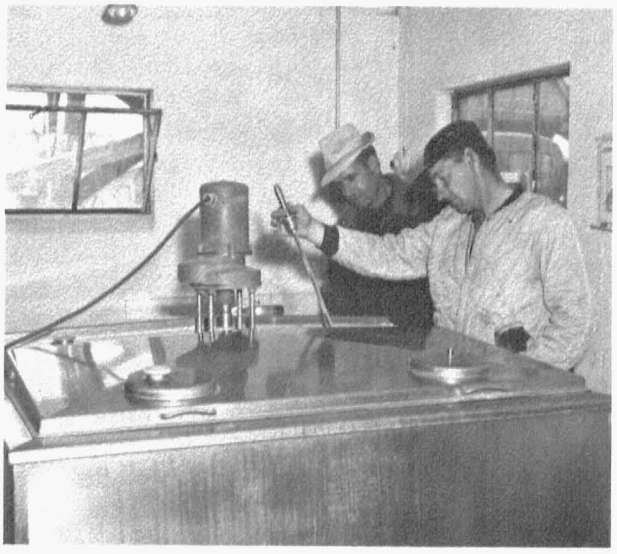
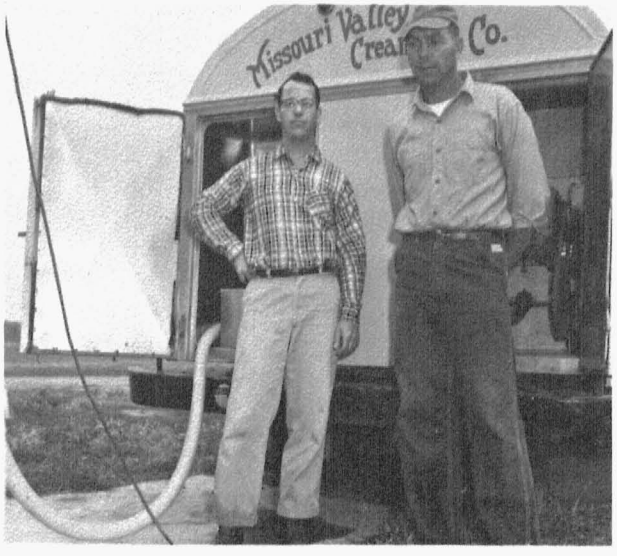
MILK ASSEMBLY IN SOUTHWEST MISSOURI





Stephen F. Whitted
and
Floyd A. Lasley

University of Missouri Agricultural Experiment Station
B 831, January, 1965

Table of Contents

Acknowledgement

This study reports on Department of Agricultural Economics research project 429. The authors appreciate the wholehearted cooperation of the dairy plant managers and milk haulers of Southwest Missouri. Many of them worked far into the night, after an exhausting day on the route, taking information from their records.

Summary

The assembly of milk is a complex process, with a high degree of inter-dependence among all segments of the industry. Each segment has been considered in this study, including the assembly of both Grade A and manufacturing milk. Bulk and can methods of collecting and receiving the milk were studied. The influence of producers, haulers, plants, and seasonal variations in production on costs was considered.

The processing plant can grow only as it can expand the volume of milk receipts. The firm sells services which must be added to raw milk. It is this need for milk which causes dairy firms to devote so much attention to the assembly organization.

Improvements in the cost structure of milk assembly operations in Southwest Missouri must necessarily arise from consideration of the reasons underlying existing inefficiencies. These basic causes are: numerous small producers, relatively long distances between patrons, extreme seasonal variation in production, overlapping routes with crosshauling, rigorous competition for milk, isolated producers requiring "backtracking," patrons switching to different plants, numerous producers who deliver their own milk, multiple grades of milk, rough terrain with poor roads, and routes organized as one truck enterprises with a sufficient capacity to haul the spring flush production at a single trip with great excess capacity the rest of the year.

The assembly cost includes three items:

1. the cost of getting milk to the station
2. the receiving cost
3. the cost of transferring a part of the milk from the receiving station to the processing unit.

Each of these activities benefits from economies of scale, but not to the same extent.

There are three levels of organization to be considered in making adjustment in the hauling phase of assembly:

1. the individual hauler
2. haulers serving a plant or firm
3. haulers serving the entire area.

The degree of difficulty in accomplishing adjustments ascends in the order listed, as does the potential saving.

Improved roads, larger trucks, mechanical coolers, insulated van bodies, and similar developments enable a truck to serve a larger area and transport a greater quantity of milk than at the time most of the routes were organized. The number of producers in Southwest Missouri has declined substantially since the mid-1950's. The average producer is shipping a larger volume of milk, and the trend is toward bulk handling methods. Bulk trucks have a greater capacity than the van trucks, and usually haul more than one load per day. These changes have led to excess hauling capacity, excess facilities, excess labor, and to many small volume routes.

Industry action to improve hauling efficiency could solve some of the more complex problems associated with the procurement of milk. The quest for additional volume has led to extension of procurement areas beyond the limits where haulers can give profitable service. The average producer has 3.66 alternative can routes and 1.26 bulk routes on which he may ship milk. Desirable competition need not be reduced; instead, a more effective form should be developed. Emphasis should be placed on reduced cost so producers can be paid maximum prices for their milk. This would help processors obtain greater volume which would reduce unit procurement and processing costs and help them to maximize their own net returns.

Variable Rates Based Upon Volume.

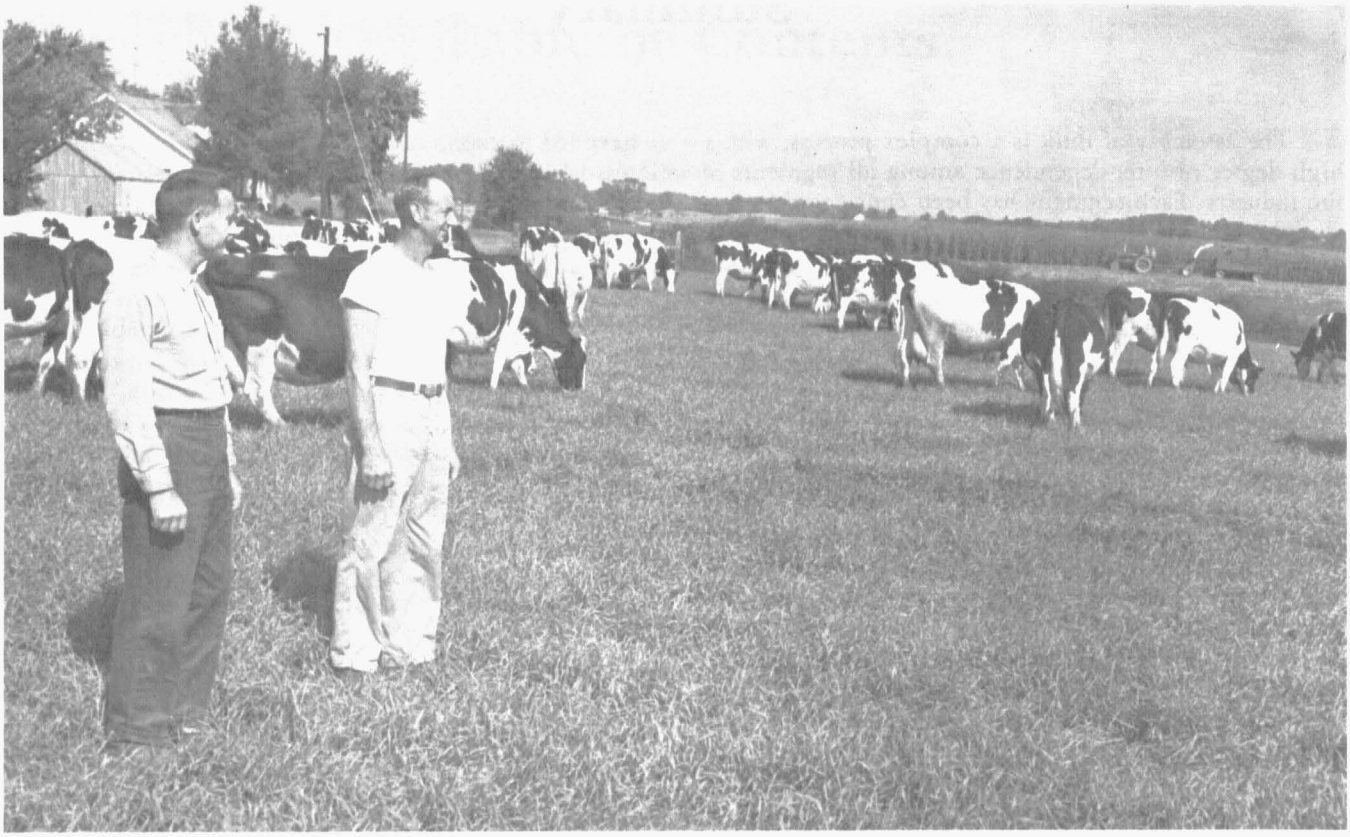
Maximum efficiency can be attained only under a haul rate structure in which each producer is paying that portion of the costs directly attributed to him. Such allocation of costs has not been practiced, nor even attempted, in the dairy area of Southwest Missouri, due to the intense competition for milk and the difficulty of determining the cost of servicing each producer.

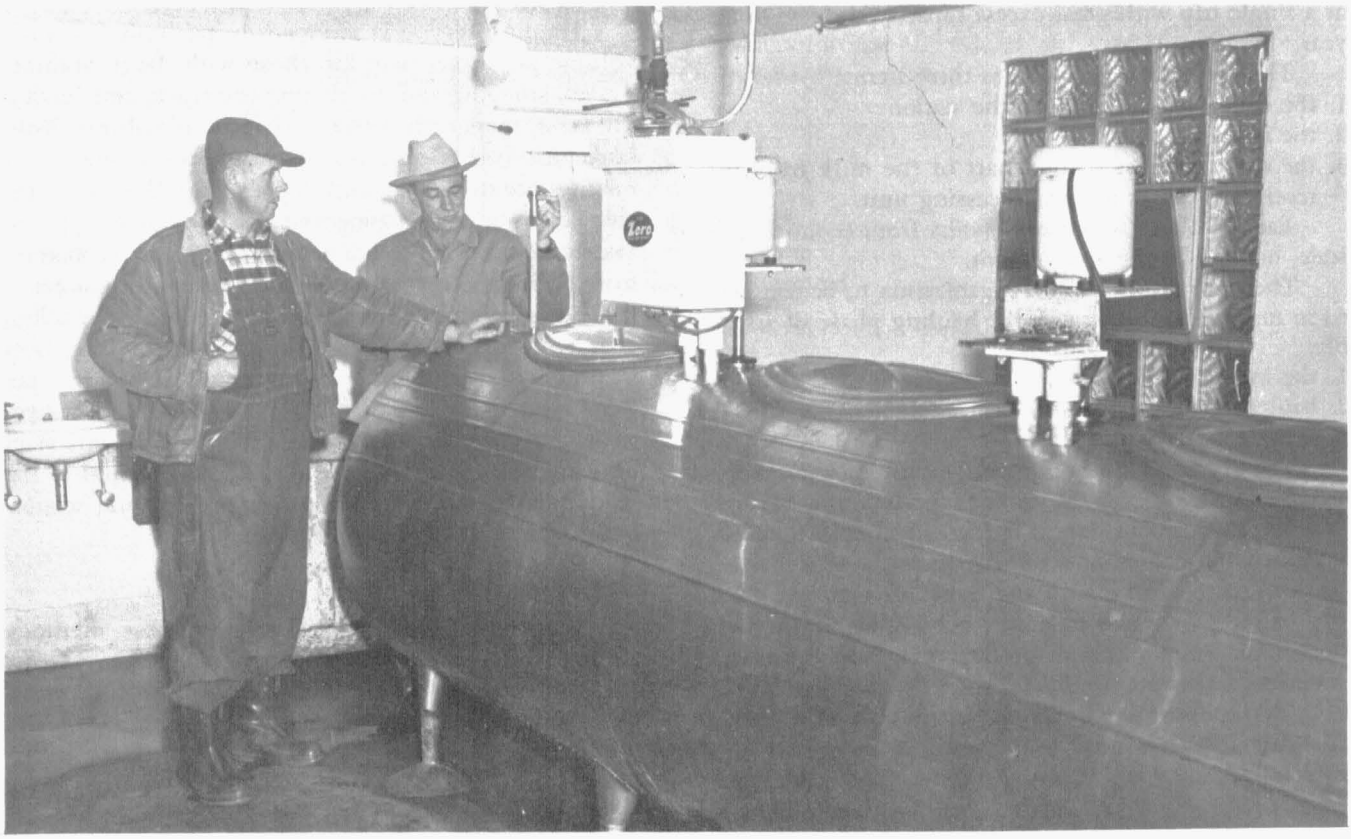
Hauling service is more costly per unit for small volume producers than for those with large volume. Travel, stopping and positioning the truck, and leaving the farm, remain the same regardless of volume. Bulk tank pickup requires a minimum of approximately 13 minutes per stop if any milk is picked up. The only variable here is actual pumping time, which requires approximately 12 seconds per 100 pounds. To realize economies from bulk collection requires large volume producers.

Sufficient flexibility should be provided in hauling charges to permit equitable adjustments for differences in production patterns, location, density, volume per farm, road and route conditions, and changes in competition. Any policy which decrees that a given rate shall be maintained may well prove to be detrimental to the dairy industry in the area, as such a policy could seriously interfere with needed adjustments.

Competing For Volume.

Plant managers should choose the best methods when striving to increase the volume of receipts. Certain measures used may be easily matched by competing firms. Others are more difficult to match or surpass. The preference for practices that are difficult to match is evident in the tendency to use non-price competitive measures to secure greater volume. The manager should




Aero

weigh the added cost against the increase in receipts of each method when deciding which measures to use.

Route Characteristics.

Many factors influence the cost of operation and the returns from a milk route. It is the assumption in this discussion that the degree of success can best be measured by the labor income of the operator. A satisfactory income should be received if the hauler is to continue in business. Otherwise, he may seek other employment; either from choice or because he is involuntarily forced to cease operation for lack of capital. Density of milk receipts on the route is a major factor in determining the success of a hauler. An area which may provide a profitable opportunity for milk assembly when worked at a low level of competition, may become a high cost area when competition increases, because of reduction in effective density of production available to each route and station. The net effect is basically the same as in an area of very low production density. Miles per unit hauled become excessive under such conditions. Productivity of labor, trucks, and processing equipment diminish under these conditions. Directly or indirectly, the value of milk at the farm is forced to a lower level because of high unit costs in the marketing process. These costs and small daily loads lead to unsuccessful route operation.

A feasible way to attack this problem is through reorganization of routes. Combination of three or more routes into a partnership can significantly lower costs and relieve drivers from the depressing "seven day a week routine."

When industry-wide understanding makes it possible, a complete reorganization of the assembly process can save millions of dollars annually in the Southwest Missouri area. One plan which would accomplish this is presented in the final section. No doubt modifications can be designed which will make it even more effective and workable.

Introduction

Significant changes in the processing and marketing of milk and milk products in Missouri have been made within a relatively short period of time. Concurrent adoption of fluid milk distribution in paper cartons and cooling milk in farm bulk tanks has presented handlers the opportunity, and even the necessity of expanding distribution areas. The major portion of this expansion has been made by city handlers, at the expense of dairies in small population centers. Several of these smaller dairies have discontinued actual processing of milk; some have become local distributors for another firm.

City handlers have tended to specialize in the processing and distribution of fluid milk. Producer cooperatives, operating under full supply and similar agreements with handlers, in many instances have accepted the dual responsibility of meeting the fluid needs of the market and managing the surplus Grade A milk. Cheese, dry milk, and other manufactured products are increasingly being manufactured by country plants and producer cooperative associations.

Bulk handling has facilitated the movement of milk over greater distances. Bulk trucks, picking up milk from the farms, may also be routed to a destination other than the normal receiving plant more readily than is possible with can trucks.

The rapidity with which the aforementioned changes occurred, the closing of several plants, and a very intense drive for volume by the remaining plants, have resulted in confusion in the collection of milk from the farm. A great amount of overlapping and crosshauling has raised assembly costs in the area. The quest for volume has caused routes to be extended to excessive distances from plants.

Fifty-four plants received milk from regular routes in the 33 county area of Southwest Missouri. Several plants received two grades at multiple lines so that a total of 89 intake lines were in operation. Seven hundred eighty-one can routes were serviced by 812 trucks, with 56 bulk trucks also servicing the area. These facilities moved 1.46 billion pounds of milk to market from more than 25,000 producers, servicing an area of 22,808 square miles. More than 1,000 persons were directly employed in hauling and receiving the milk from farms.

Approximately $5,000,000 annually is spent moving the milk from farms to the initial market in Southwest Missouri. Receiving and transfer bring the total assembly costs to $7,200,000. Pay for these services equals 10 to 30 percent of the farm value of the product.

The assembly process, including farm pick-up, receiving, and transfer to processing plants, devoloped very rapidly during the years 1935-1953, but with no overall plan. Firms tended to expand operations into new areas. This period of development preceded use of bulk cooling and handling equipment on farms. Improved roads, trucks, refrigeration, and production methods now permit larger procurement areas than were feasible then.

Competition was keen especially in procurement, with each firm endeavoring to improve its relative position. Price and non-price competition existed, with the emphasis placed on non-price competition.

Multiple grades or classes of milk, which must be hauled or received separately, further complicate the problem. Grade A and manufacturing milk in cans must be received separately, but may be hauled on the same truck. Mixed loads are not suitable on bulk tank trucks.

As population becomes more concentrated in cities, costs tend to increase. To secure greater quantities of milk requires the use of more resources. New patrons must be gained, production per patron must be increased, or both, to increase volume. This means change and movement from positions formerly considered to be in equilibrium. To induce such shifts, the plant or hauler must convince the producer to abandon his former equilibrium position.

Areas without superior natural resources may have as high a marginal product at some relatively low level of service as an advantaged area has when it operates more intensively. As a rule, there are fewer competing routes serving low-producing areas, but the number is not reduced in proportion to the volume of production available, thereby resulting in low levels of marginal productivity of assembly operations, especially to the haulers.

In selecting a location, the transfer cost of both raw materials and the product must be considered. The advantages of a given location are measured by relative total cost, including transport expenses of all inputs and outputs, as well as production costs. Differences in plant processing costs caused by location are insignificant in processing and manufacturing milk products in Southwest Missouri. The cost of transferring the product to consumers is significant in the fluid milk market. The main advantage in transfer costs for manufacturing milk plants would be realized by locating them at the point of advantage for efficient assembly of raw milk from the farms.

Efforts to trace boundary lines between different plants, except those of the same firm, revealed no sharp lines of demarcation in procurement areas. In other instances, there is an area of complete overlapping and enveloping. The overlapping of procurement areas definitely implies an absorption of costs by either the hauler, the plant, or the patrons near the plant.

Possibilities for savings are significant. Gains in efficiency in the assembly process might well contribute to greater efficiency in farm production and plant processing activities by encouraging larger volume producers. Complimentary contributions of this type would serve to improve the competitive position of an area that is considered to be basically well adapted to the production of dairy products.

Duplication of Procurement Areas

The degree of overlap of procurement areas among milk plants in Southwest Missouri is shown in Figure 1 and Table I. The number of firms competing within an area was determined by outlining the procurement area of each firm, counting the service area of each firm once. Many firms are competing for manufacturing milk, Grade A in cans and Grade A bulk. Due to this multiple procurement, a farmer may have more alternative outlets for his milk than there are firms competing in the area.

Figure 1 should not convey the impression that every farm in an area is located immediately on the route of all competing firms. The implication is that the area is being served by that number of firms, each hauler generally bearing the responsibility of collecting milk from the farmers located within the periphery of his contracted route who desire to ship milk to that hauler's plant.

Eight firms were competing in small portions of the area. As many as 12 trucks were reported servicing certain specific sections. The average farmer at the time this study was underway could choose his outlet from among four competing firms. The greatest number of competing firms was found in the areas of highest concentration of production. The most competitive areas lie mainly in a belt approximately 50 miles wide stretching in a southeasterly direction from St. Clair County through Greene County, then eastward into Webster County and portions of Wright and Douglas Counties. From Greene County a somewhat wider belt extends southwestward to Newton County.

A gradual reduction in the intensity of dairy production and the number of competing firms is evident with movement outward from the above described belt. A zone of few alternative outlets for milk tends to encircle the area studied. This zone appears on the northern and eastern limits of Figure 1. The 20 percent of the area canvassed by only two competing firms lies entirely along the outside boundary lines.

Complete abolition of overlap would not bring about a proportionate decrease in miles traveled by haulers in collecting milk. It would, however, result in a drastic reduction in travel, bringing about substantial savings in the assembly of milk.

The extent of duplication also can be estimated by comparing the area serviced by each truck with the average area per truck. Milk was collected in cans from the 22,808 square mile area by 812 trucks, an average of 28 square miles per truck. The actual service area averaged 103 square miles per truck; a duplication of effort equivalent to 3.7 can trucks servicing the same area. The can routes averaged 104 miles in length, with an annual mileage of 34,732 miles.

Bulk tank trucks also serviced much of the same area as can trucks, although this coverage was not complete. The 56 commercial bulk trucks had a combined service area of approximately 28,640 square miles, with an overlap of 1.26 trucks serving a given area. The majority of

TABLE I

MEASURE OF OVERLAP IN PROCUREMENT AREAS BY COMPETING FIRMS IN SOUTHWEST MISSOURI, DECEMBER, 1960

Number firms competing in area	Percent of total area	Square miles
0	0	0
1	.86	195.01
2	19.30	4,403.06
3	19.47	4,440.01
4	20.51	4,678.12
5	21.13	4,819.76
6	13.67	3,118.06
7	4.04	921.67
8	1.02	231.96
Total		
4.04 weighted average	100.00	22,807.65

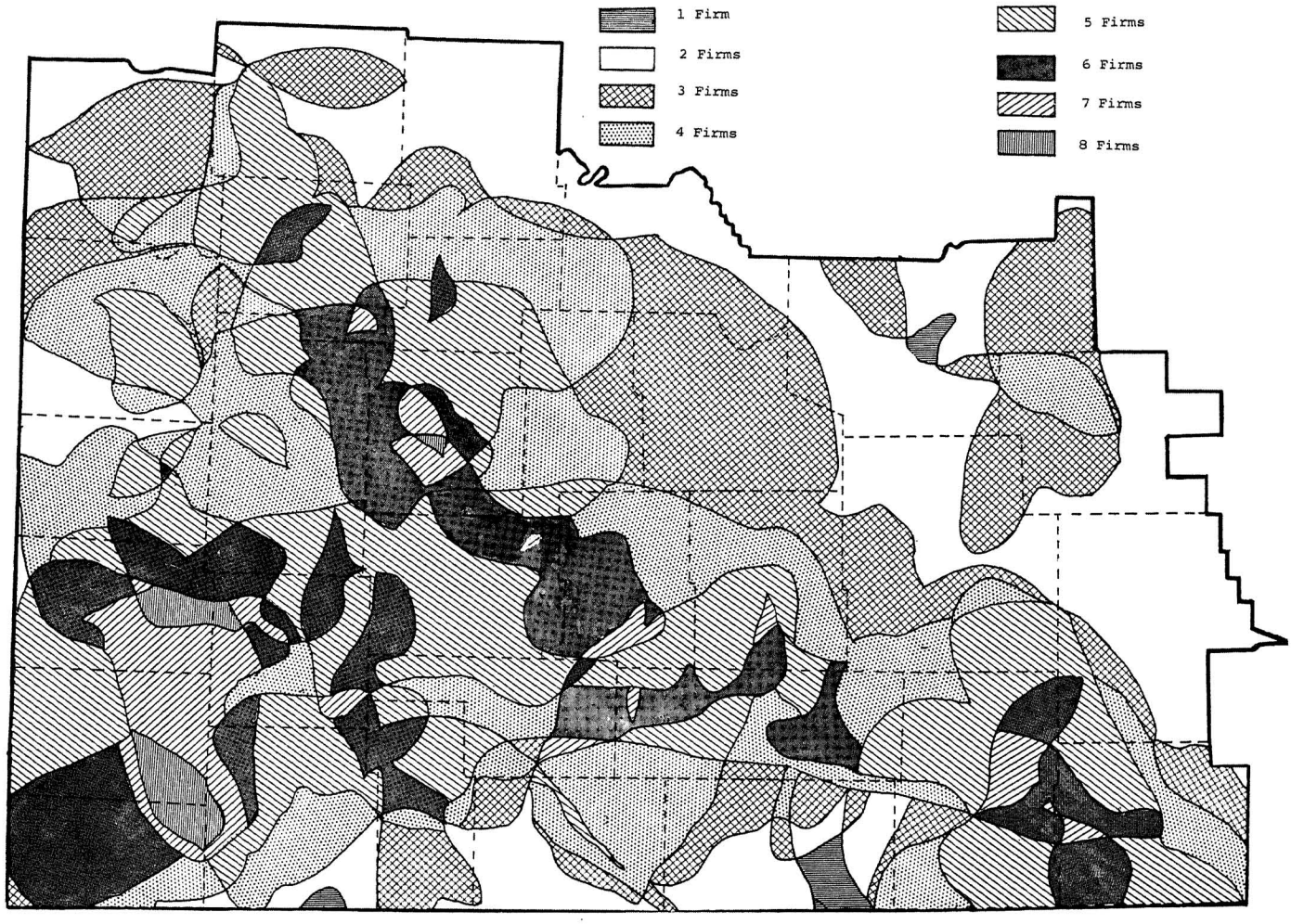


Fig. 1—Number of Plants Competing for Milk from Farms by Area in Southwest Missouri, 1960.

these bulk trucks delivered milk to stations or plants within the zone of most concentrated milk production, centering at Springfield, where up to five bulk trucks served some specific areas. However, the bulk trucks also serviced much of the outside boundary area, usually driving some distance to collect milk from a small group of producers located fairly close together. Applying the figure of 56 bulk trucks to the entire area results in an average of 407 square miles per truck, whereas the trucks actually served an average of 513 square miles. Average annual travel per bulk truck was 46,975 miles.

Service area in square miles for bulk trucks does not present a meaningful measure during a period of transition to bulk handling. Market development presents the necessity of servicing certain isolated patrons in order to establish a route and thereby encourage expansion in bulk handling.

Figure 2 presents three examples of distortions of procurement areas. These are shown in proper perspective and overlap, but are not located on the map, in order to prevent identification of specific plants. Other plants were operating within this same general locality, so these three do not represent the complete competitive picture; rather they are examples. Those sections which extended farther than the average distance from each of the three plants tended to follow the road network.

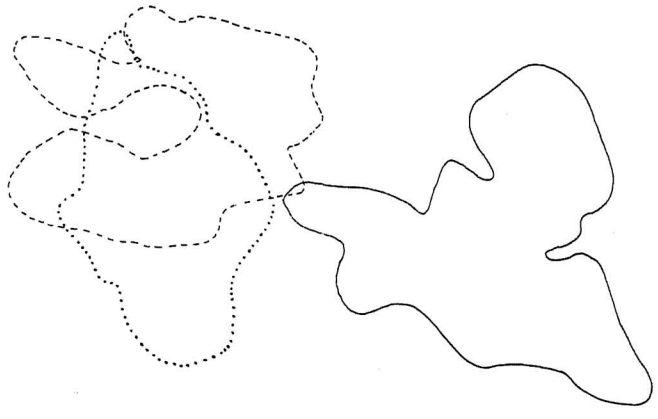


Fig. 2—Illustration of Distortions and Departure from Circular Procurement Areas by Three Plants in Southwest Missouri, 1960.

The Effects of Hauling Rate Structures Upon Assembly

Allocation Of Hauling Costs.

An attempt to allocate hauling costs equitably among producers must begin with the development of some method of dividing route costs among the various contributing factors.

A flat rate per 100 pounds of milk hauled assumes that all of these factors are related to volume rather than to stops or distance traveled. An equitable system of hauling charges would reflect the following items to each producer:

1. the percentage of cost on the route which occurs as a result of the weight of milk hauled in accordance with his percentage contribution to the pay load
2. the percentage of route costs associated with the number of stops per day
3. the net cost related to the distance from each farm to the receiving station.

Various formulae could be applied to determine a hauling rate which would attempt to distribute the costs equitably among individual producers. The following suggested methods illustrate the principles involved.

Method A.

a. Distribute the total fixed costs equally among all patrons.
b. Distribute variable costs due to distance according to the distance from the plant.
c. Distribute variable costs due to volume according to the volume of each patron.

Using this method of figuring hauling costs, the rate could be computed as follows:

$$\frac{\text{Total hauling cost x(40\%)}}{\text{Number of patrons}} = \text{Stop or service charge}$$

plus

$$\frac{\text{Total hauling cost x(30\%)}}{\text{Sum of patrons' distances from plant}} \times \text{Distance for patron}$$

plus

$$\frac{\text{Total hauling cost x (30\%)}}{\text{Sum of all patrons' volume}} \times \text{Volume for patron}$$

Method B.

a. Distribute total fixed costs equally among all patrons.
b. Distribute total variable costs on a unit-distance basis.

$$\frac{\text{Total hauling cost x(40\%)}}{\text{Number patrons}}$$

plus

$$\frac{\text{Total hauling cost x(60\%)}}{\text{Sum of patrons' hundredweight-miles}} \times \text{Individual patron's hundredweight miles}$$

The service charge would be the same as under Method A, with the variable cost depending upon the interaction of volume and distance.

Method C-Flat Rate.

Distribute total costs entirely according to volume. Applying the same assumptions, the flat rate would be computed simply by dividing the total cost by volume.

$$\frac{\text{Total hauling cost}}{\text{Total hundredweight hauled}} = \text{Hauling rate}$$

Plans A and B both encourage patrons to ship to a nearby plant by stressing distance. This is especially true with plan B. Both also reduce the charge per hundredweight for large producers by recognizing the importance of the fixed costs involved in servicing a producer. The flat rate recognizes only the volume factor as contributing to hauling cost. Under this plan, producers of large volumes, and those located near the market, subsidize those who ship smaller volumes, and those who are located some distance from the market.

1. A farmer would pay significantly different rates under the three plans, depending upon distance from market and volume.

2. These plans may readily be modified so as to reflect cost conditions under specific circumstances. Modifications may also be used to encourage producers to ship larger volumes and to ship to the nearest plant. Much of the overlap in Southwest Missouri could be eliminated by applying a rate structure which gave consideration to distance and the fixed cost of servicing a producer.

3. Hauling charges which encouraged producers to ship large volumes to nearby plants would indirectly benefit the industry through realization of economies in servicing large-volume producers located in an area contiguous to the plant.

The computation could be simplified for both Method A and B by using volume ranges and distance zones to determine the variable charges. The appropriate vari-

able charges could then be listed in tabular form so as to permit rapid determination of the rate per 100 pounds hauled for each individual patron.

Neither Method A nor B would exactly associate the cost of servicing a specific patron with his charges. However, either would perform this function in a reasonably equitable manner, far more so than the commonly used flat rate. Other mehods and variations could be applied to determine hauling charges. Farm tank capacity and mileage zones could be used to determine the variable costs, thereby eliminating the need to recalculate the rate except when hauling costs changed or patrons changed. Such variations may greatly simplify the computational work without giving up too much of the benefits of such methods of distributing hauling charges among patrons in accordance with the costs involved in providing services for them.

Effects Of Different Types Of Hauling Rates

The hauling rates in Southwest Missouri tend toward uniformity within a given locality as the areas of competition between plants overlap, providing the farmer with alternative markets for his milk. This choice of outlets, combined with very active solicitation by haulers and plant personnel, causes the farmer to be sensitive to variation in the hauling rate.

Maximum efficiency can be attained only under a rate structure in which each producer is paying that portion of the costs directly attributed to him. Such allocation of costs has not been practiced, nor even attempted, in the dairy area of Southwest Missouri. This has been due to the intense competition for milk and the difficulty of determining the cost of servicing each producer.

In the period of declining production following the peak reached in 1956, plants and haulers alike have been very active in their efforts to maintain, if not increase, the volume of milk handled. Several fluid and manufacturing operations closed, and some local plants were converted into receiving stations. When a plant ceased operations, its patrons were not left without a market, since the haulers and fieldmen of other plants competing in the locality vied for the milk. Offers, counter-offers, and assurances were made to producers in an effort to acquire entire routes or portions of former routes.

Evidence suggests that haulers exhibit a tendency to compare added out-of-pocket outlays with prospective added revenue when determining the distance and the rate at which they are willing to haul. Such comparison induces them to undercharge and to overextend their service area. So long as the truck is in good operating condition the hauler feels that all is well. However, with higher repair bills or the necessity of purchasing a new truck, he suddenly is confronted with costs not adequately considered in bidding for additional volume. Such overextension may result in less than satisfactory service to patrons, resulting in their transfer to competing routes. This action leaves a low density of milk volume on a portion of the route, even less dependable service, and a chaotic situation. Plants, haulers, and producers alike, have recognized the situation and searched for some means of alleviating their distress. Too often these efforts have intensified the practices which led to the chaos and have led even further down the road of hauling rates that represent less than full cost, overextension of routes and the other undesirable practices already discussed.

Plant managers, haulers, producers, and consumers have an interest in the establishment of a proper rate structure for hauling milk. Alternative methods of establishing charges and the consequences of each type of charge should be weighed when a rate pattern is accepted.

Flat Rate.

The most commonly used method of establishing a hauling rate is to charge uniformly per hundredweight for all patrons on a route. Although the simplest to administer, inequities exist with this method. Some producers are subsidized by others. Producers near the plant are charged more than the actual cost of providing service, while those more distant are paying less than the full cost of the service to them. Large volume producers pay more than their proportionate share, whereas small producers do not bear their full cost.

A milk producing area where a flat rate per hundredweight is charged can expect considerable overlapping of procurement areas as routes will continue to extend further from their delivery point than under other rate structures. Under this arrangement, there is little inducement for the producer to continue to sell to the nearest plant. He feels free to move from plant to plant, a costly process from the standpoint of record keeping, field service, and assembly operations. An unstable condition tends to develop as the plants and haulers employ various competitive devices, including rumor spreading, in their efforts to obtain the maximum quantity of milk.

Haulers are under constant pressure from fieldmen to extend their service area, especially when the truck is not being used to capacity. Such pressure reinforces the urge of the hauler to obtain a full load, so he tends to

lengthen his route to the point where it is no longer profitable. Determination of the highest profit length of a milk route is not an easy problem.

The haulers who were interviewed were almost unanimous in favoring the flat charge per hundredweight. Many felt that this was, "The only way of treating all patrons alike". The belief that small producers should not be penalized by charging them a higher rate was frequently expressed. Also many thought that varying rates within a route would cause the producers not favored by low charges to demand equally attractive treatment or to sell their milk elsewhere. The effectiveness of these opinions in shaping policy is shown by the uniformity of rates charged within a given community.

Flat Rate And Subsidies.

Despite the fact milk haulers in Southwest Missouri overwhelmingly favor the flat rate charge, plant managers have become concerned with this method. The use of hauling subsidies, which appear to be associated with the flat charge, is rather significant in several instances. The payments have become rather large and burdensome items in the operating costs of some plants in this area. The route subsidy and the flat hauling rate which at one time were used by some plants to increase density of production appear to have had the opposite effect in the long run. Lengthening of routes and cross-hauling brings decreased density of patrons per route and may bring forth no increase in volume for a given plant. It may cause only a larger procurement area covered in competition with a greater number of plants. The result is fewer pounds of milk secured per mile of travel.

Expansion of plant territory to secure a greater amount of milk so operating costs per hundredweight could be reduced, was the initial hope of management which led to the hauling subsidy. This hope was not realized, however, as the subsidy was more or less self-defeating. Instead of increasing plant receipts and patron numbers, it resulted in an exchange of patrons as competing firms responded in like manner.

Unit Rate Per Mile.

A uniform charge based upon a hundredweight mile has not been used in this area. A variation, that of zoning the procurement area and charging uniform rates per hundredweight within the zone, has been employed by a few plants. In at least one case, the zoning was accomplished by organizing complete routes within the single zone. This caused all patrons on a given route to pay the same rate as they were all included in the same zone.

Zoning does tend toward increased efficiency when employed by all plants competing within a given area. Producers within the zone nearest a plant are encouraged by the hauling differential to ship their milk to this plant. This concentration of patrons lends itself to more economical field service, hauling, and other services. As distance from the plant increases, it is expected that patron density will decrease as the concentration of dairymen becomes lower and the competitive influence of other plants is intensified.

This practice of zoning is perhaps the most easily instituted and administered plan of variable hauling rates. It will be readily accepted by a majority of producers. The downfall of such a plan is the same as that for other variable charges—someone attempts to circumvent the assigned limits in order to attract specific producers. A small beginning in such special rates quickly results in the breakdown of the rate structure, leading back to the single flat rate plan.

Variable Rates Based Upon Volume.

Hauling is more costly per unit for small volume producers than for those with large volume. The major portion of the cost of servicing a patron is extremely inflexible. Travel, stopping and positioning the truck, and leaving the farm remain the same regardless of volume. Bulk tank pickup requires a minimum of approximately 13 minutes per stop. The only variable is actual pumping time, approximately 12 seconds per hundredweight. To realize economies in bulk collection requires large volume producers.

A modification of this system of determining the individual haul rate is the stop charge. This system, currently being tried in one section of the area, consists of setting a charge for each stop made plus a given rate per hundredweight. This practice results in a lower net rate per hundredweight for the larger producer and a corresponding higher rate for the small producer than under a flat rate plan. The charge and the net difference for various producers depends upon the amount of the stop charge in comparison with the unit rate. The greater the portion of the total hauling rate represented by the stop charge, the greater the recognition of the savings due to volume and the higher the per unit charge to small producers.

When one plant in a locality employs this system of rates, the expected result would be for large volume producers to favor it. They would do this to obtain the lower rates while small producers would favor plants where a flat rate was charged.

The development of a pattern of large producers shipping to one plant and small producers to others would certainly cause a marked change in the relative cost curves of the competing firms. The plant receiving the major portion of its milk from large producers would be in a position to realize significant savings in its procurement, bookkeeping, and field operations. Such savings could be passed on to patrons in the form of higher prices or non-price services; retained by the company; used to improve the hauler's situation; or any combination of these measures. The latter course is the most likely, as this procedure would give a competitive advantage in each phase of plant operations other than actual processing of the milk.

Haulers servicing such a plant would benefit from a redistribution of patrons which resulted in a greater average volume per shipper.

The results of such a change are two-fold: (1) improvement in the per unit cost of the favored plant, and (2) deterioration of the cost structure of competing plants.

Pricing F.O.B. the Farm.

The advent of bulk cooling and collecting has generated thought of pricing milk F.O.B. the farm with the plant assuming complete ownership at this point. The task of measuring, sampling for butterfat and quality, and accepting or rejecting the milk from bulk coolers is completed at the farm by the operator of the bulk truck. At this point the milk is pumped into the tank and mixed with that of other patrons.

The effects of a plan which prices the milk F.O.B. the farm, would depend upon the net payment to the farmer for his milk. The New York Federal Order has zoned the procurement area, which tends to result in the effects discussed under the heading ***Unit Rate Per Mile.*** If all farmers in the milkshed were to receive the same net price for their milk, the discussion of the flat rate plan would become pertinent.

Hauling costs must be allocated to the milk and considered in the pricing process. Merely changing the point of pricing does not eliminate them. Although a portion may be moved forward to the consumer it may be assumed that a considerable part will be passed back to the farmer. In effect, this system merely transfers the point of pricing and uses one of the previously described rate patterns to determine the price to the farmer.

Combination Plans.

The impact of any of these plans for establishing hauling rates either may be exaggerated or diminished through modification or combination. Basing the hauling rate upon the volume of the producer and distance hauled would tend to favor large nearby producers while encouraging small distant producers to ship elsewhere. Such a distribution of patrons would result in the cumulative advantages discussed under the two separate plans.

Seasonal Variation Affects Assembly Operations

Production of milk results from varying combinations of diverse economic and biological functions. A dairyman exercises moderate control over certain factors, but the degree of control is severely restricted. The combination of productive factors may be varied, but the response is seldom immediate.

More resources are required to secure a given level of milk production during certain seasons of the year than at others. Therefore, the dairyman must feel that he will be reimbursed adequately for the extra resources before he attempts modification of the normal seasonal production pattern.

Milk Plants And Seasonal Variation.

Processing plants need a more nearly uniform production of milk. The plants and assembly facilities must be adequate to handle the peak flow. They experience less than full utilization during most of the year, with gross underemployment during the season of short supply.

Southwest Missouri has one of the greatest seasonal fluctuations of all the dairy areas of the United States. Federal Order market statistics for 1960 reveal that the Ozarks Area Market fluctuated through a more extreme range than any other Federal Order Market.[1]

Seasonal variations in surplus Grade A for an entire market indicate but a small degree of the fluctuations faced by some plants. Supply plants located near the periphery of the milkshed generally experience extreme fluctuations in the surplus Grade A milk that must be utilized in manufactured products. These plants send the milk to the city market only when it is needed for fluid use, or when regulations require. Individual plants were confronted by surpluses ranging from zero to 10 truckloads of can milk per day. It was common for a plant to have a ton of surplus milk during May for each hundredweight of surplus during the short season. A variation of 1,000 percent may occur within the space of one month. Much of this extreme fluctuation is hidden among market averages.

Several factors underlie this extreme seasonality. Among them are: many low volume producers; part-time farmers; some farmers cease milking in winter; low producing cows; hot, dry summers; low quality pastures and roughage: improper feeding of cows; and other factors.

[1]United States Department of Agriculture. ***Federal Milk Order Market Statistics 1960.***

In addition to the increased cost resulting from irregular receipts of milk, plants are confronted with variations in demand for fluid milk. While much less seasonal than production, demand is not uniform.[2] The consumption pattern is *contra-seasonal* to production as shown in Figures 3, 4, and 5. The result is wide variation in the amount of surplus Grade A milk not needed for fluid purposes. This surplus is manufactured, usually at country plants rather than in the city where the fluid milk is processed. This practice avoids the transfer cost to the city and permits realization of economies of scale and specialization through processing large volumes into manufactured products. The seasonal pattern of this surplus is shown in Figure 6. In 1960, the surplus milk from fluid plants operating in the Ozarks area varied from 2,141,145 pounds in January to 10,204,178 pounds in May.

The surplus Grade A is greatest when the volume of uninspected milk is also at a peak, as shown in Figure 4. This coincidence of large supply complicates the working schedules of manufacturing facilities during the spring season. The result is high fixed costs per unit.

The fluctuation in average daily deliveries per producer for the four major Federal Order Markets in Southwest Missouri is illustrated in Figure 7. Fluctuations in producer receipts are illustrated in Figure 8. Combining these fluctuations with seasonal variation in consumption of fluid milk gives the inverse proportion of milk that is used as Class I, shown in Figure 9. Both Kansas City and Neosho Valley order markets have employed seasonal incentives to influence dairymen to modify normal production patterns and have succeeded to some extent.

In order to process this milk into manufactured products, it is necessary to utilize factors of production on an irregular basis. This does not lead to maximum efficiency. To have adequate facilities and labor available for handling peak production, most plants resort to employing seasonal labor. In addition to the less efficient labor, firms also face criticism of the community for laying off workers when not needed in the fall. Consequently, some have taken steps to minimize seasonal employment. Plant maintenance and repairs are performed during the slack period, plant expansion is timed to coincide with these periods and in some cases fieldmen and supervisory personnel vary their work assignments. Perhaps the most usual adjustment is to change the length of the working day to correspond with receipts, with the understanding that longer hours in the spring and summer are compensated by shorter hours in the fall and winter.

[2]Stephen F. Whitted, *How Surplus Grade A Milk is Marketed in the Midwest.* University of Missouri, Columbia, Missouri. 1962.

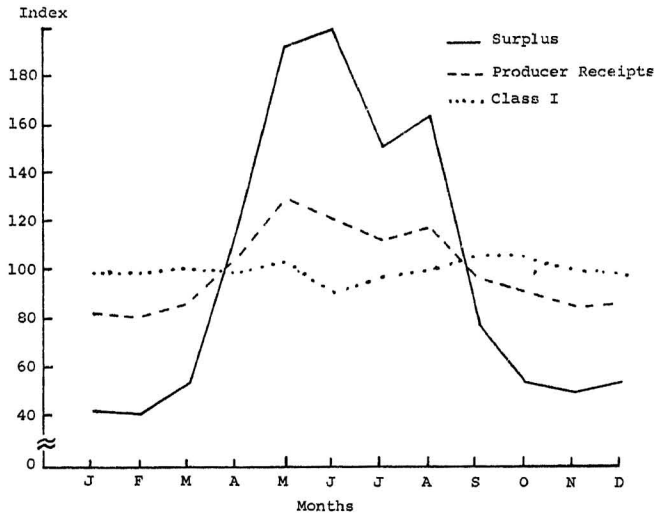


Fig. 3—Index of Seasonal Variation in Producer Receipts, Class I Usage, and Surplus Grade A on the Ozarks Area Market, 1960. Source: Market Administrators Office.

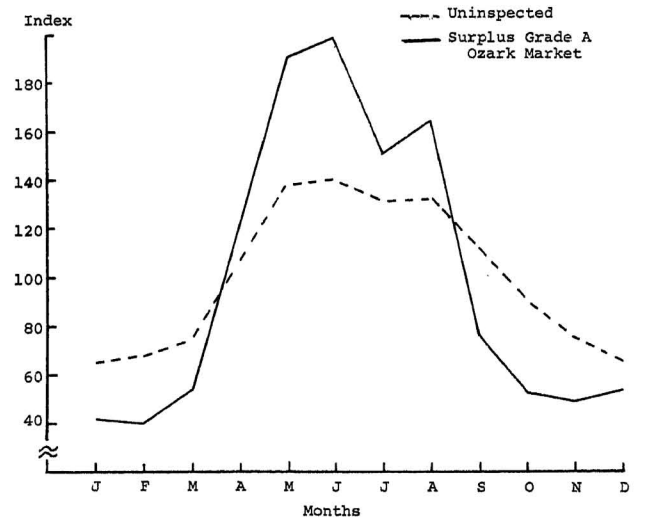


Fig. 4—Seasonal Index of Milk Utilized for Manufacturing Purposes in Southwest Missouri, 1960.

Seasonal Variation On Milk Routes.

Uninspected milk production typically is more changeable than Grade A production. The relative degrees of fluctuation are shown in Figure 10 for the sample routes. This seasonality exerts tremendous influence upon the degree of success attained by a hauler. Although the study was not designed to bring out an exact quantitative measure of how variations in supply influenced route organization, it is believed that 90 percent of the routes were organized to permit hauling of peak seasonal production in one load. Indeed, this was considered to be quite an achievement by many of the haulers. Some explained that they picked up the entire route in one load by hauling two cans in the seat for a one week period.

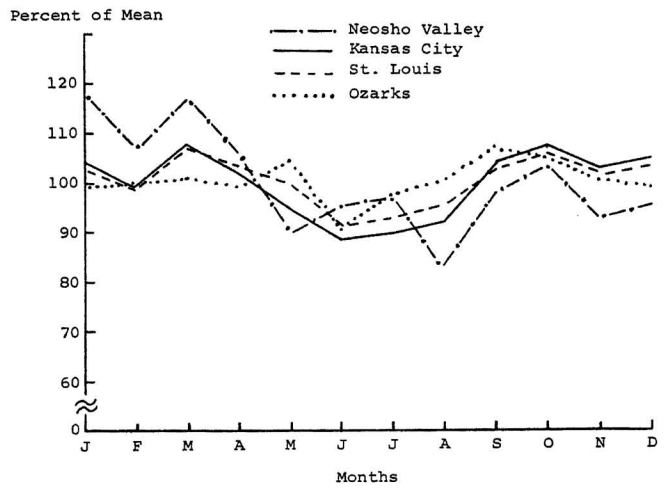


Fig. 5—Producer Milk Utilized in Class I Uses in Four of the Federal Order Markets in Which Southwest Missouri Producers Sold a Significant Portion of the Total Milk in 1960. Each Month Expressed as a Percent of the Mean.

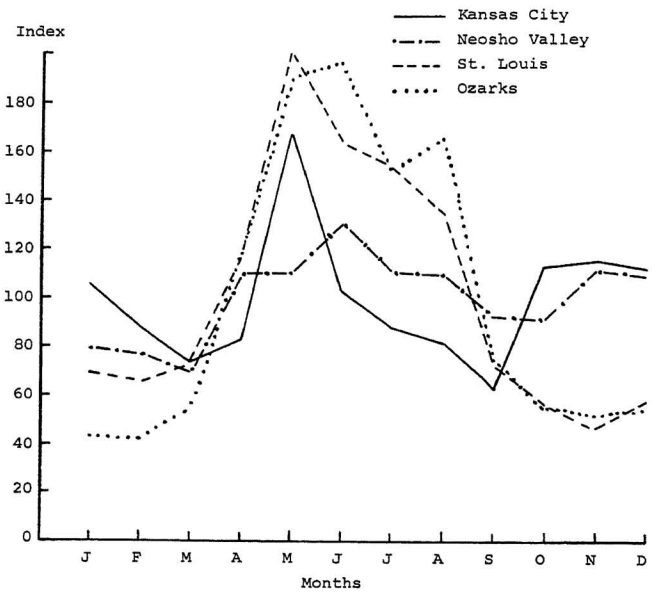


Fig. 6—Index of Seasonal Variation in Surplus Grade A Milk for the Four Major Federal Order Markets in Southwest Missouri 1960.

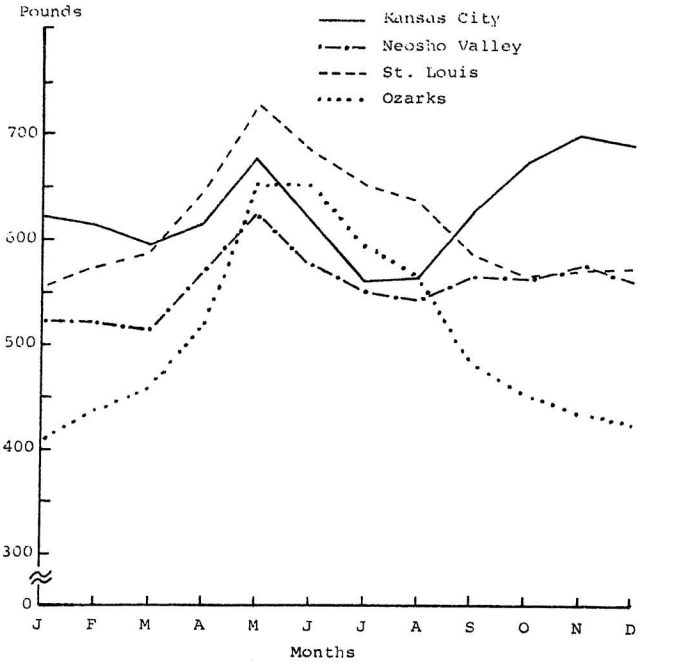


Fig. 7—Average Daily Deliveries per Producer by Months, 1960, in the Four Major Federal Order Markets in Southwest Missouri.

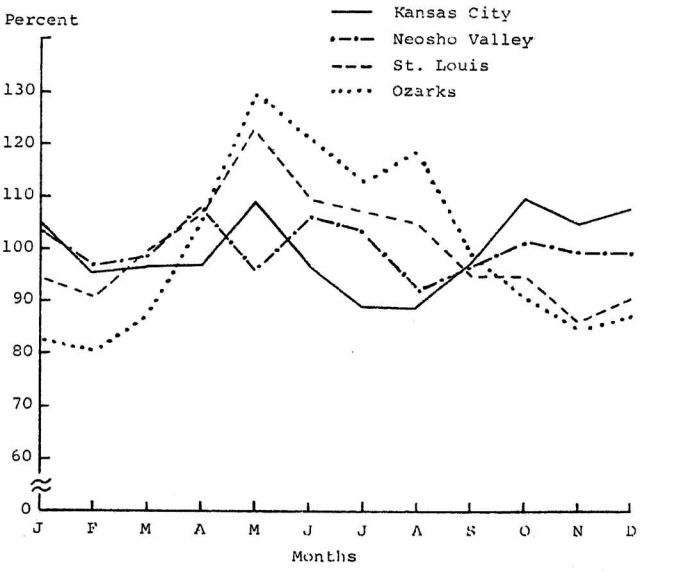


Fig. 8—Producer Receipts as a Percent of Average, by Months, 1960, for the Four Major Federal Order Markets in Southwest Missouri.

Route Combination Helps Solve the Problem.

A limited number of the haulers have reduced the cost per unit of milk and increased returns to labor by adjusting their route organization. They have combined at least three routes into a single operating unit under a partnership agreement. Such combinations, where properly effectuated, permit greater flexibility in adapting the route to changing conditions.

This type of organization permits a much higher degree of utilization of facilities and labor. During the peak production period at least one truck can make two trips daily as the other two drivers assist in performing a portion of this driver's duties. During the period of low milk production, the three "routes" are served by two trucks and drivers. The third driver may enjoy leisure a portion of the time, or may have part-time employment.

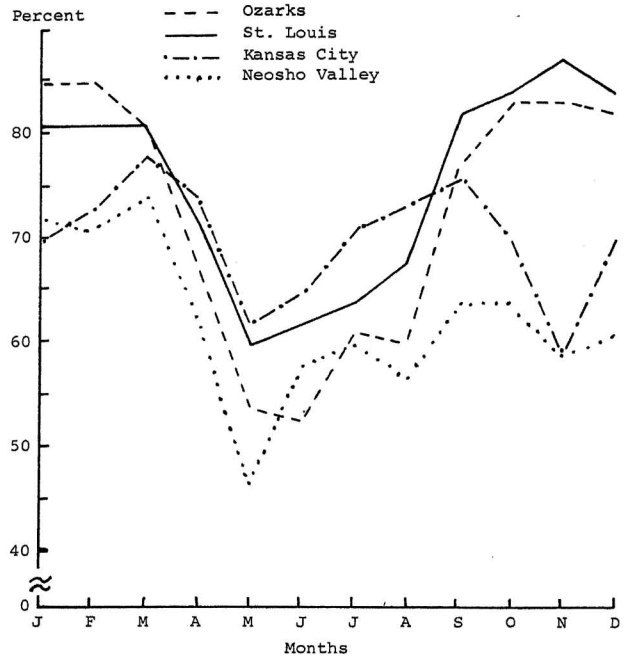


Fig. 9—Percent of Producer Receipts Utilized as Class I on the Four Major Federal Order Markets in Southwest Missouri by Months, 1960.

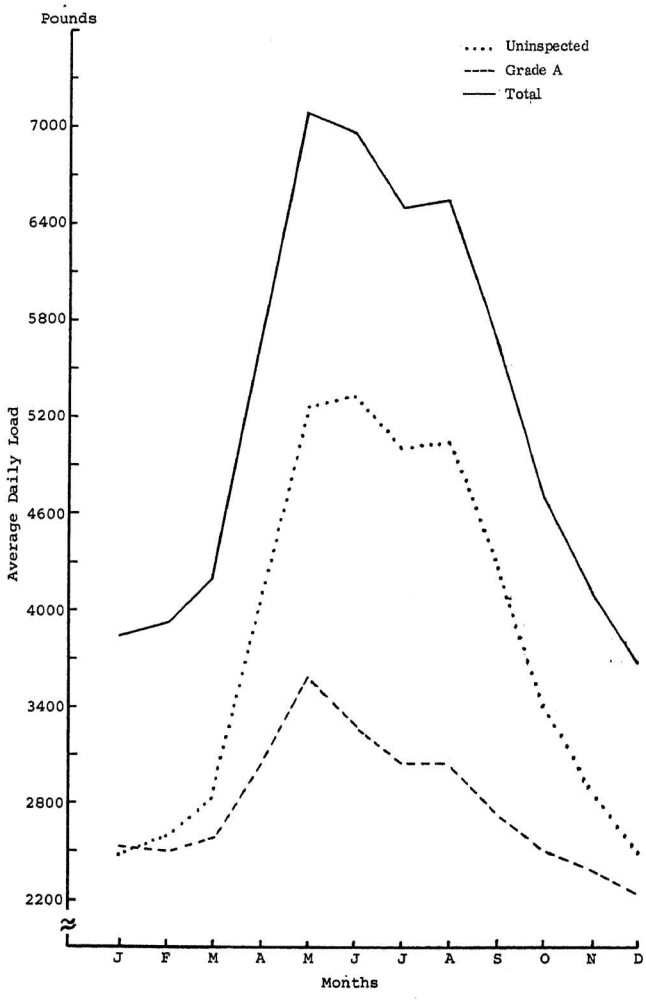


Fig. 10—Average Daily Volume per Can Route for 99 Routes by Months, 1960.

The net result of such an arrangement is lower costs per unit of milk, due to more complete utilization of facilities and greater flexibility. Those haulers involved also mentioned the freedom during a part of the year from the "seven day a week grind," pooling of resources and abilities which permitted some specialization, the assurance of a "standby" or reserve truck for emergencies, the ease of making adjustments, and greater profit.

Mechanical Cooling Reduces the Difficulty.

Mechanical cooling of milk on the farm offers an effective means of improving efficiency in the assembly operation. With adequate farm cooling facilities, uninspected milk need not be collected every day throughout the year. A hauler servicing a route where all patrons have adequate cooling facilities may vary his collection schedule more readily than on a route where few producers cool their milk. He may collect all the Grade A milk every day if required. During the flush season, all milk would be collected every day, but as production declined, certain uninspected producers might be serviced every other day. During the slack winter season every other day service would be standard, with some producers serviced only every third or fourth day, where quality standards permit. This arrangement is being used successfully by some haulers servicing routes with a large proportion of uninspected producers who do use coolers. Savings in labor and truck operating costs may be substantial. Reports indicate that overall quality of uninspected milk on these routes has actually improved under this arrangement. In addition, producers benefit from the premiums paid for mechanically cooled milk.

Seasonality Causes Extra Work and Reduces Income.

Figure 11 shows the relationship of supplementary route work to seasonality, and indicates that haulers serving the more seasonally variable routes were spending more time on such activities as contacting patrons and solicitation. Their remarks indicated that this was of necessity, not choice. Remarks by haulers, fieldmen, and plant managers implied a direct positive relationship between seasonal variation, hauler failures, and patron discontent.

Figure 12 shows the influence of seasonality on labor income. As the degree of seasonal variation increases, there is an accompanying decrease in the utilization of truck and driver capacity. The result is high cost per unit of milk hauled as compared to routes making full use of


HERO

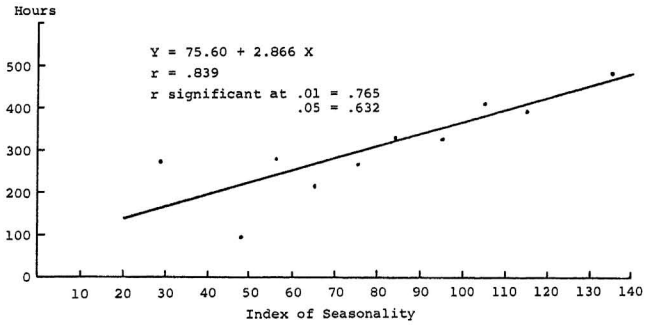


Fig. 11—Relationship of Seasonal Variation in Average Daily Volume per Route and the Hours of Supplementary Labor Spent on the Route per Year for 99 Routes Operating in Southwest Missouri, 1960.

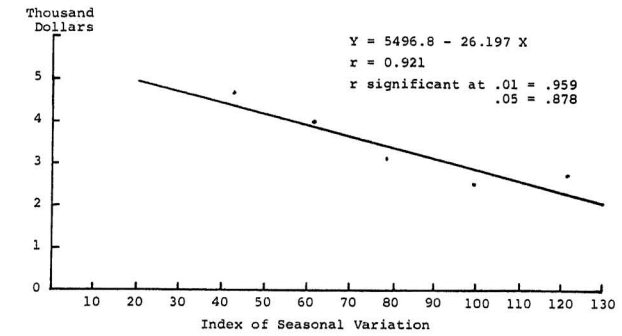


Fig. 12—Effect of Seasonal Variation in Average Daily Volume Hauled upon Annual Labor Return per Route on 99 Can Routes Operating in Southwest Missouri in 1960.

facilities throughout the year. Certainly this relationship should encourage adjustments toward full use of labor and equipment wherever possible.

Seasonality has a direct effect upon the cost of collecting milk from farms. Table II summarizes the association of selected characteristics with the degree of seasonal fluctuation on pickup routes. Seasonality was computed by expressing the average daily volume for each month as a percentage of the yearly average. The low percentage was then subtracted from the high percentage, resulting in a range in percentage points, which represents the measure of seasonality. The association between seasonality and each of the characteristics in Table II was statistically significant.

Haulers on routes with low seasonal variation had greater average daily volume as shown in Figure 13. Higher incomes permitted the maintenance of more suitable facilities, Figure 14. Haulers valued the stable routes more highly than the variable ones. This relationship of market value and degree of seasonal variation is shown in Figure 15. Figure 16 illustrates a similar concept, as the cost of truck used on the more seasonal routes was less than on the more stable routes. Higher value routes and better facilities on routes with stable volumes are again reflected by the relationships shown in Figures 15 and 17 which relate the market value of the route and total investment to the seasonal variation.

TABLE II

CHARACTERISTICS OF 99 CAN ROUTES IN SOUTHWEST MISSOURI GROUPED ACCORDING TO DEGREE OF SEASONAL VARIATION IN LOADS

Number routes	Degree of seasonal fluctuation	Average daily load	Average annual mileage	Average annual fixed cost dollars	Hours per year route business	Total route investment dollars	Annual return to labor dollars
7	42.47	8,086	39,296	1,236	127	7,336	4,623
21	61.45	6,343	37,927	1,120	239	5,821	4,003
34	78.77	4,897	35,824	877	299	5,510	2,980
24	99.64	4,579	32,038	818	373	4,172	2,498
13	121.41	4,038	29,722	531	426	3,812	2,727
99	83.19	5,239	34,796	894	309	5,158	3,163

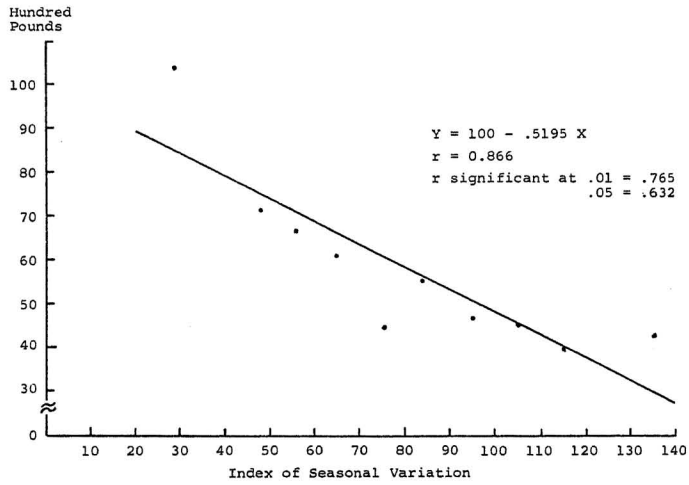


Fig. 13—Relationship of Seasonal Variation and Average Daily Volume per Route on 99 Can Routes in Southwest Missouri, 1960.

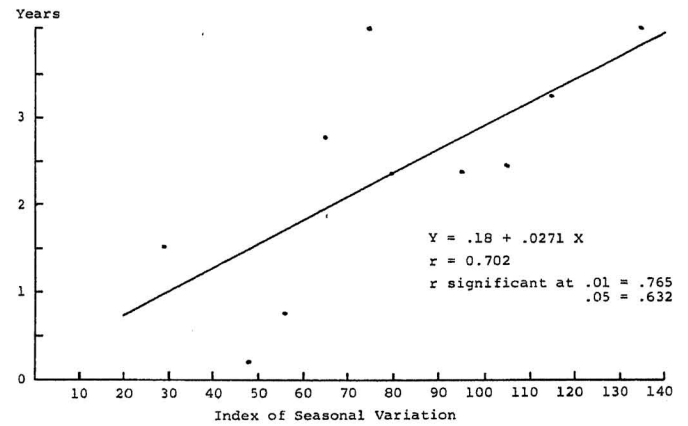


Fig. 14—Relationship Between Seasonal Variation and Age of Truck on 99 Can Routes in Southwest Missouri, 1960.

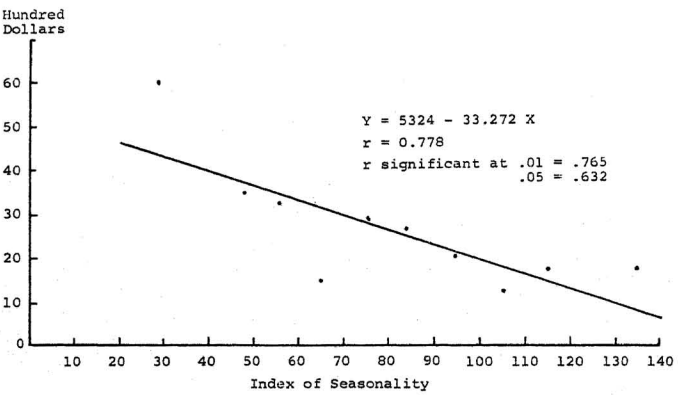


Fig. 15—Relationship of Seasonal Variation in Average Daily Volume per Route and the Market Value per Route for 99 Can Routes Operating in Southwest Missouri in 1960.

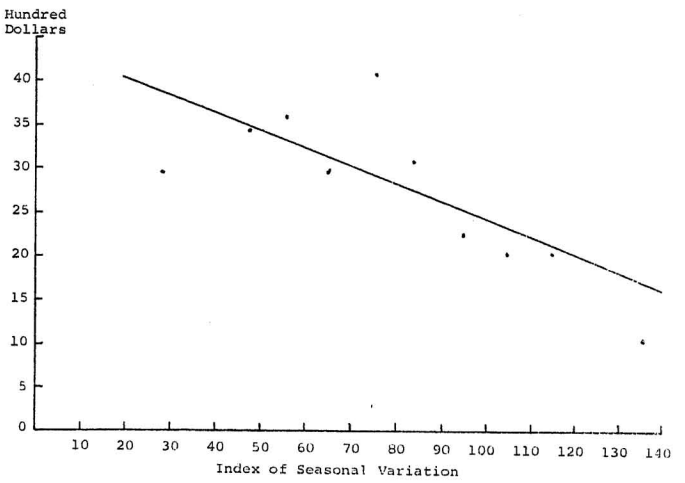


Fig. 16—Relationship Between Seasonal Variation and Cost of Truck on 99 Can Routes in Southwest Missouri, 1960.

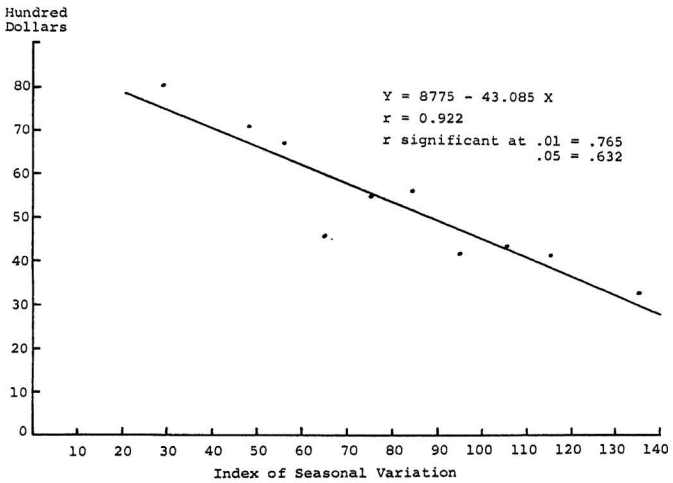


Fig. 17—Relationship of Seasonal Variation and Total Investment per Route on 99 Can Routes in Southwest Missouri, 1960.

Hauling Charges as a Percentage of Income.

Hauling charges, although exhibiting a strong tendency toward uniformity, do vary within the area. Bulk rates varied in 1960 from 18 to 21 cents per hundredweight. Can rates were concentrated near 35 cents, although a few individuals were paying 55 cents. With a stable rate throughout the year, the portion of the farm value of milk allocated to hauling varies seasonally, inversely with the price of milk. Figure 18 expresses some actual hauling rates as percentages of the farm value of different grades or classes of milk for each month in 1960. At the higher hauling rates, especially for the lower priced uninspected milk, this percentage represented a rather substantial portion of the value.

Seasonality of production does affect the efficiency of assembling milk. Greater seasonal variation leads to a higher cost situation at all levels, including receiving and shipping expenses. Adjustments in work and equipment assignments must be made by plants and haulers to handle the changing volume of milk. Not only do the total receipts from producers vary seasonally, but there is a major adjustment in the flow patterns of milk from farm to processing plant as fluid needs change, thereby further aggravating the assembly problem. For this reason, adjustments must be made from day to day.

Such violent fluctuations must be taken into consideration as management plans for facilities and seeks to coordinate each phase of the activity into a profitable business. Flexibility must be a characteristic of the operation if it is to handle peak receipts and yet avoid excessive under-utilization of facilities and labor during much of the year.

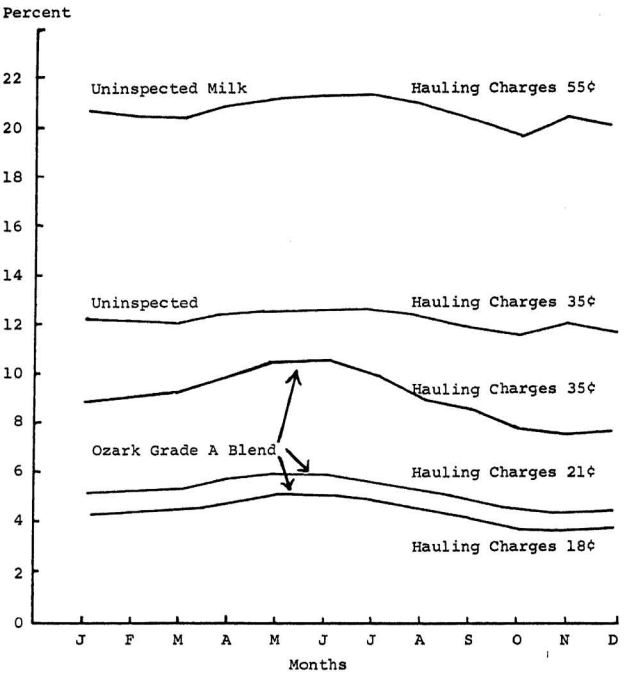


Fig. 18—Actual Hauling Charges Expressed as a Percentage of the Farm Value of Milk by Months, 1960.

Economies of Scale in Assembling Milk

Economies of scale have not been achieved in the assembly process to the same extent as in the processing of dairy products. Milk is brought to plants by many individual contract haulers with small units. Since the development of the concentrated area of dairy production in Southwest Missouri, there has been no time as favorable as the present for initiating a reorganization program. Routes must be reorganized because of rapid adoption of bulk handling equipment, the decline in numbers of milk producers, the reduction in number of receiving and processing plants, and the general shift toward specialization within the dairy industry.

The dairy industry in Southwest Missouri is characterized by a relatively large number of firms. The large firms are not simply a multiple of small firms with the proportions of inputs remaining constant. As firms have grown, new processes and new functions have been developed. There have been changes in the degree of specialization and diversification. New financial arrangements have been made. Management has developed new relationships with the employees, patrons, and community groups.

The three functions involved in milk assembly are:

1. farm pickup and delivery to the receiving line
2. receiving the milk
3. transfer to the processing unit.

The average cost curve for each of these functions is distinct from the others. The curves for processing and product distribution continue to decline over considerably larger volumes than for the collection or receiving functions. These differences have led to specialization within the industry, with either a separate firm or a separate department responsible for each function. This specialization has resulted in a lack of proper coordination, thereby resulting in significant inefficiencies.

Farm pickup can be efficiently performed by a small organization; hence, the individual contract hauler with a single truck (although this appears to be too small a unit). A can receiving line requires 15 to 20 truckloads of milk per day (30 million pounds per year) to achieve an acceptable degree of efficiency, and may realize only minor economies after this volume has been reached. A processing plant continues to realize significant economies much beyond this volume.

The receiving units included in this study varied in

size from approximately 3 million pounds receipts per year to over 100 million pounds. The individual contract routes ranged from an average daily load of 700 pounds from 5 can patrons to nearly 100,000 pounds from slightly over 100 bulk patrons (serviced by a fleet of five bulk trucks).

Organization of the assembly process to provide adequate facilities and labor during the period of peak seasonal receipts contributes to a relatively high fixed unit cost during the seasons when production is low.

Imperfect divisibility contributes to less than full employment of factors. Equipment, such as trucks and receiving lines, is made in complete units which must be employed in a certain multiple relationship. Even though operating at less than capacity, the units must continue to operate at near the same relationship. This means that some items will be less fully employed than others. This is especially important to firms considering reorganization of collection and receiving facilities, increases in their plant capacity or the addition of new receiving stations to an existing network.

The net price of inputs other than milk is affected but little as plants vary the size of their operations within a community. However, in order to increase volume at a specific plant, milk must be bid away from competing plants through price or non-price competition, or farmers must be induced to increase their volume.

Some firms have a network of receiving stations that supply a centrally located processing plant. This pattern permits economies of scale in the plant. It also permits long hauls of large loads as compared with higher rates for regular route pickup trucks.

Although not so dominant as previously, the belief continues to exist among producers, plant men, and other local businessmen, that a local market is highly desirable. This attitude has encouraged the establishment of receiving stations by large firms within the trading area of a community.

Technology And Economies Of Scale.

Technological progress has been marked by a substantial increase in fixed costs of equipment and facilities. Such changes, together with the decline in production of manufacturing milk, has resulted in the closing of several manufacturing plants. Some have discontinued operations entirely, while others have been converted into receiving stations that forward milk to a central plant where large volume processing is accomplished.

Because of the specialized nature of dairy processing equipment, it is difficult to adapt a dairy plant to other uses. As a rule, the equipment has been moved or stored when a building was converted to other uses. In the old processing plants now operated as receiving stations, only the receiving line and holding tanks are used. The processing equipment is idle.

The conversion of the processing plant into a receiving station may have a marked effect upon the community, especially when the plant is a major industry. A small community near the center of the Southwest Missouri dairy area had a major processing plant, which employed 57 people. When converted to a receiving station the number of employees was reduced to seven. The other workers had to find new jobs in the community or move away.

A milk processing plant has opportunity to grow only as it can increase milk receipts. The firm sells services which must be added to raw milk. It is this need for milk which causes dairy firms to devote so much attention to the assembly organization. A decline in receipts increases unit cost. This explains the reluctance of a plant to discontinue servicing an area or community even though that community may be providing a rather small amount of milk. Plants are under considerable pressure to salvage a milk route even though maintenance of service may be expensive.

Route Subsidization.

The practice of subsidizing hauling routes is widely used in Southwest Missouri, especially by smaller plants. Although managers dislike these subsidies, they feel compelled to pay them. Haulers on certain routes report that they will be unable to continue operations unless rates are increased or subsidies are paid by the plant. Management feels that patron reaction to increased rates would be even more pronounced than to a reduction in milk price; therefore, they tend to subsidize the route as the lesser of two evils. In some instances the subsidy has gotten out of hand and is adding excessively to the cost of securing milk.

Plants also have been reluctant to combine routes, although this procedure is being followed to some extent. Economies of scale apply to pickup routes as well as to processing plants and receiving stations. Multiple units under a single management offer the possibility of using superior management skills, sounder financial arrangements, and greater degrees of flexibility. The extreme seasonal variation in production of milk in Southwest Missouri makes flexibility in plant and route operations essential if cost is to be kept at a reasonable level. Multiple unit routes offer the possibility of internal adjustments as the volume of receipts vary.

Alternative Methods For Increasing Volume.

Plant managers must decide between various alternatives when striving to increase the volume of receipts. Certain measures used may be easily matched by competing firms and the effectiveness lost. Others are more difficult to match or surpass. The preference for practices that are difficult to match is evident in the tendency to use non-price competitive measures.

Although easily matched by competing firms, an in-

crease in price may result not only in greater supplies of milk for the initiating plant, but also stimulate producer response throughout the area. Bonuses and premiums are similar to an increase in price. However, such premiums often are preferred as they may be directed to bring about a greater response by certain producers rather than a general response. Cooler and barn premiums currently being offered in Southwest Missouri are an example. These premiums have encouraged both quality and quantity response by requiring a certain volume of milk per day before the patron can qualify for a quality premium.

A similar response has been obtained by making available superior animals through purchase or breeding programs, machinery and equipment, feed, seed, fertilizer, and management help through the field staff. Financial assistance to enable producers to enlarge their herds or to add equipment and facilities has also been given by dairy plants in the area. The aid has included out-right loans, rental of certain equipment, assistance in securing loans from other sources, and withholding regular payments from the milkcheck.

Free equipment, especially milk cans, has been used as a competitive device in some areas. Evidence that free equipment leads to higher costs when its use cannot be controlled is found in patrons setting mail boxes in milk cans, using them to haul water, kerosene, gasoline, and oil, as well as in general neglect. Although "free" cans are not really free, someone must pay for them, the dairy firm is in poor position to exercise effective control over their use.

The practice of selling farm supplies, especially those used in dairying, to patrons at less than retail prices has been widely used in Southwest Missouri. Plants find that they have greater control or influence over the quality of supplies used by their patrons when following this practice.

A practice so widely used by the firms that it no longer can be considered a competitive device is that of advancing money to patrons against the next regular pay check.

Giving patrons whey without charge was an important good will building device in the rivalry between cheese and non-cheese firms.

Some managers attempted to keep in touch with farmers by issuing publications or periodic letters which presented helpful hints and news of mutual interest. The topics discussed included milk quality, sanitation, seasonal variation in production, farm legislation, and loyalty to cooperative associations.

Other public relations activities included sponsoring rural youth organizations, special events such as plant picnics, open house, floats in local parades, free movies, community betterment projects, and the like.

Some of the practices used were considered to be unfair competition by people in the industry.

Fieldmen And Haulers As Competitive Agents.[3]

While farmers respond to specific policies and practices such as price and beneficial service, some of them may require frequent contact with other people to personalize the program and to stimulate their response. Skillful use of this personal contact often differentiates one firm from another. Although it is not possible to fully measure the effectiveness of personal relationship with patrons in monetary terms, management relies heavily upon the goodwill that is developed in this manner. Cognizance of the importance of personal relationships between management and patrons led to the development of field staffs by some firms. As dairy firms grow, procurement areas must be expanded and solicitation becomes a part of the expansion process. Fieldmen become key employees of the firm. It is no longer possible for most plant owners in Southwest Missouri to maintain a personal relationship with their patrons without the services of these men.

The fieldmen of most firms worked on both procurement and quality improvement. However, the representatives of some plants stressed only one phase of this activity. Managers expressed concern over the fact that a fieldman serving the dual role may not be effective in one or the other as there is an apparent conflict between the two.

Fieldmen help to establish and maintain the reputation of the firm in the community. Because of this, they should use discretion in the choice of practices when they compete for patrons. Maximum benefits can be obtained from a field staff only when a cordial relationship is maintained between the fieldmen, the managers, the haulers, and the patrons.

Dairy firms in Southwest Missouri have recognized the importance of haulers in maintaining good relations between plants and patrons. Some managers insist that the hauler is the most important single factor in successfully competing for supplies of milk. He makes day to day contact with patrons, gains their confidence, and renders various services for them.

A contract hauler does not represent a plant officially, but he can build good will on an unofficial basis. He is an independent contractor, and is paid on the basis of pounds of milk delivered at the plant. It is to his best interest to maintain or increase the volume of shipments from his route. Many of the managers who were interviewed felt that it would be very difficult to hire haulers who would give patrons the same consideration, and have the same interest in their jobs that contract haulers have. They described a good hauler as one who is courteous, good natured, punctual, able to listen to the farmers'

[3]This section presents a summary of interviews with plant managers, fieldmen and haulers in Southwest Missouri regarding competitive procurement practices. In general, these interviews were subjective and were not quantitatively analyzed.

complaints, one who defends the company, is job conscious, and gets along with farmers. The good hauler works closely with the fieldman in reporting prospective producers, emerging problems, patron discontent and similar information. The fieldman often rides the route with the hauler, but most of their combined efforts are associated with visits to farms after the hauler has completed the route for the day.

Dairy plants make a definite effort to keep their good haulers by helping them to finance equipment, by advancing portions of their pay, by loaning them money, or by guaranteeing a loan at the local bank. Some plants letter the van for their haulers and maintain or paint it. The plants also aid in securing new patrons and give assistance on patron problems. Differences in point of view between fieldmen and haulers are of a special concern to managers as these differences offer possibilities for developing patron discontent. Managers and farmers alike criticize haulers for not being punctual. Irregularity leads to high costs as receiving lines must be kept open, waiting for the late arrival. Farmers claim that the quality of their milk suffers and become generally displeased at not knowing what time to expect the hauler. Financial difficulties of haulers also concern managers as shortage of funds makes extension of credit necessary and brings up other problems that result in inefficiency on the route.

Some haulers create problems for managers by always concurring with the farmers. While this attitude may develop temporary patron loyalty, such actions tend to create more problems in procurement than temporary gains justify. Irresponsibility on the job, backing into buildings, plowing up driveways, careless driving about the farmstead, expressing to patrons ideas about running the plant, and unethical practices such as starting rumors or spreading gossip to confuse farmers, were other complaints about haulers.

Much of the field work that has been done in the area of procurement has resulted in patrons changing from one plant to another rather than an actual increase in total production. Such transfer of patrons from one plant to another usually adds to the cost associated with procurement.

Managers develop procurement policies designed to bring greater quantities of milk into the plant. Their decisions are made and carried out under conditions such that competitors are generally quick to react to changes in the usual practices. The decisions must conform to the framework of competition and at the same time, these decisions help to determine the competitive structure of the industry.

Shipments By Different Patron Groups Compared.

The volume of milk sold by individual patrons varies greatly. Southwest Missouri has an unusually large proportion of producers whose daily output is small. Managers feel that many of the quality maintenance problems arise from this pattern of production. This means that managers are confronted by several problems in collecting milk from small producers, including high cost per hundred pounds of milk collected.

In order to better consider some of the most pressing problems associated with procurement of milk from producers individual shipping records were examined for 3,714 farmers for the year 1960.

Tables III, IV, and V show a breakdown of each class of shipper, listing those who shipped continuously during the year, those who started in that class, those who stopped shipping in that class, and those who started and stopped during the year. Degrades from Grade A were not included as uninspected shippers, nor was the milk which they sold as degraded product included in their annual sales. An uninspected shipper who became a Grade A producer was listed under uninspected as "Stop to 'A' Can", and under Grade A Can as "Start from 'C' " so as to show the change in classification. The appropriate quantities are listed under each class. All quantities shown are in terms of dollars paid to the patrons for whole milk.

In comparing Grade A can shippers, those who were in the market all year sold at a slightly higher rate than those selling only part of the year. There was no significant difference in the rate of sales among the different groups of Grade A can shippers selling only part of the year. The situation was very similar for Grade A producers who used bulk cooling equipment.

Uninspected milk producers sold much smaller volumes per patron than did Grade A producers. The ungraded patrons who shipped all year sold an average of $1,637 worth of milk compared to an annual rate of $1,312 for those shipping only part of the year. Those who shifted from uninspected to Grade A can or bulk, and those who shifted the opposite direction, made larger shipments than the average.

The average annual rate of sales for uninspected producers was $1,598. For Grade A can shippers the average rate was $5,279 per year, while the annual rate for bulk shippers averaged $12,404.

Figure 19 shows the annual rate of shipment by producers divided into percentile groups according to volume. Each class of shipper was considered separately. The height of the line indicates the annual dollar volume of sales by each percentile group on a per patron basis. The tremendous difference between average shipments of bulk, Grade A can, and uninspected milk producers is pointed up in this comparison.

The low 20 percent of bulk producers shipped about 10 percent of the volume, while the comparative group of uninspected producers shipped less than 4 percent of the uninspected volume. Approximately one-fourth of the uninspected patrons shipped less than 30 pounds of milk per day.

Collecting and receiving milk from very small

TABLE III

COMPARISON OF GRADE A MILK SALES BY PATRON GROUPS, CAN SHIPPERS

Grade A can patrons	Number patrons	Average months sold per patron	Percent of patrons in class	Percent of total actual sales
Sold all year	414	12.00	68.43	83.65
Sold part of year	191	6.17	31.57	16.35
Starts	40	7.06	6.61	3.22
Starts from "C"	11	5.91	1.82	.73
Started and stopped	10	3.80	1.65	.38
Stops	141	6.09	23.31	12.75
Stops to "C"	16	6.06	2.64	.82
Stops to bulk	27	6.93	4.46	4.30
Total "A" can patrons	605	10.16	100.00	100.00

TABLE IV

COMPARISON OF BULK GRADE A MILK SALES BY PATRON GROUPS, BULK SHIPPERS

Grade A bulk patrons	Number patrons	Average months sold per patron	Percent of patrons in class	Percent of total actual sales
Sold all year	187	12.00	69.26	89.36
Sold part of year	83	5.49	30.74	10.64
Starts	53	5.40	19.63	4.85
Starts from "A" can	27	6.52	10.00	4.23
Starts from "C"	2	6.50	.74	.47
Started and stopped	0	-	-	-
Stops	30	5.66	11.11	5.79
Stops to "A" can	0	-	-	-
Stops to "C"	1	9.00	.37	.16
Total bulk patrons	270	10.00	100.00	100.00

TABLE V

COMPARISON OF UNINSPECTED MILK SALES BY PATRON GROUPS

Uninspected can patrons	Number patrons	Average months sold per patron	Percent of patrons in class	Percent of total actual sales
Sold all year	2,230	12.00	78.55	90.10
Sold part of year	609	6.03	21.45	9.90
Starts	239	7.15	8.42	4.87
Starts from "A" can	16	5.13	.56	.37
Starts from "A" bulk	1	3.00	.04	.03
Stops	370	5.30	13.03	5.03
Stops to "A" can	11	3.55	.39	.20
Stops to "A" bulk	2	4.00	.07	.06
Total "C" patrons	2,839	10.72	100.00	100.00

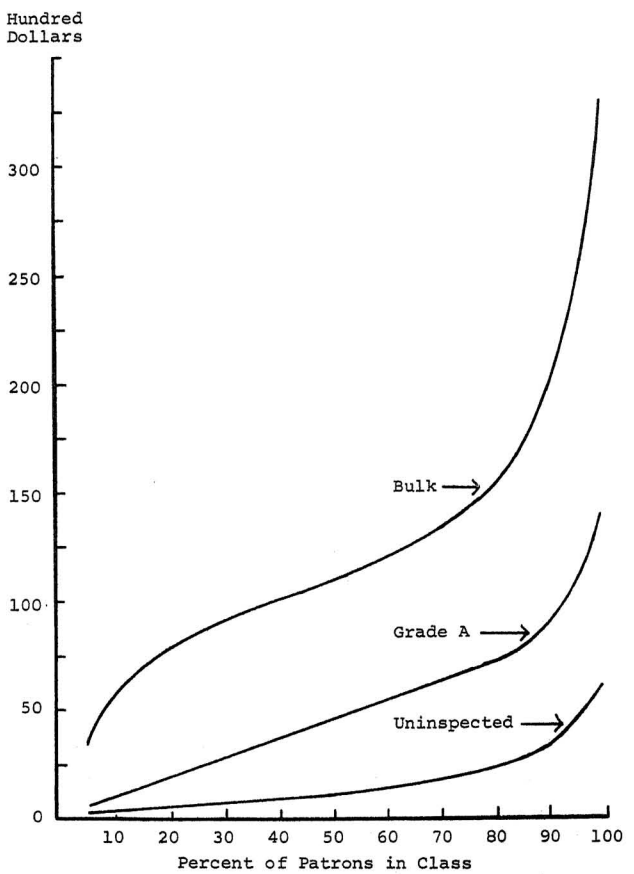


Fig. 19—Average Annual Rate of Sales in Dollars per Patron During 1960 by Given Percentage Groups of Patrons. Each Class of Shippers was Arrayed from the Smallest to the Largest Shippers, Including 2839 Uninspected, 605 Grade A Can, and 270 Grade A Bulk Shippers.

shippers is an expensive operation. Haulers face the prospect of being forced either to discontinue service to exceptionally small producers, or to initiate variable hauling charges in line with cost rather than considering only the contribution to volume.

Re-organization of Milk Assembly Systems

Efforts by segments of the dairy industry to improve the organization and operation of the assembly processes have been hindered in the past by an overall attitude of protecting vested interests. Such an attitude has developed in Southwest Missouri because of the ease of securing haulers, a history of increasing supplies of milk, and industry scrutiny by regulatory agencies inclined to view with alarm those practices which they felt might lead to a lessening of competition. Milk haulers, as well as receiving stations and processing plants, have come under pressure from increasing costs and declining receipts. The bulk tank program has seriously disrupted some previously well organized and profitable routes. These changing conditions have increased the interest in reorganizing the assembly system in the area.

Re-organization of the milk assembly system need not bring about a decline in effective competition among plants for milk. Farmers treasure the privilege of maintaining effective alternative markets. Any proposal which

would reduce these outlets is viewed with suspicion. Businessmen and other citizens as well as farmers, are not enthusiastic about proposals which would eliminate local processing or receiving facilities. Community pride often is an obstacle to economic progress in such matters.

Despite those objections, changing technology, shifts in supply and demand, and economies of scale combine to dictate certain changes in order for an area to remain competitive in the national market.

An effective plan of re-organization must consider the present status of the industry, desired goals to be attained, and alternative procedures by which such goals may be reached. The following proposal would improve the milk collecting and receiving systems in the area.

There is need for developing a less divergent and more efficient organization. Southwest Missouri has excessive receiving, handling, and processing facilities. In order to develop efficient flow from farms to processors, it is essential to reduce the labor and capital now devoted to assembling milk. Maximum efficiency could be approached only by placing the assembly facilities under the unified management of a single organization, which is designated as the "Federation." This organization could be composed of all co-operating processors, handlers, and receiving stations, whether co-operative or proprietary, and representatives of producers and milk haulers. Each segment of the industry could have a voice in the Federation. Actual management could be supervised by a board of governors or directors selected from the Federation membership. The board would be responsible for policy, operating procedures, and selection of an active manager, who would be directly responsible to it. The Federation would maintain an adequate office staff and the facilities needed to conduct the business of the organization. Standards could be developed for each type of service and charges made that would meet expenses, leaving a margin of profit for necessary expansion. Surplus could be returned to members from time to time as dividends.

Initial financing of the Federation could be accomplished by sale of stock to each of the interested organizations, by assessing them in proportion to their volume of business, by obtaining loans from governmental agencies, or by selling rights to operate collecting routes, or to receive milk.

Elimination of overlapping routes would be one of the duties of the Federation. All milk within a given route territory would be picked up by that route and delivered to a given receiving station.

The pattern of receiving stations to be used should be determined carefully after considering the present technology and supply within the area, but allowing for adequate flexibility to meet changing conditions. The receiving operation would be performed under the management of the Federation, which would also be responsible for transfer of milk. The plant facilities not owned by the Federation could be leased from the owner. A fair and equitable charge should be made for their use, including the necessary stand-by facilities.

Competition.

Active competition between plants for the producers' milk could be maintained—even intensified—by an arrangement which would permit producers to sell to any co-operating member of the Federation. At the initiation of such a program, the patrons would be assigned to the plant at which they were presently selling their milk. Patrons would be free to change the first of any month by submitting a change form or letter designating the change. The milk would still be placed on the same truck, delivered to the same station, and then either sent or credited to the firm designated by the patron. Under this system, any producer delivering to the Federation could sell to any member plant.

He would only need to pay the hauling cost associated with volume of his delivery and the distance between his farm and the designated plant.

The workers at each receiving station would be employed by the Federation, but any plant or co-operative should be free to employ a check tester to review the work of the Federation employees.

Clearing House.

The main office of the Federation would serve as a clearing house for routing of the flow of milk, both within the area and for outside shipments, or for inshipments. Milk delivered to receiving stations would be moved to plants in over-the-road tankers. Each plant would receive credit for the consignments by their patrons. These consignments would then be summed to secure the grand total of milk consigned. Shipments from these receiving stations to the plant would be debited to the plant. These debits and credits would then be balanced in such a manner as to indicate which plant should pay into the Federation pool and which plant should receive payment from it for the relatively small net differences between credits and debits.

Although each patron would indicate the plant to which his milk was consigned, the information would be used primarily for accounting purposes. An optimizing distribution model would be developed and used as a guide in transferring the milk to the appropriate plants in the most efficient manner. This model should be simple and flexible so as to permit application of adjustments by field personnel without access to electronic data processing. Preliminary investigation indicates that the major portion of potential economies can be outlined by use of simple, straightforward models. Such a model would make it possible to arrive at solutions for adjustment in operations using only pencil and paper. Additional refinement could be obtained by use of electronic

computers when available. Differences in quality requirements of all outlets would be a consideration in determining the service and facilities necessary to satisfactorily perform the assembly functions.

Clearing house activities of this sort by the Federation would enable any given plant to operate on a five-day week if it so desired. Prior arrangements could be made between processing plants to carry out this type of activity by staggering the operations so that the necessary plants would be operating each day. The problem of the heavy weekend demand for fluid milk and the following light demand also would be greatly alleviated, as the milk could be diverted efficiently to the most advantageous outlets.

Maximum efficiency in assembling milk can be attained only if complete cooperation is secured. However, this plan can be initiated and put into operation with a majority of the plants taking an active part. Initiation of this concept can be effected more readily in the assembly of milk for the fluid market than for the ungraded market. If the industry should desire to initiate such a program on a step by step basis, it is suggested that Grade A supplies be brought under Federation assembly first. Grade A producers are more closely organized and many plants are already operating under some form of full supply arrangement. The supply could be assembled with a small portion of the present receiving facilities, and fewer trucks would be needed for picking up milk from farms.

The system of collecting milk in 1960 cost approximately $4,800,000. Transfer costs brought the total transportation bill to $5,700,000, annually. The cost at receiving stations was approximately $1,500,000 making a total assembly expense of $7,200,000. Two major types of savings could be realized under the plan outlined above:

1. collection savings, and
2. efficiencies in receiving.

Routes could be consolidated so the milk could be collected with fewer than one-half of the can trucks servicing the area in 1960. Total mileage would be reduced as overlap would be eliminated.

Reduction in the number of receiving plants, and fuller utilization of facilities by the more efficient units would make possible a savings in receiving cost of 4 to 5 cents per hundredweight.

The proposed plan would require an increase in the cost of transferring milk from receiving stations to processing plants. This addition would amount to slightly less than 2 cents per hundredweight of the total volume.

With complete industry backing, this type of re-organization would reduce costs by an amount equal to 40 to 50 percent of the collection cost. Less than complete application of such a plan could result in worthwhile savings somewhat less than proportional to the degree of application.

Although there are some differences, the proposed plan of re-organization is essentially an extension of the full supply concept to a logical inclusion of the entire milk supply problem, rather than simply to one segment. The major difference is that there has been a plentiful supply of Grade A milk to meet all handlers' needs for fluid purposes, whereas there has been milk in excess of capacity in the manufacturing industry. The national market for manufactured dairy products has been almost unlimited when compared to the available markets for fluid milk.

These same economies could be realized by a single firm handling the entire assembly function. The difficulty with this arrangement would be subjection to charges of eliminating competition and reluctance of plants to participate in the arrangement.

Alternative Procedure.

Realistic variations in hauling rates could improve efficiency and reduce assembly costs. A new rate structure that charged for collection in proportion to the cost of the service could greatly influence the industry toward greater efficiency. It would discourage overlap of area and crosshauling by graduating the charge with distance, and would encourage larger volume producers by graduating the rate inversely with the volume. Such rate structures are more completely discussed in the section on Effects of Hauling Rate Structures Upon Assembly.

Revised rates have the advantage of being much simpler to initiate than the complete re-organization. The weakness lies in the difficulty of maintaining equitable rates as haulers come under pressure to make concessions to specific producers to secure or retain their business.

To achieve improvement, any procedure must reduce overlap and crosshauling, and accomplish the work with fewer routes and receiving units, so that operating facilities and labor can be employed at more nearly full capacity.