	2	1	
40-49.....	1			1			
50 & over.....	2		2				

Table 47.--Coefficient of variation (seasonal) of small nearby study farms cross-classified in 3 years, 1959-1962--Continued

Coefficient of variation	Total	Third year coefficient of variation (percent)					
		1-9	10-19	20-29	30-39	40-49	50 & over
	Farms						
First year 40-49 total.....	19	2	2	4	7	2	2
Second year							
1-9.....							
10-19.....	1	1					
20-29.....	6		1	2	2		1
30-39.....	6	1		1	2	1	1
40-49.....	4		1	1	1	1	
50 & over.....	2				2		
First year 50 & over total.	7		3	2			2
Second year							
1-9.....							
10-19.....	3		3				
20-29.....	1			1			
30-39.....	2			1			1
40-49.....							
50 & over.....	1						1

Table 48.--Coefficient of variation (seasonal) of medium nearby study farms cross-classified in 3 years, 1959-1962

Coefficient of variation	Total	Third year coefficient of variation (percent)					
		1-9	10-19	20-29	30-39	40-49	50 & over
	Farms						
First year total.....	371	53	198	92	16	7	5
Second year							
1-9.....	57						
10-19.....	188						
20-29.....	96						
30-39.....	21						
40-49.....	7						
50 & over.....	2						
First year 1-9 total.....	48	10	27	8	2	1	
Second year							
1-9.....	14	6	8				
10-19.....	24	3	13	5	2	1	
20-29.....	6	1	3	2			
30-39.....	2		1	1			
40-49.....	2		2				
50 & over.....							
First year 10-19 total.....	213	35	121	47	6	1	3
Second year							
1-9.....	35	10	22	3			
10-19.....	121	21	76	23	1		
20-29.....	45	4	19	16	4		2
30-39.....	9		4	4	1		
40-49.....	3			1		1	1
50 & over.....							
First year 20-29 total.....	83	6	41	27	5	3	1
Second year							
1-9.....	6	1	4	1			
10-19.....	39	3	22	12	2		
20-29.....	33	2	13	11	3	3	1
30-39.....	5		2	3			
40-49.....							
50 & over.....							
First year 30-39 total.....	19	2	7	7	1	1	1
Second year							
1-9.....	2		2				
10-19.....	4	1	2	1			
20-29.....	7		2	5			
30-39.....	3				1	1	1
40-49.....	1			1			
50 & over.....	2	1	1				

Table 48.--Coefficient of variation (seasonal) of medium nearby study farms cross-classified in 3 years, 1959-1962--Continued

Coefficient of variation	Total	Third year coefficient of variation (percent)					
		1-9	10-19	20-29	30-39	40-49	50 & over
	Farms						
First year 40-49 total.....	5		2	1	2		
Second year							
1-9.....							
10-19.....							
20-29.....	3		1	1	1		
30-39.....	2		1		1		
40-49.....							
50 & over.....							
First year 50 & over total..	3			2		1	
Second year							
1-9.....							
10-19.....							
20-29.....	2			1		1	
30-39.....							
40-49.....	1			1			
50 & over.....							

Table 49.--Coefficient of variation (seasonal) of large nearby study farms cross-classified in 3 years, 1959-1962

Coefficient of variation	Total	Third year coefficient of variation (percent)					
		1-9	10-19	20-29	30-39	40-49	50 & over
	Farms						
First year total.....	299	76	166	49	5	2	1
Second year							
1-9.....	68						
10-19.....	167						
20-29.....	53						
30-39.....	9						
40-49.....	1						
50 & over.....	1						
First year 1-9 total.....	50	26	24				
Second year							
1-9.....	29	20	9				
10-19.....	20	6	14				
20-29.....	1		1				
30-39.....							
40-49.....							
50 & over.....							
First year 10-19 total.....	170	39	111	18	2		
Second year							
1-9.....	31	11	17	2	1		
10-19.....	113	24	77	11	1		
20-29.....	25	4	17	4			
30-39.....	1			1			
40-49.....							
50 & over.....							
First year 20-29 total.....	64	10	26	26	1	1	
Second year							
1-9.....	7	4	2	1			
10-19.....	27	5	14	7	1		
20-29.....	23	1	7	14		1	
30-39.....	6		3	3			
40-49.....							
50 & over.....	1			1			
First year 30-39 total.....	13	1	5	4	1	1	1
Second year							
1-9.....	1		1				
10-19.....	6		4	2			
20-29.....	3	1		1	1		
30-39.....	2			1		1	
40-49.....	1						1
50 & over.....							

Table 49.--Coefficient of variation (seasonal) of large nearby study farms cross-classified in 3 years, 1959-1962--Continued

Coefficient of variation	Total	Third year coefficient of variation (percent)					
		1-9	10-19	20-29	30-39	40-49	50 & over
	----------Farms----------						
First year 40-49 total.....	1				1		
Second year							
1-9.....							
10-19.....							
20-29.....	1				1		
30-39.....							
40-49.....							
50 & over.....							
First year 50 & over total..	1			1			
Second year							
1-9.....							
10-19.....	1			1			
20-29.....							
30-39.....							
40-49.....							
50 & over.....							

the class intervals at the top of the table, the second-year distribution is broken down into the third-year distribution. The one farm which was in the 1-9 class moved back to the 20-29 class. The 56 which were in the 10-19 class now range from below 10 to over 50, and the same is true for the 114 in the 20-29 class. There were 57 out of the original 260 in the 20-29 class of the first year which were in the 20-29 class in all three years.

This phenomenon of dispersing and regrouping has already been expressed in relation to annual average level of delivery in tables 33, 34, and 35 and in tables 39 and 40. In the case of annual average level of delivery, farms exhibit a wide array of all possible combinations of increase, decrease, and stable. The same wide array is exhibited in relation to the amount of seasonal variation.

The description of this phenomenon of dispersing and regrouping both in relation to annual level of delivery and to the amount of seasonal variation is the primary contribution of this study. During this study period, initial classification of a farm by size and/or by seasonal pattern would have been at best a fair indicator of the size and/or seasonal pattern for the farm in the next year, and at best a poor indicator for two years later. These farms exhibited a large amount of movement among size categories, and among levels of amount of seasonal fluctuation.

With all of this diverse movement among farms there was, however, a definite movement of the mass toward larger farms. A similar movement of the mass of farms toward less seasonal variation can be seen in the six tables, tables 44-49, and has been converted to percentages for easier reading in table 50. The tendency toward decreasing seasonal variation was more pronounced among distant farms (where seasonal variation was significantly higher than that of nearby farms) and among larger farms (where seasonal variation was already significantly less than it was on small farms).

Table 50.--Coefficient of variation (seasonal) percentage distribution of study farms in each of 3 years by size of daily milk delivery, 1959-1962

July 1, 1959-June 30, 1962		Distant farms			Nearby farms		
Average daily delivery	Coefficient of variation	1st year	2nd year	3rd year	1st year	2nd year	3rd year
Pounds	Percent	Percent of all farms					
		791 farms			338 farms		
Below 495	1-9.....	1	1	2	7	6	7
	10-19.....	20	21	21	42	49	44
	20-29.....	33	32	35	31	28	30
	30-39.....	23	20	22	12	10	11
	40-49.....	13	16	13	6	5	5
	50 & over....	10	10	7	2	2	3
	Total.....	100	100	100	100	100	100
		583 farms			371 farms		
495-994	1-9.....	2	4	4	13	15	14
	10-19.....	32	34	41	58	50	54
	20-29.....	38	35	33	22	26	25
	30-39.....	19	19	15	5	6	4
	40-49.....	6	6	5	1	2	2
	50 & over....	3	2	2	1	1	1
	Total.....	100	100	100	100	100	100
		274 farms			299 farms		
995 & over	1-9.....	5	6	9	17	23	25
	10-19.....	40	40	48	57	56	56
	20-29.....	34	38	31	22	18	16
	30-39.....	15	11	9	4	3	2
	40-49.....	5	4	3	(1)	(1)	1
	50 & over....	1	1	(1)	(1)	(1)	(1)
	Total.....	100	100	100	100	100	100

[1] Less than 0.5 percent.

Correlation of Year to Year Patterns

The coefficient of variation, since it is a single value which describes seasonal fluctuation, has simplicity. However, it does not take the shape of a pattern into consideration. Also, examination of variation from year to year in the size of the coefficient, was not tested to see whether the year-to-year change in size was more than could be expected due to chance.

To cover the problem of consistency of individual farms in shape of seasonal pattern, the correlation of the patterns of three years was determined. For this, intraclass correlation was used, where each month is a class. The results are presented in relation to a three-year average coefficient of variation in table 51.

Table 51.--Correlation coefficients for three years of seasonal patterns of study farms by size of daily milk delivery and by average coefficient of variation, 1959-1962

Three year		Distant farms					Nearby farms				
Average daily delivery	Coefficient of variation	Correlation coefficient[1]					Correlation coefficient[1]				
		Below .4	.4-.5	.6-.7	.8-.9	Total	Below .4	.4-.5	.6-.7	.8-.9	Total
Pounds	Percent	Number									
Below 495	1-19.....	57	42	38	7	144	97	52	24	3	176
	20-39.....	85	93	177	143	498	45	34	47	23	149
	40 & over.	23	15	31	80	149	6	2	2	3	13
	Total...	165	150	246	230	791	148	88	73	29	338
495-994	1-19.....	69	58	67	21	215	107	69	70	15	261
	20-39.....	25	50	114	146	335	25	22	30	29	106
	40 & over.	4	1	5	23	33	3		1		4
	Total...	98	109	186	190	583	135	91	101	44	371
995 & over	1-19.....	33	27	49	32	141	82	67	74	25	248
	20-39.....	8	10	31	75	124	8	7	9	24	48
	40 & over.	3		2	4	9	3				3
	Total...	44	37	82	111	274	93	74	83	49	299
		Percent of total									
Below 495	1-19.....	40	29	26	5	100	55	29	14	2	100
	20-39.....	17	19	35	29	100	30	23	32	15	100
	40 & over.	15	10	21	54	100	(2)	(2)	(2)	(2)	(2)
	Total...	21	19	31	29	100	44	26	21	9	100
495-994	1-19.....	32	27	31	10	100	41	26	27	6	100
	20-39.....	7	15	34	44	100	24	21	28	27	100
	40 & over	(2)	(2)	(2)	(2)	(2)	(2)		(2)		(2)
	Total....	17	18	32	33	100	36	25	27	12	100
995 & over	1-19.....	23	19	35	23	100	33	27	30	10	100
	20-39.....	7	8	25	60	100	17	15	18	50	100
	40 & over..	(2)	(2)	(2)	(2)	(2)	(2)				(2)
	Total....	16	13	30	41	100	31	25	28	16	100

[1] The procedure for calculating the intra-class correlation coefficient is given in the reference Statistical Methods, 5th Edition, Iowa State University Press, by G. W. Snedecor. This correlation coefficient may be thought of as the average of the first year pattern correlated to the average pattern of three years, of the second year pattern correlated with the average, and of the third year pattern correlated with the average.

[2] Too small to determine percent.

Variation from Year to Year in "Best-Fit" Pattern

Inconsistency in seasonal pattern (indicated by a correlation coefficient of less than .8) was present to a significantly greater extent among nearby farms than among distant farms (about 88 percent of nearby farms and 68 percent of distant farms). Small farms had a higher proportion of inconsistent farms than large farms, and inconsistency was proportionately greater when the coefficient of variation was lower.

This tendency toward less consistency when seasonal variation is less is, in part, due to the nature of a correlation coefficient. If there is only a small amount of variation, then there is not much variation which can be related from year to year and the proportion of seasonally related variation in monthly production (which is what the correlation coefficient measures) is low.

In spite of the inadequacy of the intraclass correlation to measure consistency when seasonal variation is low, the analysis leads to the conclusion that for a high proportion of farms the shape of the seasonal pattern varied from year to year.

This conclusion, which confirms the coefficient of variation analysis, is further borne out by a second measure of consistency, the test for difference among the three best-fit sine-cosine curves of seasonality on individual farms. This measure also revealed significant variation. Table 52 shows that the proportion of farms which had consistent seasonal patterns (no significant difference among best-fit sine-cosine curves) was only about 32 percent. There is still some positive relationship between the proportion consistent and the amount of seasonal variation, but it is less pronounced. The difference between distant and nearby in the proportion of farms which were consistent disappeared. Because of the fact that distant farms were more variable and therefore tended toward high correlation coefficients, the difference in degree of consistency measured by the correlation coefficient favored distant farms.

The best-fit sine-cosine curve, however, still imposes a restriction on the pattern of seasonality that needs to exist in order to satisfactorily measure consistency. This fit requires a symmetrical fluctuation in time and magnitude. Test can be made, however, to see if the intraclass correlation and test of significant difference among the best-fit curves did corroborate each other, by relating the correlation coefficient to the test for significant difference. As expected (table 53), the proportion of farms which did not show significant variation among the three years of best-fit sine-cosine curves was significantly higher when the correlation coefficient was high (.8 or better) than it was when the correlation was low. A closer verification than exists in table 53 might have been hoped for but all analyses point to the same conclusion, that on more than half of the farms the seasonal patterns were not consistent during the three-year period.

Table 52.--Significant difference of sine-cosine curve best-fit to three seasonal patterns of study farms by size of daily milk delivery and by average coefficient of variation, 1959-1962

Three year		Distant farms			Nearby farms		
		Difference among curves			Difference among curves		
Average daily delivery	Coefficient of variation	Not significant	Significant	Total	Not significant	Significant	Total
Pounds	Percent	Number					
Below 495	1-19.....	50	94	144	66	110	176
	20-39.....	141	357	498	41	108	149
	40 & over..	43	106	149	4	9	13
	Total....	234	557	791	111	227	338
495-994	1-19.....	80	135	215	77	184	261
	20-39.....	95	240	335	20	86	106
	40 & over..	7	26	33	3	1	4
	Total....	182	401	583	100	271	371
995 & over	1-19.....	54	87	141	87	161	248
	20-39.....	37	87	124	16	32	48
	40 & over..	2	7	9		3	3
	Total....	93	181	274	103	196	299
		Percent of total					
Below 495	1-19.....	35	65	100	38	62	100
	20-39.....	28	72	100	28	72	100
	40 & over..	29	71	100	(1)	(1)	(1)
	Total....	30	70	100	33	67	100
495-994	1-19.....	37	63	100	30	70	100
	20-39.....	28	72	100	19	81	100
	40 & over..	(1)	(1)	(1)	(1)	(1)	(1)
	Total....	31	69	100	27	73	100
995 & over	1-19.....	38	62	100	35	65	100
	20-39.....	30	70	100	33	67	100
	40 & over..	(1)	(1)	(1)	(1)	(1)	(1)
	Total....	34	66	100	34	66	100

[1] Too small to determine percent.

Table 53.--Relationship of correlation coefficient and significant difference of seasonal patterns of study farms by size of daily milk delivery, 1959-1962

Three year		Distant farms			Nearby farms		
Average daily delivery	Correlation coefficient	Difference among curves			Difference among curves		
		Not significant	Significant	Total	Not significant	Significant	Total
Pounds		Number					
Below 495	Below .4	33	132	165	46	102	148
	.4-.5	37	113	150	23	65	88
	.6-.7	61	185	246	31	42	73
	.8-.9	103	127	230	11	18	29
Total		234	557	791	111	227	338
495-994	Below .4	19	79	98	24	111	135
	.4-.5	26	83	109	24	67	91
	.6-.7	59	127	186	35	66	101
	.8-.9	78	112	190	17	27	44
Total		182	401	583	100	271	371
995 & over	Below .4	14	30	44	23	70	93
	.4-.5	10	27	37	30	44	74
	.6-.7	22	60	82	28	55	83
	.8-.9	47	64	111	22	27	49
Total		93	181	274	103	196	299
		Percent of total					
Below 495	Below .4	20	80	100	31	69	100
	.4-.5	25	75	100	26	74	100
	.6-.7	25	75	100	42	58	100
	.8-.9	45	55	100	38	62	100
Total		30	70	100	33	67	100
495-994	Below .4	19	81	100	18	82	100
	.4-.5	24	76	100	26	74	100
	.6-.7	32	68	100	35	65	100
	.8-.9	41	59	100	39	61	100
Total		31	69	100	27	73	100
995 & over	Below .4	32	68	100	25	75	100
	.4-.5	27	73	100	41	59	100
	.6-.7	27	73	100	34	66	100
	.8-.9	42	58	100	45	55	100
Total		34	66	100	34	66	100

July-August to May Relationship

One facet of particular interest in the overall seasonal pattern description was the relationship of milk deliveries in July and August to May. What would be shown, ideally, is the level of deliveries for July and August relative to the preceding May. However, because of the time period used for the study this was possible for only two years. Therefore, average daily milk delivery in July and August was expressed as a percentage of the following May.

The relationship of July-August to May for each of three years and for three size groups of farms (size determined by first-year average daily delivery) in the distant and nearby areas is shown in table 54. On the average, July-August deliveries as a percent of the following May were higher in the nearby area than they were in the distant area. Small farms (below 495 pounds) in both areas showed more variation, that is, there was a higher proportion of farms where deliveries were high as well as low than was true of large farms. Large farms (995 pounds and over) of both areas had a higher proportion of farms where July-August deliveries were below the following May than was true of small farms. This was particularly true in the distant area.

This facet of seasonal pattern had particular interest because July and August are becoming short months in some markets. In these markets May continues to be a high month. A better explanation of this phenomenon may be obtained by referring to the seasonal patterns of figure 7. This shows that most patterns were low in July and August (below the annual average). Most patterns were high in May, but some were falling. The apparent abrupt drop from May to July-August may be an available-feed-supply phenomenon, coupled with a fall-freshening of herd program. An explanation of low deliveries in July and August with a high in May is easier to understand when looking at the entire year's seasonal pattern, than it is when looking at these three months separately.

This relationship of July-August to May is another means which can be used to determine individual-farm consistency with itself. In other words, the July-August to May relationship in three consecutive years can be examined to see whether individual farms maintain the same relationship. This was done using three size groups in each of the location zones. The analysis showed, for each of the six groups, that farms shifted a great deal from one level of relationship to another from year to year. The analyses for two groups are shown in tables 55 and 56. The method of presentation is the same as that used to show changes in annual level of delivery and the coefficient of variation--the distribution is made for the first year, each first-year size group is distributed for the second year, and each of these in turn for the third year. The analyses showed individual farms shifting more from year to year than was shown in previous similar analyses of producer delivery patterns.

Table 54.--July-August milk delivery percent of May of study farms by year and by size of first year daily delivery, 1959-1962

Year	July-August delivery percent of following May delivery	First year average daily delivery (pounds)			
		5-494	495-994	995 and over	Total
		DISTANT FARMS			
		Percent			
		852 farms	566 farms	230 farms	1,648 farms
First year	121 & over	12	4	3	8
	101-120	10	10	3	9
	81-100	24	23	23	24
	61-80	35	39	40	37
	60 & under	19	24	31	22
	Total	100	100	100	100
Second year	121 & over	11	6	4	8
	101-120	11	9	5	9
	81-100	25	29	26	27
	61-80	33	35	40	35
	60 & under	20	21	25	21
	Total	100	100	100	100
Third year	121 & over	16	10	4	12
	101-120	17	13	10	15
	81-100	27	31	34	29
	61-80	27	31	32	29
	60 & under	13	15	20	15
	Total	100	100	100	100
		NEARBY FARMS			
		367 farms	371 farms	270 farms	1,008 farms
First year	121 & over	13	5	3	7
	101-120	18	11	8	13
	81-100	32	39	37	36
	61-80	27	34	38	33
	60 & under	10	11	14	11
	Total	100	100	100	100
Second year	121 & over	12	6	5	8
	101-120	17	12	11	13
	81-100	31	40	37	36
	61-80	28	32	37	32
	60 & under	12	10	10	11
	Total	100	100	100	100
Third year	121 & over	15	7	6	9
	101-120	17	14	11	14
	81-100	30	38	44	37
	61-80	28	30	31	30
	60 & under	10	11	8	10
	Total	100	100	100	100

Table 55.--July-August milk delivery percent of May of nearby study farms with over 995 pounds average daily delivery in first year cross-classified in 3 years, 1959-1962

July-August percent of May	Total	Third year July-August percent of May				
		121 & over	101-120	81-100	61-80	60 & under
	Farms					
First year total.....	270	15	31	118	85	21
Second year						
121 & over.....	14	3	4	6		1
101-120.....	30	5	4	12	8	1
81-100.....	101	1	17	47	33	3
61-80.....	98	4	5	44	39	6
60 & under.....	27	2	1	9	5	10
First year 121 & over						
Total.....	9	5	1	1		2
Second year						
121 & over.....	4	2	1			1
101-120.....	1	1				
81-100.....	2	1		1		
61-80.....	1					1
60 & under.....	1	1				
First year 101 - 120.						
Total.....	22	2	5	10	4	1
Second year						
121 & over.....	2		1	1		
101-120.....	4	2	1	1		
81-100.....	14		2	8	3	1
61-80.....	2		1		1	
60 & under						
First year 81 - 100..						
Total	99	2	9	55	30	3
Second year						
121 & over.....	5		2	3		
101-120.....	13	1	1	7	3	1
81-100.....	42		5	22	14	1
61-80.....	36	1	1	21	12	1
60 & under.....	3			2	1	

Table 55.--July-August milk delivery percent of May of nearby study farms with over 995 pounds average daily delivery in first year cross-classified in 3 years, 1959-1962--Continued

July-August percent of May	Total	Third year July-August percent of May				
		121 & over	101-120	81-100	61-80	60 & under
	Farms					
First year 61-80.....						
Total.....	102	4	11	45	36	6
Second year						
121 & over.....	3	1		2		
101 - 120.....	9		2	3	4	
81 - 100.....	34		7	13	13	1
61 - 80.....	43	3	1	21	17	1
60 & under.....	13		1	6	2	4
First year 60 & under						
Total.....	38	2	5	7	15	9
Second year						
121 & over.....						
101 - 120.....	3	1		1	1	
81 - 100.....	9		3	3	3	
61 - 80.....	16		2	2	9	3
60 & under.....	10	1		1	2	6

Table 56.--July-August milk delivery percent of May of distant study farms with under 495 pounds average daily delivery in first year cross-classified in three years, 1959-1962

July-August percent of May	Total	Third year July-August percent of May				
		121 & over	101-120	81-100	61-80	60 & under
	Farms					
First year total.....	852	137	146	226	227	116
Second year						
121 & over.....	92	44	20	9	10	9
101-120.....	95	22	29	30	9	5
81-100.....	218	42	38	75	49	14
61-80.....	279	19	46	75	105	34
60 & under.....	168	10	13	37	54	54
First year 121 & over						
Total.....	102	35	17	27	16	7
Second year						
121 & over.....	32	21	5	2	3	1
101-120.....	18	4	5	7		2
81-100.....	22	6	4	8	4	
61-80.....	18	3	2	6	5	2
60 & under.....	12	1	1	4	4	2
First year 101-120						
Total.....	84	19	21	20	15	9
Second year						
121 & over.....	19	6	6	2	2	3
101-120.....	16	4	6	6		
81-100.....	25	6	6	7	4	2
61-80.....	15	1	3	3	7	1
60 & under.....	9	2		2	2	3
First year 81-100						
Total.....	207	34	51	61	51	10
Second year						
121 & over.....	17	8	4	2	3	
101-120.....	32	6	12	12	2	
81-100.....	75	16	13	27	15	4
61-80.....	61	4	15	15	23	4
60 & under.....	22		7	5	8	2

Table 56.--July-August milk delivery percent of May of distant study farms with under 495 pounds average daily delivery in first year cross-classified in three years, 1959-1962--Continued

July-August percent of May	Total	Third year July-August percent of May				
		121 & over	101-120	81-100	61-80	60 & under
	Farms					
First year 61-80.....						
Total.....	294	35	45	83	93	38
Second year						
121 & over.....	21	9	5	2	2	3
101-120.....	22	5	6	5	5	1
81-100.....	72	9	11	24	22	6
61-80.....	128	9	23	35	45	16
60 & under.....	51	3		17	19	12
First year 60 & under						
Total.....	165	14	12	35	52	52
Second year						
121 & over.....	3			1		2
101-120.....	7	3			2	2
81-100.....	24	5	4	9	4	2
61-80.....	57	2	3	16	25	11
60 & under.....	74	4	5	9	21	35

Seasonal Patterns Found

The introduction to the section on seasonality noted that the primary problem in analyzing seasonal milk delivery patterns is to find "a measure" to describe seasonal fluctuation. This study has depended on the coefficient of variation, intraclass correlation, and an analysis of variance of periodic fluctuation to determine the degree of consistency. Description of individual farm patterns was not attempted. Now, the problem of trying to describe patterns is considered.

The starting point is a three-year average pattern for each farm. In other words, the monthly percent of annual average daily delivery was averaged for three Julys, three Augusts, three Septembers, etc. For the first analysis of these averages, the "high month" was determined (the first month beginning with July and running through June which was as high or higher than any following month), and then the low month (the lowest or as low as any succeeding month). For those who had the highest month in any particular month, the number of farms was shown which had their low in a particular month. For example, 40 farms reached a peak of deliveries in November. Of these 40, 14 were lowest in July, 11 in August, 4 in September, and the remaining 11 were lowest from February through June (number in each month is given in table 57).

This presentation shows a wide variety of high-low month combinations. There are 132 possible combinations and 108 of them have one or more farms. The combination which appeared more often than any other one was high in June and low in November. The month of August, however, had more lows than any other one month.

For the second analysis to describe patterns, a best-fit sine-cosine curve was calculated to each farm's three-year average seasonal pattern. The farms were sorted into categories, using the coefficients of the best fit. There were 12 categories determined

Table 57.--Highest month and lowest month in 3-year average seasonal milk delivery pattern for 2,501 study farms[1], 1959-1962

Highest Month	Lowest month												
	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	Total
	Number												
July.....			1	3	15	22	12	21	9	4		1	88
Aug.....	1			3	13	12	14	15	12	12	3	5	90
Sept.....	19				3	15	6	19	12	20	3	5	102
Oct.....	34	25	1		1	3	2	1	6	9	1	7	90
Nov.....	14	11	4					2	1	3	2	3	40
Dec.....	21	32	4	1	1				1	1		3	64
Jan.....	46	65	18	4	1					2		5	141
Feb.....	35	32	9	11	6	1	1					6	101
Mar.....	30	52	10	3	18	10					1	1	125
Apr.....	15	41	21	15	26	10	7	6	2				143
May.....	59	129	75	58	124	88	37	33	3	1			607
June.....	16	83	46	58	209	129	149	166	43	10	1		910
Total	290	470	189	156	417	290	228	263	89	62	11	36	2,501

[1] All of these 2,501 farms are part of the 2,656 study farms. The omitted farms are those which had a temporary drop or had added or dropped a farming unit.

by three levels of the sine coefficient (below -20, -1 to -20, and 0 and over)[14] and four levels of the ratio[15] of the sine coefficient to the cosine coefficient (sign of cosine opposite to sign of sine and less than sine, sign of cosine opposite to sign of sine and equal to or more than sine; sign of cosine same as sign of sine and less than sine, and sign of cosine same as sign of sine and equal to or more than sine).

Using these 12 categories the farms were further sorted for zone location (distant and nearby) and for size (using three-year average level of delivery below 495 pounds, 495-994 pounds, and 995 pounds and over). The farms sorted into these 72 possible groups (12 types of pattern times 2 areas times 3 sizes) are shown in table 58.

To best show the different patterns, all farms with a given type pattern were grouped together. The actual three-year average pattern for each farm was then put into a frequency distribution. The average July percents of annual average for farms with one type of pattern were distributed, then August was distributed for the same farms, etc., for all 12 months. An example for two curves is given in table 59. The central point (simple arithmetic mean) of each distribution was determined. The seasonal pattern curves for the 12 categories are shown in figure 7. In addition to the curves, the proportion of the total in each of the six groups of farms (three size groups by two areas) which accompanies each type curve is included in figure 7.

Table 58.-- Number of study farms by type of seasonal milk delivery pattern and by size of daily delivery, 1959-1962

Seasonal pattern type		Curve designation	Distant farms				Nearby farms			
Sine coefficient	Ratio of sine to cosine coefficient		Average daily delivery (pounds)							
			Below 495	495-994	995 & over	Total	Below 495	495-994	995 & over	Total
Below -20.00	Below -1.00	A	80	38	5	123	4	4		8
	-.01 to-1.00	B	98	72	20	190	30	18	4	52
	.00 to .99	C	50	50	33	133	10	21	13	44
	1.00 & over	D	8	6	9	23	1	1		2
-.01 to -20	Below -1.00	E	232	142	59	433	78	61	23	162
	-.01 to -1.00	F	65	80	38	183	58	77	49	184
	.00 to .99	G	56	53	42	151	24	60	72	156
	1.00 & over	H	46	46	48	140	27	60	75	162
.00 & over	Below -1.00	M	18	29	7	54	14	13	33	60
	-.01 to -1.00	L	10	7	3	20	13	6	6	25
	.00 to .99	K	13	11		24	22	17	7	46
	1.00 & over	J	115	49	10	174	57	33	17	107
	Total		791	583	274	1,648	338	371	299	1,008

[14] The values of the sine coefficient are percentage points.

[15] It is unfortunate that the actual cosine coefficient was not used. Initially it was felt that the ratio of sine to cosine would be a single figure that would describe curves of a particular shape. Only the sine coefficient and the ratio were saved in the output programmed from the computations made by the computer.

Table 59.--Distribution of 554[1] study farms whose 3-year average seasonal milk delivery pattern had a best-fit with a sine coefficient of -.01 to -20. and cosine coefficient plus and absolute value greater than sine coefficient, by each month's percent of annual average daily delivery

Percent of annual average	Month											
	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June
	-Number-											
170 & over.....	6	1								1	2	30
150-169.....	18	1	1								19	77
130-149.....	77	43	6							14	145	199
110-129.....	250	218	158	26			1	1	11	203	319	219
90-109.....	193	277	376	399	114	111	118	143	354	317	67	29
70-89.....	10	13	13	129	355	318	296	290	169	19	2	
50-69.....		1			81	109	106	92	19			
Below 50.....					4	16	33	28	1			
Average Percent.....	117	110	105	96	80	78	78	79	92	107	124	134

Distribution of 354[2] farms whose 3-year average seasonal pattern had a best-fit with a sine coefficient of 0 to 20 and cosine coefficient plus and absolute value equal to or less than absolute value of sine coefficient, by each month's percent of annual average daily delivery

Percent of annual average	Month											
	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June
	-Number-											
170 & over.....												
150-169.....											1	3
130-149.....									1	4	39	59
110-129.....	32	5	4	1		2	3	21	100	207	262	230
90-109.....	278	258	240	219	127	180	267	283	247	142	52	62
70-89.....	44	87	107	132	224	167	83	50	6	1		
50-69.....		4	3	2	3	5	1					
Below 50.....												
Average Percent.....	99	94	93	92	85	89	94	98	105	112	119	120

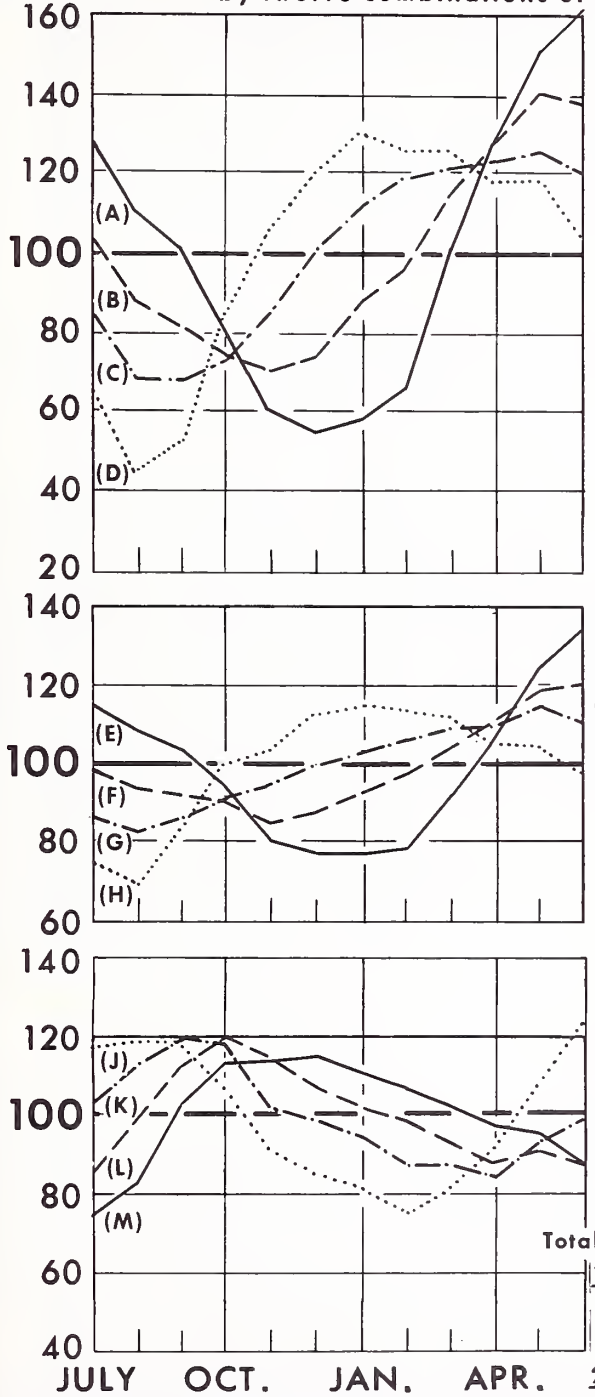
[1] Total of distant and nearby farms for this "curve E" is 595. Farms with temporary drop and change in number of farm units are not included in this frequency distribution.

[2] Total of distant and nearby farms for this "curve F" is 367. Farms with temporary drop and change in number of farm units are not included in this frequency distribution.

AVERAGE SEASONAL MILK DELIVERY

PERCENT

Study farms whose three-year average patterns were best-fit by twelve combinations of sine and cosine, 1959-1962[1/]



	All Study Farms	Distant 0.1-4.9	Distant 5.0-9.9	Distant 10.0-Over	Nearby 0.1-4.9	Nearby 5.0-9.9	Nearby 10.0-Over
				Percent			
(A)	5	10	7	2	1	1	
(B)	9	12	12	7	9	5	1
(C)	7	6	9	12	3	6	4
(D)	1	1	1	3	2/	2/	
(E)	22	30	24	21	23	16	8
(F)	14	8	14	14	17	20	17
(G)	11	7	9	15	7	16	24
(H)	11	6	8	18	8	16	25
(J)	11	15	8	4	17	9	6
(K)	3	2	2		7	5	2
(M)	4	2	5	3	4	4	11
(L)	2	1	1	1	4	2	2
Total	100	100	100	100	100	100	100

1/ Table accompanying figure shows the percent of six groups of study farms which fell in each type of seasonal pattern category

2/ Less than 0.5 percent

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Figure 7

An attempt to distinguish which groups of farms (distant vs. nearby, or size groups within each area) were associated with particular patterns is complicated by the fact that there are 12 seasonal patterns. However, some things may be seen which already have been mentioned, plus a few more. Distant farms showed more seasonal fluctuation than nearby farms; small farms (both distant and nearby) more often followed the high spring and low early winter pattern than did large farms. The principal pattern of large nearby farms was a low summer and high or increasing winter pattern; and patterns of late summer and early fall highs with lows in the spring were not prevalent on many farms but occurred primarily on nearby farms.

The 12 patterns shown here are only averages. The 108 high-low combinations mean there were at least 108 different patterns; this was not the limit because for a given combination of high and low, there was variation in the amount of fluctuation. Some patterns were covered up by using a three-year average pattern for individual farms.

Forecasting Seasonal Fluctuation

Two measures which were developed in the correlation analysis can be used to determine the precision with which the seasonal milk delivery pattern for a producer can be forecast, based on the average of his three seasonal patterns. It can be assumed that individual producers will continue to vary the shape of their seasonal milk delivery patterns in the future as they did in the three-year period of the study.

The first of the two measures is equivalent to the total amount of seasonal fluctuation for each individual. It is the three-year average coefficient of variation. It can be multiplied by 3.25 to measure the average difference between the highest and lowest month of the year. The second measure is equivalent to the amount by which the actual seasonal patterns of the individual differed from his three-year average seasonal pattern. It will be called the seasonal pattern coefficient of variation. This amount can again be multiplied by 3.25 to get an average maximum spread.[16] The maximum this time is made up of two figures. The two figures are the maximum amount by which any month is below the average seasonal pattern plus the maximum amount by which any month is above the average seasonal pattern. A simple way to think of the two by-product values is to think of the first value as a measure of the total amount of seasonal fluctuation and the second as a measure of how much the seasonal patterns differ from the average seasonal pattern. The first value measures how much an individual producer on the average fluctuates during the year in deliveries of milk. The second value measures how much on the average the individual's seasonal patterns differ from the average of his seasonal patterns. The second value, taken alone, measures the precision with which the seasonal pattern of a farmer could be forecast if the three-year average seasonal pattern was the forecast. However, the correlation ratio since it measures the association among the yearly seasonal patterns, also will be tied in with this discussion of determining the precision of a forecast.

In table 60 the relationships that existed between total seasonal fluctuation and the differences of individual year seasonal patterns from the average pattern of three years is shown for farms that had a correlation ratio of .8 or more and for farms with a lower ratio. The farms also are separated into distant and nearby groups. The "Average Coefficient of Variation" groups across the top of the table classify the farms according to the total seasonal fluctuation of the farm. The "Seasonal Pattern Coefficient of Variation" groups down the left-hand side classify the farms according to the amount the seasonal patterns in the three years differed from the three-year average seasonal pattern.

This table shows the marked relationship between the total amount of seasonal fluctuation and the amount of difference of seasonal patterns from the average seasonal pat-

[16] The analysis of these data used average daily delivery in each month expressed as a percentage of the average daily delivery for the year. Thus the mean of the monthly figures in each year was 100. The average coefficient of variation is the pooled standard deviation for three years. (Total sum of squares in the analysis of variance divided by 35 and then take the square root). The seasonal pattern coefficient of variation is total sum of squares minus group (months) sum of squares divided by 24 and then take the square root.

The 3.25 constant used to approximate the range is the normal relationship of the standard deviation and the range when the number of observations is 12. The distribution of seasonal fluctuation is undoubtedly not normal. However, empirical results show that the constant 3.25 does closely approximate the range in most cases.

Table 60.--Relationship of average coefficient of variation and seasonal milk delivery pattern coefficient of variation of study farms, by location and by correlation ratio, 1959-62.

Correlation Ratio	Seasonal Pattern Coefficient of Variation	Average Coefficient of Variation						
		0-9	10-19	20-29	30-39	40-49	50 and over	Total
		Distant Farms						
.8 and over	under 5.....		4		1			5
	5-9.....		56	160	44	10		270
	10-14.....			50	91	35	8	184
	15-19.....				18	30	8	56
	20-24.....					5	7	12
	25-29.....						3	3
	30 and over.....						1	1
	Total.....		60	210	154	80	27	531
Below .8	under 5.....							
	5-9.....	24	143	6				173
	10-14.....		228	209	2			439
	15-19.....		44	143	67	1		255
	20-24.....		1	52	48	20	1	122
	25-29.....			16	28	6	7	57
	30 and over.....			2	20	24	25	71
	Total.....	24	416	428	165	51	33	1,117
		Nearby Farms						
.8 and over	under 5.....		3	3				6
	5-9.....		40	35	3			78
	10-14.....			21	13	1		35
	15-19.....				1	1		2
	20-24.....						1	1
	25-29.....							
	30 and over.....							
	Total.....		43	59	17	2	1	122
Below .8	under 5.....	9						9
	5-9.....	71	216	3				290
	10-14.....	6	288	64				358
	15-19.....		50	67	10			127
	20-24.....		2	38	17			57
	25-29.....			5	14	1	1	21
	30 and over.....				9	9	6	24
	Total.....	86	556	177	50	10	7	886

tern. Since the amount of difference of seasonal patterns from the average seasonal pattern measures the precision of a forecast, the relationship indicates that the precision in forecasting is positively related to the amount of seasonal fluctuation present. This is true both for farms which had a high correlation ratio as well as for farms which had a ratio below .8. The reason for this is that when there is a small amount of seasonal fluctuation it is harder to have a high proportion of it common in all years. Thus when seasonal fluctuation is great a high proportion can be common to all years and yet there may still be considerable difference between yearly patterns and the average pattern.

The reason for presenting the information in this table is, however, to describe the precision in forecasting for individual producers. We might have assumed that if there was a close association among seasonal patterns (a high correlation ratio) then forecasts based on the average pattern would give precise forecasts. This is true to a limited extent because, as we have seen, the error in forecasting (the amount of difference between yearly patterns and the average pattern) is related to the amount of seasonal fluctuation that is originally present. Thus the precision in forecasting is dependent on two things, the amount of seasonal fluctuation to begin with and the closeness of the association between the seasonal patterns of the different years.

Recognizing that the total seasonal fluctuation and the degree of association govern the precision in forecasting there is still the question of how to interpret the seasonal pattern coefficient of variation as it relates to the precision of a forecast. We have said that it could be multiplied by 3.25 to get the average maximum spread, the sum of the maximum by which any month was below plus the maximum by which any month was above the average of the seasonal patterns. This maximum spread divided by two will give us the approximate amount by which any month may be off either above or below the forecast in any year. If the seasonal pattern coefficient of variation was 10, the maximum spread to be expected would be 32.5. In any year one month could be expected to be below the forecast by about 16 percentage points and one month could be expected to be above the forecast by about 16 percentage points. About eight of the twelve months could be expected to be within 10 percentage points or less of the average either above or below.

These differences between an actual seasonal pattern in any year and the average seasonal pattern of three years hold true whether the patterns had a high correlation ratio or a low one. It does not hold entirely true, however, if the correlation ratio was minus. When the correlation ratio is minus, the seasonal pattern coefficient of variation is greater than the average coefficient of variation which seems to imply that the average seasonal pattern would be a less accurate forecast than the forecast that every month would be an average month. This is not possible on the average for a group of years if the same inverse patterns occur. However, it would be possible to forecast a pattern based on similar years (no inverse patterns). If after this an inverse pattern occurred, the forecast based on the similar months would be less accurate than if a forecast of no difference among the months had been made. To this extent the seasonal pattern coefficient of variation larger than the average coefficient of variation is valid and correct when the correlation ratio is minus.

For the 2,656 study farms the data of table 61 show that there were only 21 farms for which a forecast of seasonal pattern based on the average of three years would not have an error of more than 8 percentage points in two months of the year. For 9 of these 21 farms it was not the high degree of association among their seasonal patterns that made this precision of forecasting possible but rather that the farms had a small amount of seasonal fluctuation. This degree of precision (or lack of it) of forecasting for individual farms compares with a precision for the average of all distant farms of about 3.5 percentage points, and for the average of all nearby farms the comparable figure is 1.8. For the average of all farms together it can be expected that in any year there will be two months which will differ from the average seasonal pattern by 2 percentage points.

Precision in forecasting is measured by the seasonal pattern coefficient of variation. The precision is related to the total amount of seasonal fluctuation and to the degree of association among seasonal patterns.

Table 61.--Coefficient of variation (seasonal) percentage distribution of study farms in each of 3 years by size of daily delivery, 1959-1962

July 1, 1959-June 30, 1962		Distant farms			Nearby farms		
Average daily delivery	Coefficient of variation	1st year	2nd year	3rd year	1st year	2nd year	3rd year
Pounds	Percent	Percent of all farms					
		791 farms			338 farms		
Below 495	1-9.....	1	1	2	7	6	7
	10-19.....	20	21	21	42	49	44
	20-29.....	33	32	35	31	28	30
	30-39.....	23	20	22	12	10	11
	40-49.....	13	16	13	6	5	5
	50 & over....	10	10	7	2	2	3
	Total.....	100	100	100	100	100	100
		583 farms			371 farms		
495-994	1-9.....	2	4	4	13	15	14
	10-19.....	32	34	41	58	50	54
	20-29.....	38	35	33	22	26	25
	30-39.....	19	19	15	5	6	4
	40-49.....	6	6	5	1	2	2
	50 & over....	3	2	2	1	1	1
	Total.....	100	100	100	100	100	100
		274 farms			299 farms		
995 & over	1-9.....	5	6	9	17	23	25
	10-19.....	40	40	48	57	56	56
	20-29.....	34	38	31	22	18	16
	30-39.....	15	11	9	4	3	2
	40-49.....	5	4	3	(1)	(1)	1
	50 & over....	1	1	(1)	(1)	(1)	(1)
	Total.....	100	100	100	100	100	100

[1] Less than 0.5 per cent.

Changes in Average Daily Delivery, Same Month, Successive Years

To determine the number of farms which delivered the same amount of milk in the same month of successive years, the average daily delivery in June and in November were analyzed. All study farms were sorted for level of delivery in the first year. Each first year size group was then sorted for second year level, and each of these groups was again sorted for level in the third year. The procedure and presentation in tables 62 and 63 is the same as that used for annual average level of delivery (tables 33-35) and for the coefficient of variation (tables 44-49).

For both months the proportion of farms which stayed in the same size group in all three years was less than half. This can be seen by comparing the number of farms in any given first year size group with the number which stayed in the same size group in the two following years. Other aspects of change which occurred in the three-year period were movement both up and down, and reversal of change from year to year.

It would be attributing too much to seasonal pattern change to say that all of the shifting from year to year that appears in tables 62 and 63 was change in seasonal patterns. Part of the shifting was a result of change in level of annual average daily delivery, and part was seasonal pattern change. Previous analyses have shown the separate effects (tables 34 and 35 for shifting in annual average daily delivery and tables 44-49 for shifting in amount of seasonal fluctuation). What is presented here is the combined effect.

Table 62.--June average daily milk delivery of study farms cross-classified in 3 years, 1959-1962

Average daily delivery	Total	Third year average daily delivery (pounds)						
		Below 245	245-494	495-744	745-994	995-1,494	1,495-1,994	1,995 & over
Pounds	Farms							
First year total.....	2,656	222	589	549	486	471	190	149
Second year.								
Below 245.....	200	153	42	1	1	1	1	1
245-494.....	634	67	451	108	6	2		
495-744.....	586	1	92	352	129	12		
745-994.....	452		4	79	270	96	3	
995-1,494.....	464	1		8	78	313	60	4
1,495-1,994.....	179			1	2	44	99	33
1,995 & over.....	141					3	27	111
First year below 245..	266	157	93	10	5		1	
Second year								
Below 245.....	159	132	26				1	
245-494.....	98	25	64	7	2			
495-744.....	7		3	3	1			
745-994.....	2				2			
995-1,494.....								
1,495-1,994.....								
1,995 & over.....								
First year 245-494....	703	58	418	186	32	9		
Second year								
Below 245.....	35	19	16					
245-494.....	477	38	357	78	3	1		
495-744.....	173	1	45	106	18	3		
745-994.....	16			2	11	3		
995-1,494.....	2					2		
1,495-1,994.....								
1,995 & over.....								
First year 495-744....	609	7	70	290	202	39	1	
Second year								
Below 245.....	4	2		1	1			
245-494.....	51	4	26	20	1			
495-744.....	362		41	222	92	7		
745-994.....	174		3	46	104	20	1	
995-1,494.....	18	1		1	4	12		
1,495-1,994.....								
1,995 & over.....								

Table 62.--June average daily milk delivery of study farms cross-classified in 3 years, 1959-1962--Continued

Average daily delivery	Total	Third year average daily delivery (pounds)						
		Below 245	245-494	495-744	745-994	995-1,494	1,495-1,994	1,995 & over
Pounds	Farms							
First year 745-994.....	428		8	54	191	158	17	
Second year								
Below 245.....								
245-494.....	6		4	2				
495-744.....	43		3	20	18	2		
745-944.....	220		1	28	133	58		
995-1,494.....	154			4	39	96	15	
1,495-1,994.....	5				1	2	2	
1,995 & over.....								
First year 995-1,494...	405			8	55	241	86	15
Second year								
Below 245.....								
245-494.....	2			1		1		
495-744.....	1			1				
745-994.....	39			3	20	15	1	
995-1,494.....	275			2	35	196	39	3
1,495-1,994.....	83			1		29	44	9
1,995 & over.....	5						2	3
First year 1,495-1,994.	143			1	1	21	75	45
Second year								
Below 245.....	1							1
245-494.....								
495-744.....								
745-994.....	1						1	
995-1,494.....	13			1		7	5	
1,495-1,994.....	83				1	12	50	20
1,995 & over.....	45					2	19	24
First year 1,995 & over	102					3	10	89
Second year								
Below 245.....	1					1		
245-494.....								
495-744.....								
745-994.....								
995-1,494.....	2						1	1
1,495-1,994.....	8					1	3	4
1,995 & over.....	91					1	6	84

Table 63.--November average daily milk delivery of study farms cross-classified in 3 years, 1959-62

Average daily delivery	Total	Third year average daily delivery (pounds)						
		Below 245	245-494	495-744	745-994	995-1,494	1,495 1,994	1,995 & over
Pounds	Farms							
First year total.....	2,656	516	736	506	359	313	119	107
Second year								
Below 245.....	535	424	107	3	1			
245-494.....	801	88	560	140	11	2		
495-744.....	486	3	65	284	123	11		
745-994.....	327	1	3	73	167	78	4	1
995-1,494.....	303		1	5	56	200	36	5
1,495-1,994.....	113			1	1	19	70	22
1,995 & over.....	91					3	9	79
First year below 245...	617	434	170	8	2	3		
Second year								
Below 245.....	454	388	64	1	1			
245-494.....	159	46	104	7	1	1		
495-744.....	4		2			2		
745-994.....								
995-1,494.....								
1,495-1,994.....								
1,995 & over.....								
First year 245-494.....	814	80	506	195	32	1		
Second year								
Below 245.....	78	36	41	1				
245-494.....	568	41	420	100	7			
495-744.....	150	3	43	85	19			
745-994.....	16		1	9	6			
995-1,494.....	2		1			1		
1,495-1,994.....								
1,995 & over.....								
First year 495-744.....	482	1	55	252	141	32	1	
Second year								
Below 245.....	2		1	1				
245-494.....	70	1	34	33	2			
495-744.....	276		19	180	73	4		
745-994.....	124		1	37	61	24	1	
995-1,494.....	8				4	4		
1,495-1,994.....	2			1	1			
1,995 & over.....								

Table 63.--November average daily milk delivery of study farms cross-classified in 3 years, 1959-62--Continued

Average daily delivery	Total	Third year average daily delivery (pounds)						
		Below 245	245-494	495-744	745-994	995-1,494	1,495 1,994	1,995 & over
Pounds	Farms							
First year 745-994....	307	1	4	44	149	104	4	1
Second year								
Below 245.....	1		1					
245-494.....	2		1		1			
495-744.....	52		1	18	28	5		
745-994.....	163	1	1	24	89	45	2	1
995-1,494	89			2	31	54	2	
1,495-1,994.....								
1,995 & over.....								
First year 995-1,494..	268		1	7	34	153	58	15
Second year								
Below 245.....								
245-494.....	2		1			1		
495-744.....	4			1	3			
745-994.....	24			3	11	9	1	
995-1,494.....	188			3	20	132	30	3
1,495-1,994.....	45					11	26	8
1,995 & over.....	5						1	4
First year 1,495-1,994	89				1	18	48	22
Second year								
Below 245.....								
245-494.....								
495-744.....								
745-994.....								
995-1,494.....	15				1	9	3	2
1,495-1,994.....	60					8	42	10
1,995 & over	14					1	3	10
First year 1,995 & over	79					2	8	69
Second year								
Below 245.....								
245-494.....								
495-744.....								
745-994.....								
995-1,494.....	1						1	
1,495-1,994.....	6						2	4
1,995 & over	72					2	5	65

Examples of Change on Individual Farms

Figures 8 and 9 illustrate types of extreme difference among seasonal patterns. The first illustration is for a farm which had a correlation coefficient of .080. There was no significant difference in the sine-cosine best-fit curves.

The second illustration is for a farm which had a correlation coefficient of -.399. There was a significant difference in the sine-cosine best-fit curves. This second farm was the most extreme in seasonal pattern difference.

A more complete illustration of two relatively stable farms is given in table 64 and figures 10 and 11.

The first is a distant farm and the second nearby. The farms were selected because they were relatively stable both in year to year change in average daily delivery and in their three seasonal patterns. The reader is urged not to interpret these farms as having been typical. The detailed descriptions are presented to show average daily delivery in three years combining both year to year change in average daily delivery and change in seasonal patterns.

In analyzing the year to year change in average daily delivery the distant farm stayed in the same size group in all three years. The nearby farm shifted into a higher size group in the third year. The distant farm had percentage increases in average daily

Table 64.--Farm analyses for two farms, 1959-1962

Analyses	Distant farm	Nearby farm
Average daily delivery:		
1st year	550	950
2nd year	650	900
3rd year	710	1,030
Percent of previous year:		
2nd year	118	95
3rd year	109	115
Coefficient of variation:		
1st year	21	13
2nd year	30	16
3rd year	26	12
Difference of seasonal patterns	Not sig.	Sig.
Correlation ratio	.802	.818
Average coefficient of variation	25.2	13.5
Seasonal pattern coefficient of variation	11.5	5.9
Seasonal pattern type	B[1]	E[1]

[1] Curves shown in Figure 7.

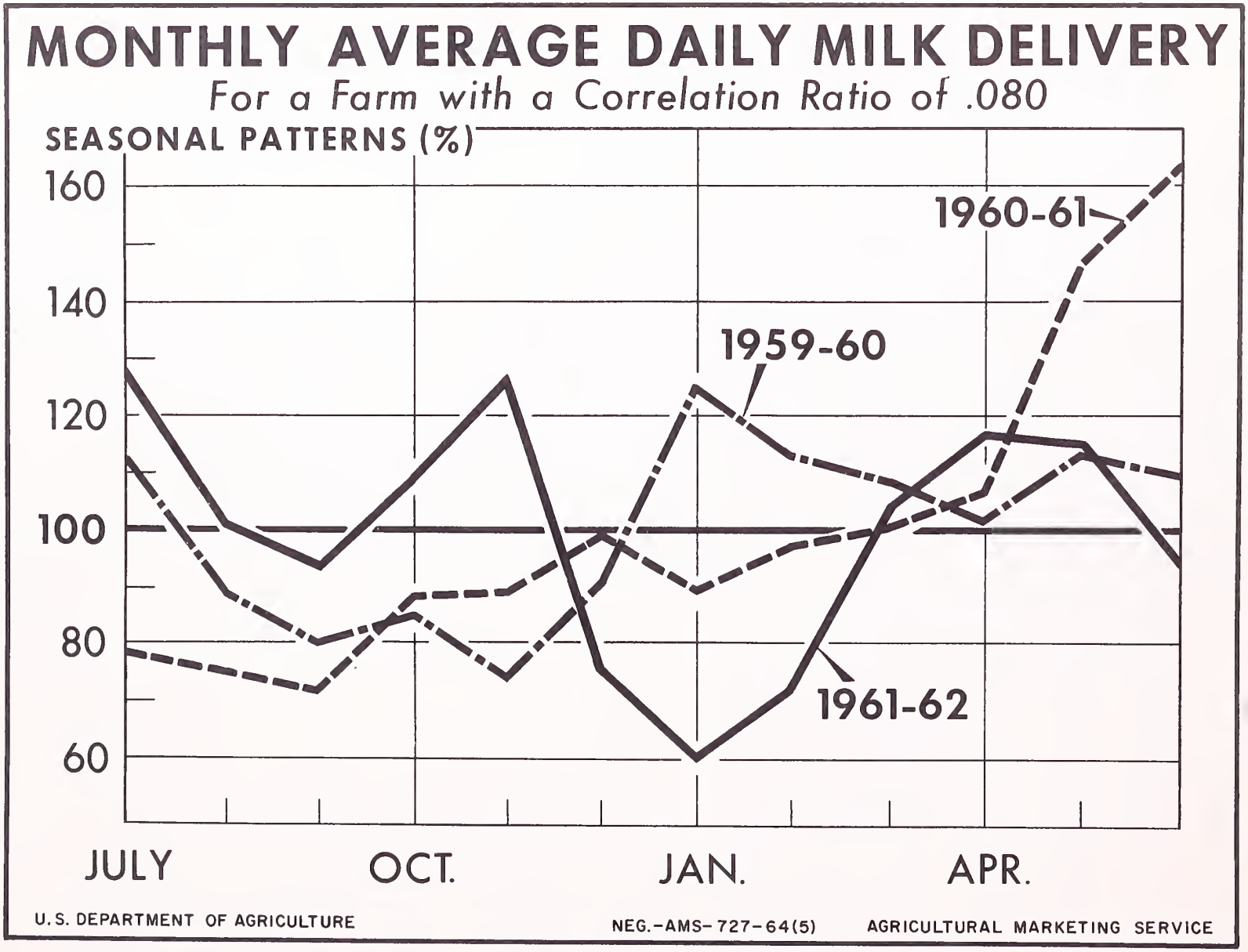
MONTHLY AVERAGE DAILY MILK DELIVERY
For a Farm with a Correlation Ratio of .080
SEASONAL PATTERNS (%)
160
140
120
100
80
60
1960-61
1959-60
1961-62
JULY
OCT.
JAN.
APR.
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Figure 8

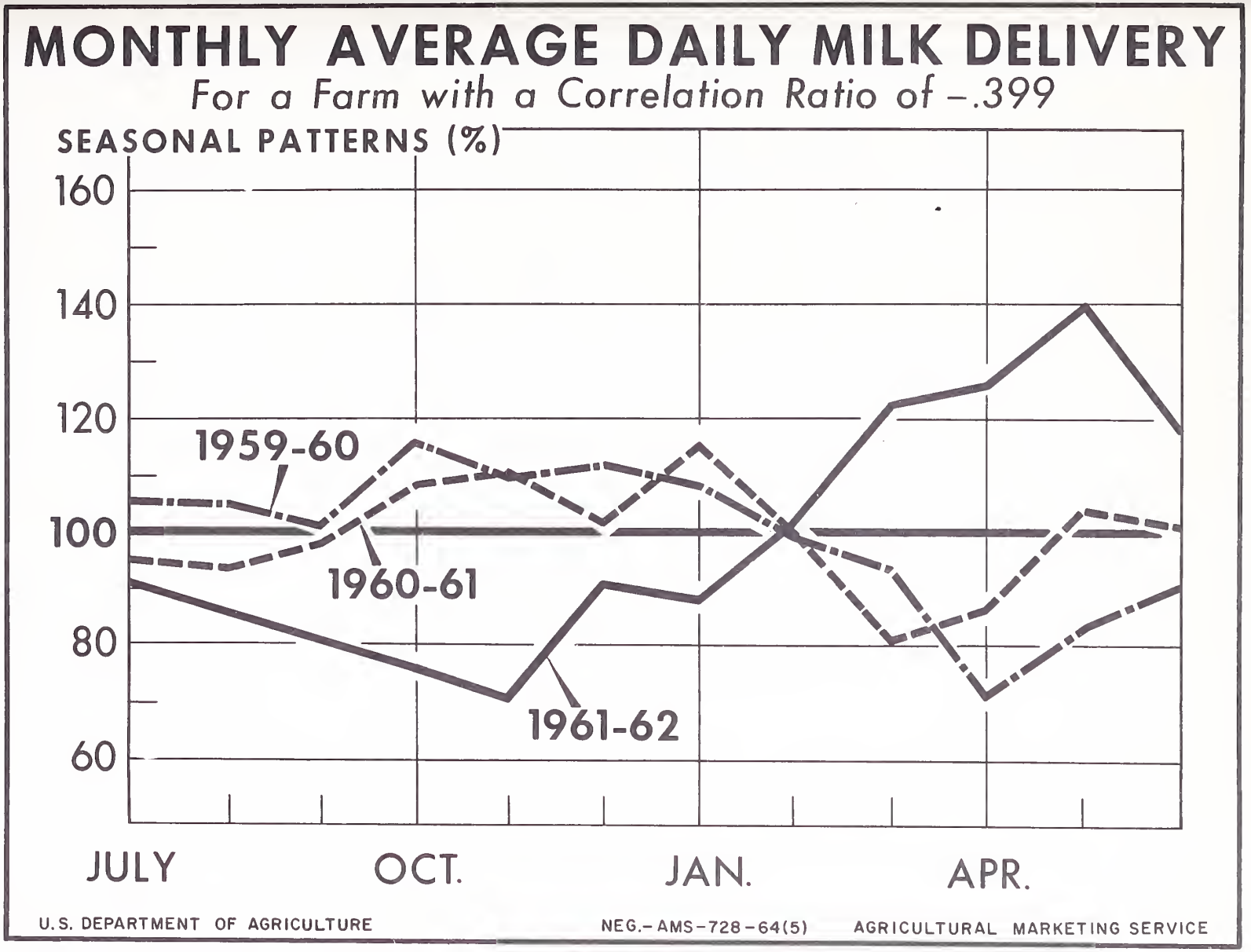
MONTHLY AVERAGE DAILY MILK DELIVERY
For a Farm with a Correlation Ratio of –.399
SEASONAL PATTERNS (%)
160
140
120
100
80
60
1959-60
1960-61
1961-62
JULY
OCT.
JAN.
APR.
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Figure 9

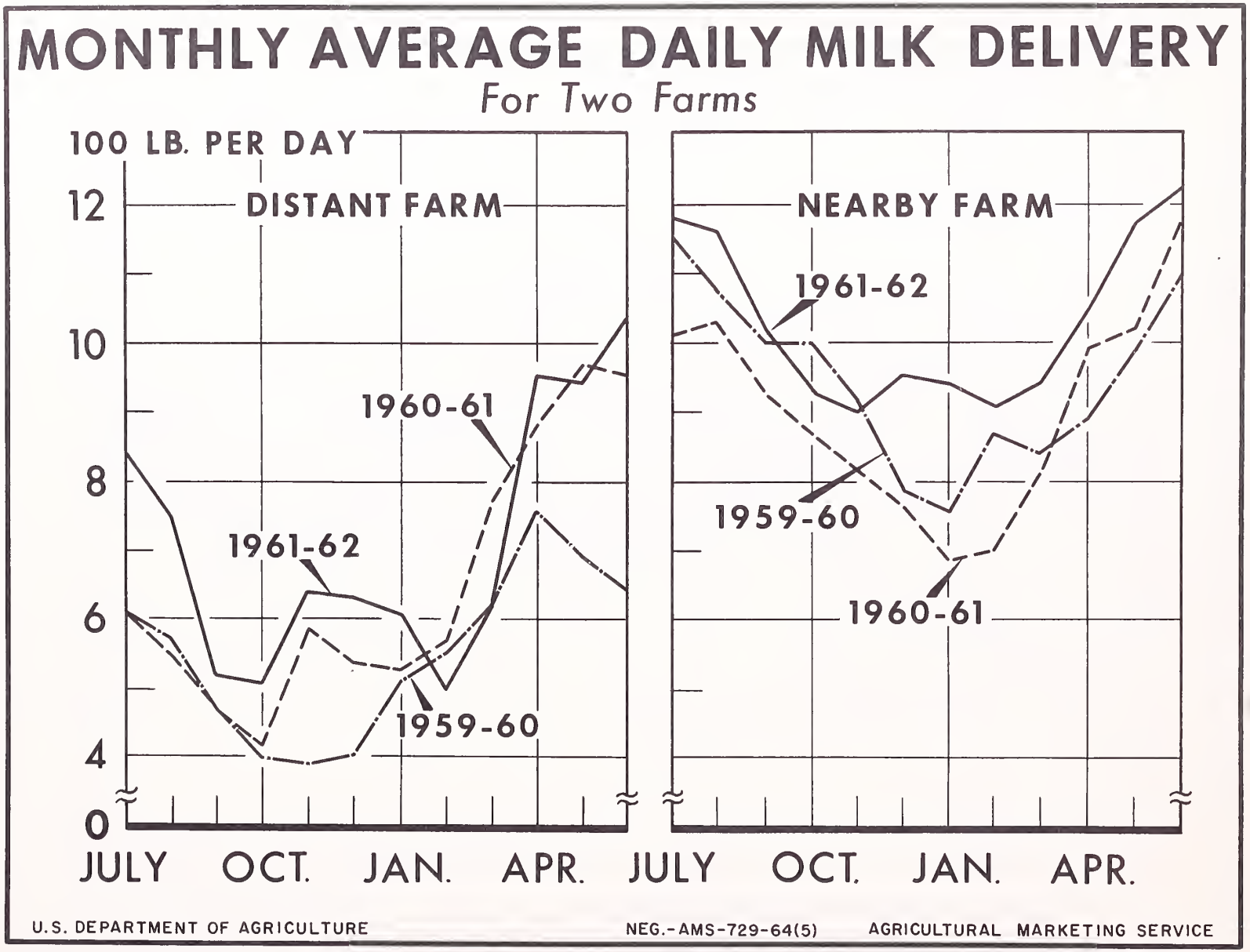
MONTHLY AVERAGE DAILY MILK DELIVERY
For Two Farms
100 LB. PER DAY
12
10
8
6
4
0
DISTANT FARM
1960-61
1961-62
1959-60
NEARBY FARM
1961-62
1959-60
1960-61
JULY
OCT.
JAN.
APR.
JULY
OCT.
JAN.
APR.
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Figure 10

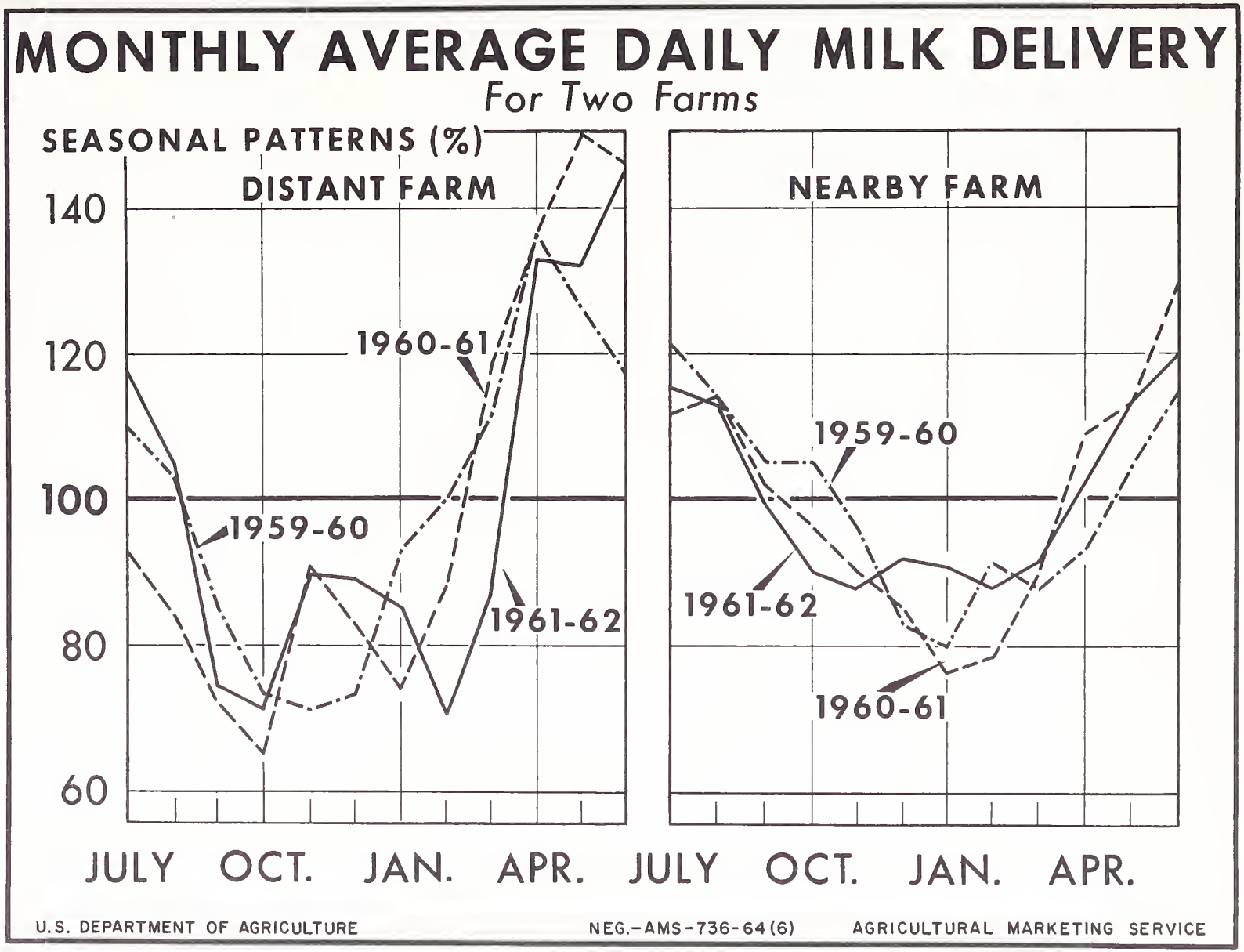
MONTHLY AVERAGE DAILY MILK DELIVERY
For Two Farms
SEASONAL PATTERNS (%)
DISTANT FARM
NEARBY FARM
140
120
100
80
60
1960-61
1959-60
1961-62
1959-60
1961-62
1960-61
JULY
OCT.
JAN.
APR.
JULY
OCT.
JAN.
APR.
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Figure 11

delivery from year to year of over 5 per cent in both cases. The nearby farm was relatively stable from the first to second year but had over a 5 per cent increase from the second to third year.

The distant farm moved into a higher size class of the coefficient of variation from the first to the second year and dropped back into the same class in the third year. The nearby farm was in the same size class in all three years. Both farms had a high correlation ratio but the nearby farm had a significant difference among the three seasonal patterns. There was almost twice as much seasonal fluctuation on the distant farm as there was on the nearby farm. In forecasting the distant farm seasonal pattern you could expect two months to deviate from the average pattern by about 18.5 percentage points and for the nearby farm you could expect about 9.5 percentage points deviation in two months.

RELATIONSHIP OF BULK TANK TO MILK DELIVERY PATTERNS

The introduction of bulk tanks for farm storage of milk has been thought by some to have had an impact on the change in level of deliveries and on the seasonality patterns of milk deliveries. Since information on the bulk-tank status of farms was obtained in this study, the relationship of bulk-tank status to change in level of deliveries and to the amount of seasonal fluctuation was investigated.

In table 65 the bulk-tank status of study farms is shown. A higher proportion of nearby farms (65 percent) than of distant farms (32 percent) had bulk tanks July 1, 1959. On June 30, 1962, the proportion of farms with tanks had increased to 76 percent for nearby and 60 percent for distant. Among study farms which left the market, 40 percent of nearby and 15 percent of distant farms had bulk tanks.

Table 65.--Bulk tanks ownership of study farms by size of daily milk delivery, 1959-1962

Average daily delivery	Distant farms having				Nearby farms having			
	No tanks	Added tanks	Continuous tank ownership	Total	No tanks	Added tanks	Continuous tank ownership	Total
Pounds	FARMS IN MARKET 36 MONTHS							
10-249.....	207	33	7	247	69	7	18	94
250-499.....	269	176	99	544	96	32	116	244
500-999.....	146	199	238	583	59	49	263	371
1,000-1,999.....	40	53	152	245	19	19	202	240
2,000 & over.....	1	7	21	29	1	2	56	59
Total.....	663	468	517	1,648	244	109	655	1,008
Percent of total.....	40	28	32	100	24	11	65	100
	FARMS LEAVING MARKET							
10-249.....	222	2	7	231	85	1	14	100
250-499.....	106	9	19	134	35	1	32	68
500-999.....	35	5	17	57	19	2	24	45
1,000-1,999.....	5	1	6	12	4	1	18	23
2,000 & over.....	1			1		1	2	3
Total.....	369	17	49	435	143	6	90	239
Percent of total.....	85	4	11	100	60	2	38	100

Annual Average Daily Delivery

The relationship between bulk-tank status and percent change in level of milk deliveries from the first year to the third year is shown in table 66. On the average, farms which added a bulk tank had a higher percentage increase than those farms which were never bulk or were always bulk. This general tendency held best for all size groups of farms (size measured by average level of delivery in the first year) when the comparison between farms which added bulk was made with farms which were never bulk.[17] This analysis based on averages did not, of course, hold true for each individual farm. The same shifting of direction mentioned earlier appeared in all groups of farms regardless of bulk-tank status.

Table 66.--Distribution of study farms and percent change in average daily milk delivery from first year to third year by average daily delivery first year and by farm bulk tank ownership, 1959-1962

Average daily delivery	Distant farms having			Nearby farms having		
	No tanks	Added tanks	Continuous tank ownership	No tanks	Added tanks	Continuous tank ownership
Pounds	-Number of farms-					
5-244	222	47	10	73	10	22
245-494	271	189	113	99	34	129
495-744	95	115	147	32	27	135
745-994	42	67	100	24	21	132
995-1,494	25	35	92	9	12	138
1,495 & over	8	15	55	7	5	99
Total	663	468	517	244	109	655
	Percent change first year to third year in average daily delivery					
5-244	20	38	12	17	121	14
245-494	9	23	17	4	25	13
495-744	10	15	14	9	16	13
745-994	3	14	14	6	14	8
995-1,494	9	13	12	12	6	11
1,495 & over	5	13	11	16	-1	12
Average	10	17	13	9	15	11

[17] The author is reluctant to attribute greater increase in deliveries to the acquisition of a bulk tank. The order of relationship might better be that on farms where growth was taking place (improvement was going on) the operators used purchase of a bulk tank as one improvement. Or if a producer felt there was opportunity to grow, he felt capable of purchasing a bulk tank. Of course payments on a bulk tank would be an incentive to maintain or raise income.

Seasonality

The change in amount of seasonal fluctuation which was associated with bulk-tank status is demonstrated in table 67. For distant farms which added a bulk tank, there was more of a shift to less seasonal fluctuation than was true for other distant farms. Both distant and nearby farms which were "always bulk" showed less seasonal variation in all years than was true for "never bulk" or "added bulk" in the comparable areas.

One difficulty with this initially convincing set of relationships was that nearby farms which added bulk tanks did not show a significant shift to less seasonal fluctuation. Another difficulty was that low seasonal fluctuation was size related (low for large farms). Farms which were always bulk were primarily large farms which had low seasonal fluctuation. In other words, there may be a question whether seasonality is related to acquisition or

Table 67.--Coefficient of variation (seasonal) of study farms by bulk tank ownership, 1959-1962

Coefficient of variation	Distant farms			Nearby farms		
	First year	Second year	Third year	First year	Second year	Third year
Percent	Percent of total					
No tanks:	663 farms			244 farms		
1-9	1	2	3	13	14	15
10-19	22	24	26	48	46	41
20-29	35	31	32	24	26	29
30-39	22	21	22	9	8	9
40-49	10	13	10	4	4	4
50 & over	10	9	7	2	2	2
Total	100	100	100	100	100	100
Added tanks:	468 farms			109 farms		
1-9	2	3	3	9	15	13
10-19	28	31	35	51	50	47
20-29	34	34	37	25	19	27
30-39	20	17	14	10	8	6
40-49	11	10	7	3	6	6
50 & over	5	5	4	2	2	1
Total	100	100	100	100	100	100
Continuous tank ownership:	517 farms			665 farms		
1-9	3	4	5	12	15	16
10-19	35	33	38	54	54	55
20-29	35	38	33	25	24	22
30-39	17	16	15	6	6	5
40-49	7	7	7	2	1	1
50 & over	3	2	2	1	(1)	1
Total	100	100	100	100	100	100

[1] Less than 0.5 percent.

use of a bulk tank or to size of farms.[18] There was also shifting up and down in the coefficient of variation for farms with all states of bulk-tank ownership.

This study has described the dynamics of individual actions in the deliveries of milk by producers. The variation among individuals, as well as the changing of direction by individuals from one period to another, have been noted. Even with all of the dynamics of individuals a direction of movement by the entire group was apparent.

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[18] An analysis by size groups could have been made and it would have been helpful in showing the relationship that existed. However, the line or order of relationship would not be indicated. It is the author's opinion that the ability and awareness of the operator is the controlling factor and that increased size of operation, lower seasonality, and use of a bulk tank all stem from the operator's direction. He does not feel that higher milk production which is more seasonally even than that which had existed would automatically be the result of the placing of a bulk tank on all farms.

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Agricultural Marketing Service
Washington, D. C. 20250

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