Transportation of New Hampshire milk, Bulletin, no. 325

MacLeod, Alan

New Hampshire Agricultural Experiment Station

Bulletins 306-326 OK - RBS 4/10/4

#313 - 50th Ann. Rpt. - 1938 } OK - RBS
319 - 51st Ann. Rpt - 1939 }
4/24/42

Bulletin 325 June, 1940

Transportation of New Hampshire Milk

II. Reorganization of Truck Routes

By ALAN MacLEOD

New Hampshire Agricultural Experiment Station
UNIVERSITY OF NEW HAMPSHIRE
DURHAM, N. H.

THE TRANSPORTATION OF NEW HAMPSHIRE MILK

II. Reorganization of Truck Routes[1]

by Alan MacLeod

THIS is the second of two studies on the transportation of milk from farms to the markets where it is consumed. The preceding study[2] laid particular emphasis upon the charges levied upon the milk. These charges were analyzed in considerable detail in an attempt to determine not only their amount but the bases upon which they were set.

The present study pays attention to what might be termed the physical process of assembling milk from farms to plants, as contrasted with the preceding study which had to do with charges levied on this milk. This attention to the process of milk hauling is not for the purpose of obtaining knowledge for its own sake, but is expected to be of value in reorganizing the marketing structure.

Excessive charges may come about in two ways: first, by a failure to keep charges in proper relationship to the cost of the services rendered, and second, by a failure to maintain the physical process of assembly in a condition of maximum efficiency.

The Problem

How can waste motion be eliminated?

This question, which states the problem in summary fashion, is not academic to the farmer. Where unnecessary duplication of equipment and effort exist in the transportation of New Hampshire milk, someone must pay for this waste motion.

Because trucking charges are customarily deducted directly from the farmer's check, the greater these charges the smaller his check. Expressed in another way, any decrease in charges should reflect back to producers in increased returns.[3]

In this study an attempt is made to discover whether or not equipment and personnel are being used efficiently, or whether (and, if so, to what extent) duplication, overcapacity, and useless effort form a part of the transportation picture in New Hampshire. With this information as a base, various changes in truck routes and equipment whereby the efficiency of collection can be increased, will be made. Finally, the savings possible through reorganization will be estimated and methods by which they might be brought about will be presented.

The preceding study[4] had to do entirely with trucking charges. It outlined the problem as follows: "High costs of distribution adversely affect returns to fluid milk producers. Many of the costs of milk col-

---

[1] This is a New Hampshire publication in the New England-wide milk marketing study, which is sponsored by the New England Research Council. Acknowledgment is made to Mary L. Geraghty and Byron Peterson for assistance with tabulations and maps, and to truck operators, plant officials, and farmers who supplied information for this study.

[2] MacLeod, Alan and Geraghty, Mary L.: The Transportation of New Hampshire Milk; I Analysis of Trucking Charges; New Hampshire Agricultural Experiment Station Bulletin 307, 1938.

[3] Perhaps a qualification is needed—that depending upon the slopes of supply and demand curves, after time for adjustment is allowed—producers would share with consumers a portion of the gain through more efficient assembly.

[4] MacLeod, et al., opus cit.

lection and distribution lie outside the influence of the producer and he has difficulty in doing anything about them. But the hauling of milk from farm to country station or city plant is an operation upon which the producer can exert an influence."

The extent to which rates actually charged departed from those expected under conditions of perfect competition was investigated and it was found that there was a marked divergence of actual charges from those which might be expected were competitive forces active in adjusting rates.

Method and Scope of Study

In the preceding study of this series,[1] a detailed description of the methods used to collect data, of the data themselves, and of the limitations of the data, was given. It is not proposed to repeat this information here, except to indicate that data referred to June, 1937, and included a rather detailed description of truck routes operating at that time.[2]

Minor additions and corrections have been made in some of the data, as additional information has been obtained, but in the main, the situation as it existed in June, 1937, has been used as the base from which to determine possible reorganizations.

Though data were collected for all truck routes operating in the state, only those in south-central New Hampshire are considered in this reorganization study. The study was restricted in this manner for two reasons: first, because without data from adjoining states, no complete reorganization of routes in a milkshed which extended over the state line could be made; and second, because principles and techniques developed in one section of the state could be applied with little modification to others.

Three schemes of reorganization have been assumed—each involving a progressively more drastic reorganization than the one preceding. In the first stage, it is assumed that producer-dealer relationships would remain undisturbed and that only those producers whose milk is now being hauled on commercial truck routes would participate in the reorganized hauling. (Producers who exchanged hauling or who hauled their own milk would not be included in the scheme.) The only disturbance to the present route structure would be that the same truck might deliver milk to several different dealers.

The next scheme of reorganization of routes would progress a step further and would require that all milk now sold by producers at wholesale would be hauled on commercial truck routes. (A few producers located near the dealers to which they sell milk are excepted.) This would involve in some markets, at least, a large addition to the volume of milk available to commercial trucks with very little additional distance traveled. Such a reorganization might have advantages not only from the standpoint of reducing costs to individual producers, but in making less congested and unsatisfactory the delivery of milk at the dealer's plant.

The third and most far-reaching reorganization would involve not

[1] MacLeod, et al., opus cit. pp 4, 5.

[2] Details regarding the methods of analysis used in this study are given in the appendix.

only the two preceding stages but would investigate the possible relocation of milkshed boundaries so that unnecessary expense and duplication might be eliminated.

Only the third stage of reorganization involves shifting producer-dealer relationships. In the first or second stages, by shifting producers between dealers, a small reduction in distance traveled could be secured. But several factors peculiar to the markets considered, made the additional savings through these changes seem less significant than the other changes in milk assembly which have been studied. In the first place, most routes collecting milk for more than one dealer, deliver to dealers' plants situated in the same part of the city. Second, many small dealers do not purchase sufficient milk to warrant the operation of a commercial truck route, and so it is necessary to combine the production of farmers supplying two or three dealers in order to secure sufficient volume for a route. Third, because the great majority of dealers in the area studied received all their milk from only one or two truck routes, the problem of congestion and delay at the dealer's plant—the most significant trucking cost factor at many large plants—is practically nonexistent.

Should producers be shifted between dealers, but no truck haul milk for more than one dealer, the savings through such reorganization would be appreciably less than in the first stage of reorganization outlined above. This would be true because of the large number of small dealers in some markets, the consolidation of whose routes offers the chief opportunity for savings in the first stage of reorganization. If this combination of routes were prevented, a much smaller reduction in hauling costs could be expected.

Certain assumptions, more or less borne out by fact, are necessary in making these readjustments. The first is that dealers and producers would forego relationships through truckmen which may have been in existence for some time, in order that greater efficiency of collection might result. Some of the present inefficiencies have crept into existence because of the desire on the part of certain distributors to have a direct contact with their producers through their truckmen. Indeed, it has been reported in some parts of the country that dealers have attempted to exercise monopoly powers in purchasing milk by insisting that deliveries be made to a particular truckman. However, such a situation is not common, and it is likely that offered efficient transportation, few dealers would refuse to use it. In some markets where strong cooperative organizations operate,[1] producers largely control the transportation system and are able to introduce economies as opportunity for them arises.

The second assumption—in order that the milk of all producers shipping to the market be hauled on commercial routes—is that commercial

[1] For example, see:
Bartlett, R. W. and Caskey, W. F., "Milk Transportation Problems in the St. Louis Milkshed," University of Illinois, Agricultural Experiment Station Bulletin 430, 1937.
Weldon, W. C. and Stitts, T. G., "Cooperative Milk Marketing in Louisville," Farm Credit Administration Bulletin No. 32, 1939.
——————, "Milk Cooperatives in Four Ohio Markets," Farm Credit Administration Bulletin No. 16, April, 1937.

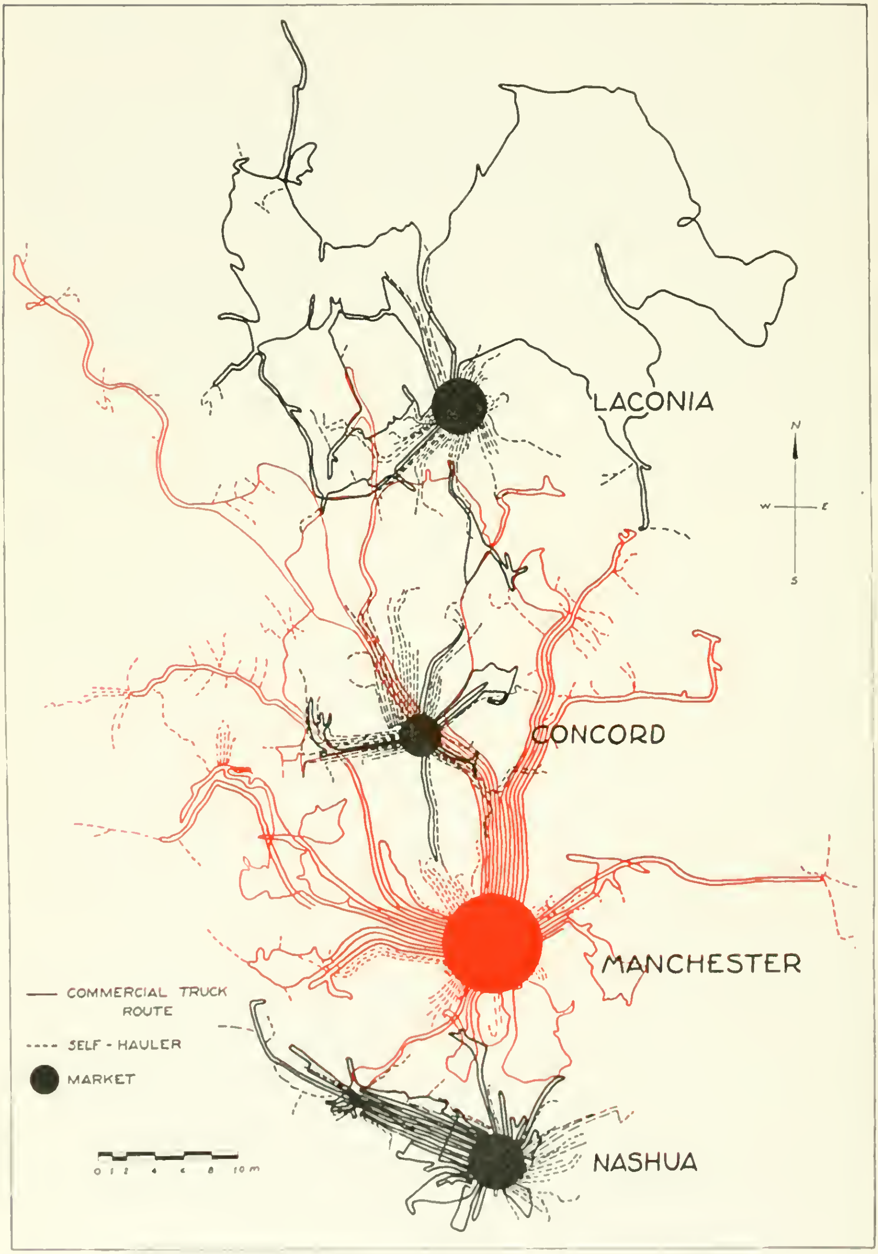

Figure 1.—Truck Routes and Self Haulers in June, 1937, Before Any Attempt at Reorganization Was Made.

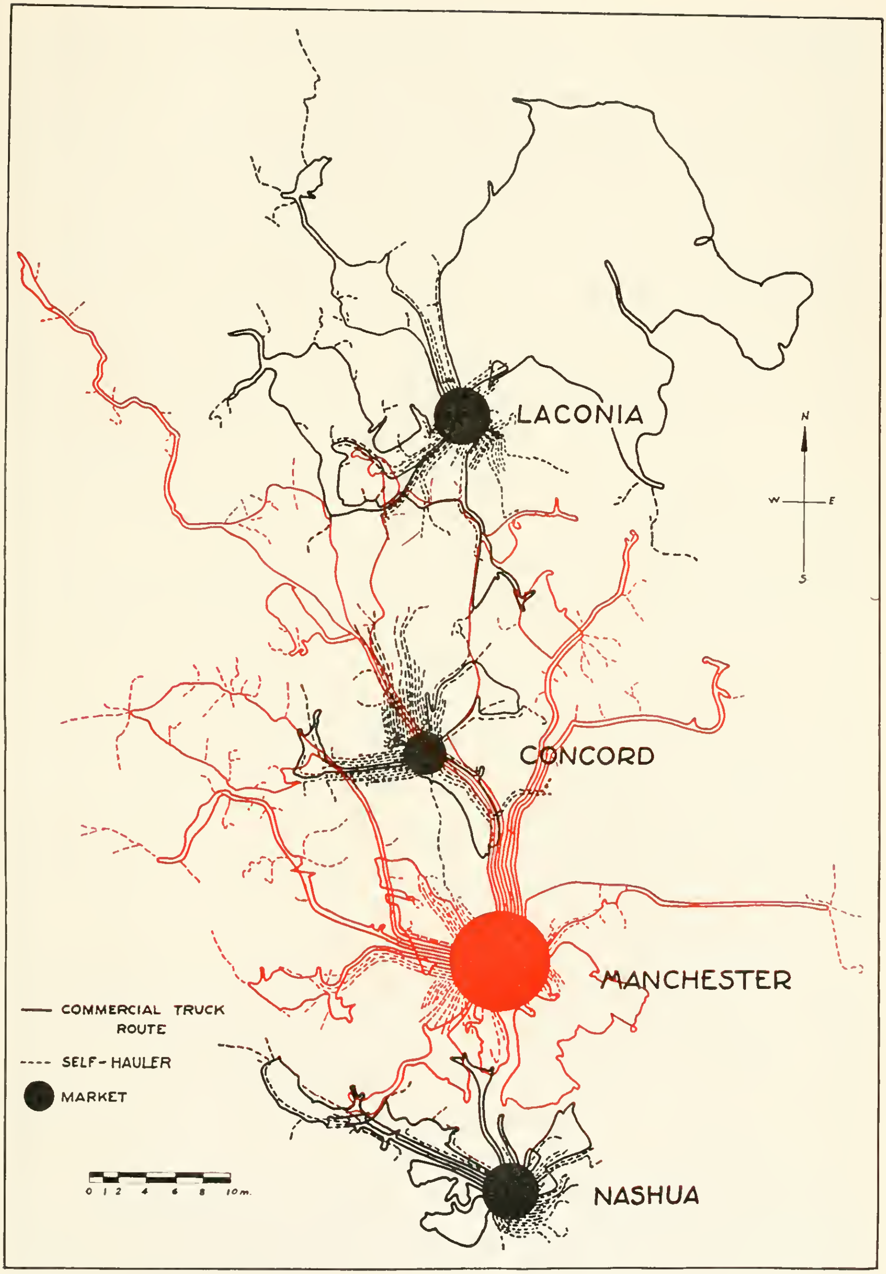

FIGURE 2.—TRUCK ROUTES AND SELF HAULERS AFTER THE FIRST STAGE OF PROPOSED REORGANIZATION IN WHICH THE EXISTING ROUTES WOULD BE COMBINED.

hauling would be more efficient than self-hauling or exchange hauling—and that truck rates be adjusted on the basis of efficiency.[1] It is probable, however, that even should commercial truck routes offer rates at lower levels than all costs of self-haulers, there would be a disinclination to change the method of shipment by many producers. The reason for this is that the out-of-pocket costs of self-haulers are relatively small, particularly if the time of the person concerned has no valuation placed upon it. Frequently, too, there may be other business reasons for coming to town, and if not, many people experience a certain pleasure in making the trip which may outweigh any savings made by sending milk on a commercial route.

The third step in reorganization would involve a shifting of some producers between markets, and necessarily, therefore, between dealers. In order to make such a shift, quality of milk (including necessary sanitary precautions) must not differ too greatly between the markets concerned. A survey several years back indicates that in the markets considered in this study, while different agencies necessarily were responsible for inspection for the various markets, quality standards did not differ greatly, and no very radical or expensive changes would accompany the shift of a producer from one market to another.[2] As far as such factors as butter-fat content, regularity of production, etc., are concerned there is much more variation among individuals in a particular market than there is between the averages of the markets considered.[3]

The First Stage of Reorganization

AS outlined above, the first step which has been taken in this attempt at reorganization of truck routes involves the maintenance of present markets and producers already on truck routes, and involves only the relocation and consolidation of routes in such a way as to approach the most efficient set-up possible in this situation. Producers now shipping milk to dealers in the south-central part of the state are included. This part of the state includes the four cities, Manchester, Nashua, Concord, and Laconia, which together contain more than one-fourth of the population of the state.

In attempting to outline a more efficient system of milk collection from farm to dealer, several principles have been kept constantly in mind.[4] Under present operating conditions, there is frequently unused truck capacity even at the peak production period of the year. This in turn results in man-power and equipment not used to their effective capacity. As long as unused capacity exists, there is no reason for two or more trucks to travel along the same roads, each collecting only a part of the milk sold.

[1] See MacLeod, et al., opus cit. pp 17-20.

[2] See Bressler, R. G., Jr., "Laws and Regulations Governing the Production of Grade B Milk in New England," New England Research Council, 1938.

MacLeod, Alan, "Sanitary Laws and Regulations Governing the Production and Distribution of Dairy Products for Consumption Within New Hampshire," New Hampshire Agricultural Experiment Station, 1937.

[3] Parker, L. A., "A Description and Economic Analysis of Milk Supplies for Connecticut Markets," Master's Thesis, Connecticut State College, 1938.

[4] See Hammerberg, D. O. and Bressler, R. G., Jr., "Research Problems Involved in the Country Phases of Milk Marketing"—Typewritten report in files of New England Research Council, 1939.

Even should capacity operations with some of the present equipment be obtained, there may be (and usually are) further opportunities for increased efficiency by employing trucks of greater capacity. Each of these adjustments will necessarily result in a smaller number of trucks, either of the same or greater capacity than those now in operation. This immediately reduces labor costs and should cut down not only the number of trucks, but the total distance traveled (though it may increase the distance a particular truck is driven each day).

Another principle kept in mind in reorganizing these routes has been reduction of truck mileage to a minimum. (This, of course, is subject to limitations of size of truck which may be driven economically over a particular road.) The reason that total mileage has been given so much importance is that while there may be economies in reducing the number and increasing the capacities of the trucks hauling milk to a particular market, such economies are much smaller than those obtained by eliminating unnecessary mileage traveled and by using trucks to their full capacity.

In general, where distances from the plant are great, there are economies in employing a system of loop routes with stub routes leading off them. Such a system enables the economies of a truck of large capacity operating over the hard surfaced roads with relatively few farm stops and long distances, to be combined with smaller trucks traveling over side roads collecting from farms and bringing milk in to the main road.[1] Indeed, in many cases, it would be impracticable to attempt to drive a truck greater than 1½ or 2 tons rated capacity over the back roads on which many of the farmsteads are located.

Where the milkshed is compact and roads radiate out from market, there are no particular economies in employing large trucks, as in order to secure capacity loads a large truck would need to come very near, if not into, town at intervals during collection. There trucks of smaller capacity, and consequently lower operating costs per mile, could be employed, and in order to be used with greatest efficiency could collect milk over more than one route daily, unloading the milk from the first route and then collecting the second. Limitations on the number of routes which such a truck could collect would depend upon the time at which dealers require milk to be delivered at their plants. However, there would often be opportunity for the same truck to bring in at least two routes and thus increase the daily income from hauling to a level sufficient to maintain equipment in operation, while producers were charged a relatively low rate.

---

[1] See Hammerberg, et al., opus cit. Theoretical considerations developed in this paper suggest that for short routes, relatively small trucks will be most effective, while longer routes are most advantageously handled by medium sized or large trucks. It was suggested that "the variable cost per cwt. mile would be smaller for large trucks than for small trucks, that the fixed cost per cwt. probably would be smaller, but that the cost of making the farm stops would be larger for the large trucks. In short . . . . that large trucks have an advantage as far as actual hauling is concerned, but that small trucks are more efficient from the collection standpoint. This has led to the development of a type of farm to plant transportation that combines a large truck with several smaller trucks. The small trucks . . . . perform the farm collection plus as much of the hauling as is necessary to bring the scattered farm milk to some point on the main route, while the large truck picks up the milk at these concentration points and hauls it to the plant. In this manner it is possible to take advantage of the economies peculiar to each size of truck."

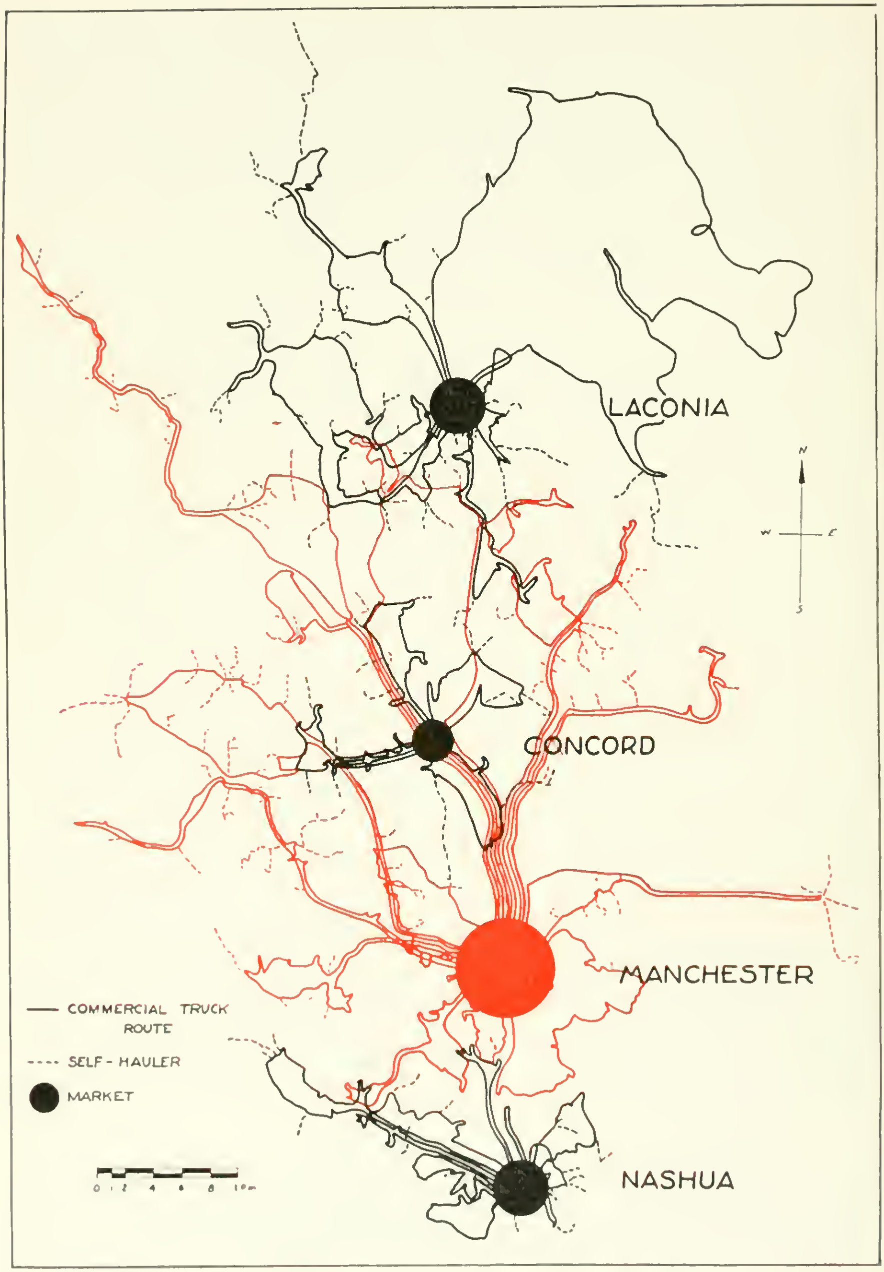

Figure 3.—Truck Routes and Self Haulers After the Second Stage of Proposed Reorganization in Which All Producers (Except Those Located Immediately Beside Dealers' Plants) Would be Placed on Routes.

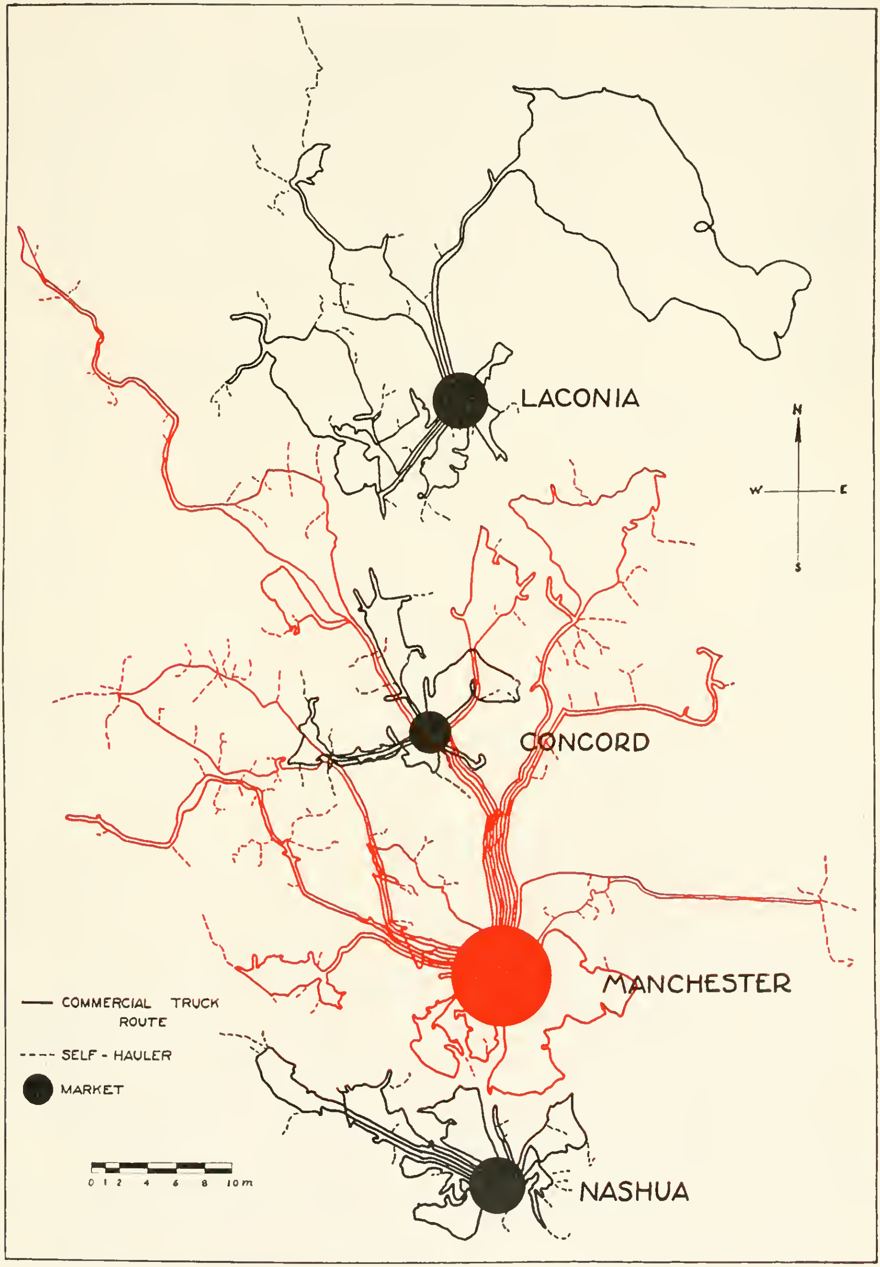

FIGURE 4.—TRUCK ROUTES AND SELF HAULERS AFTER THE FINAL STAGE OF PROPOSED REORGANIZATION IN WHICH OVERLAPPING OF MILKSHEDS WOULD BE REDUCED.

Table I—Number of commercial truck routes and self-haulers operating within the area, June, 1937.

Market	Before reorganization	After reorganization First stage	Second stage	Third stage
	number	number	number	number
		Commercial truck routes (main routes)		
Manchester	20	11	12	12
Nashua	16	6	7	7
Concord	6	4	5	4
Laconia	6	4	6	6
		Stub routes		
Manchester	3	7	7	5
Nashua	–	–	–	–
Concord	–	–	–	–
Laconia	1	1	1	1
Total commercial routes	52	33	38	35
		Self-haulers		
Manchester	68	68	11	11
Nashua	34	34	6	6
Concord	46	46	–	–
Laconia	65	65	5	5
Total self-haulers	213	213	22	22
GRAND TOTAL	265	246	60	57

Figure 1 shows the present route structure in the part of New Hampshire in which this study was made. In the chart an attempt has been made to show conditions in one segment of the area to indicate not only commercial truck routes, but the routes (in a general way) of individuals taking their own milk to market. Each solid line represents a commercial route; broken lines represent self-haulers. Different colors are used to differentiate between markets. (Black for Nashua, Concord, and Laconia, red for Manchester.) Data for all direct-haul routes operating to the four cities under consideration are given in Appendix Table I.

In figure 2 the first step in reorganization has been completed. While no change in milkshed areas has been made, and self-haulers remain as they were, truck routes serving those already shipping on commercial routes have been completely reorganized. Long study of figures 1 and 2 is not necessary to indicate the large reductions possible in mileage traveled and number of trucks needed. Tables I and II indicate a reduction in number of routes (including stub routes) from 52 to 33, or 37 per cent, and in mileage traveled, from 2,086 to 1,433, or 31 per cent for the area.[1] One qualification must be made at this point, namely, that

[1] In estimating the volume of milk per route, the number of cows reported per farm is used as the basis of allocation, the quantity of milk hauled on all routes combined being assumed constant. The resulting estimates, while not exact, are considered to be well within the limits of accuracy required.

This method of allocation is used throughout the analysis, care being taken to base the factors of daily shipments of milk per cow in each market on the data from that particular market.

the mileage which individual producers would have to haul milk has been increased somewhat (from 2,956 to 3,052).[1]

Not only mileage, but also the number of trucks has been reduced greatly and therefore the amount of milk carried per truck has been much increased. This makes it possible to increase total gross income per truck over that formerly received, while at the same time charges per hundred-weight to producers can be reduced.

Although there are several approaches to the problem of determining the relative magnitude of the savings which might be attained in the area under study, by this first stage of reorganization, the data lend themselves to one method in particular. This method involves the ap-

Table II—Mileage traveled by commercial truck routes and self-haulers.

Market	Before reorganization	After reorganization First stage	Second stage	Third stage
	miles	miles	miles	miles
Commercial truck routes (main routes)				
Manchester	1168.8	716.7	748.1	730.0
Nashua	344.2	188.9	217.8	213.9
Concord	106.0	80.5	139.1	133.6
Laconia	412.5	303.7	360.5	326.2
Stub routes				
Manchester	38.0	132.5	132.5	109.2
Nashua	–	–	–	–
Concord	–	–	–	–
Laconia	16.0	10.5	10.5	10.5
Total commercial routes	2085.5	1432.8	1608.5	1523.4
Self-haulers				
Manchester	964.0	964.0	27.6	27.6
Nashua	330.0	330.0	9.4	9.4
Concord	640.0	640.0	–	–
Laconia	604.0	604.0	21.0	21.0
Individual farmers (excl. self-haulers)				
Manchester	307.6	342.8	369.2	365.2
Nashua	6.4	23.2	46.8	42.4
Concord	4.4	14.8	77.2	38.8
Laconia	99.8	133.4	197.4	133.0
Total individual mileage	2956.2	3052.2	748.6	637.4
GRAND TOTAL	5041.7	4485.0	2357.1	2160.8

[1] While no precise rule has been followed, a rough procedure in making reorganizations has been to require a producer who lived more than one mile off the route and who produced less than 150 pounds of milk daily to bring that milk to the main route, rather than to send the commercial truck over the extra distance. Should producers so located object to this procedure, perhaps a commercial truck would call at the farm but only for an additional cwt. charge. See Brown, A. A., "Milk Cartage in the Southwick-Agawam Area of the Springfield Milkshed," Mass. Agric. Exp. Sta. Bul. 363, 1939, for a suggested schedule for such "off-route" producers.

plication of cost figures. These have been adapted from the Motor Truck Red Book, 1936. Disregarding the cost of labor to run the truck and assuming that all overhead expenses of the truck are chargeable to milk hauling, estimates of the difference in costs between the original collection system and the various stages of reorganization may be obtained. Such estimates, as they include no labor costs and impute all fixed costs to milk hauling (while the truck may be used for other purposes during that part of the day after milk is delivered) are not to be interpreted in any way as standards—but are of value to indicate the **difference** between operating costs before and after reorganization. When on top of these savings, it is taken into account that savings in labor costs are made, the magnitude of the total savings is increased still further.

For a complete picture of milk transportation, it is necessary not only to consider commercial routes, but also to take into account the assembly of milk where no definite charge is made, as in self-hauling. Because of the difficulty, if not impossibility, of placing precise monetary valuations on such hauling, certain arbitrary assumptions have had to be made. Accordingly it has been assumed that "self-haulers" would not have purchased trucks or cars primarily for the purpose of hauling milk and that the use of the vehicle for such use is primarily a "by-product" use. Accordingly, no overhead charges are allocated to "self-haulers" and on these routes, only the variable costs for trucks of one-half ton capacity are charged. Such a procedure certainly does not place an inflated cost on milk "self-hauled" and should, if anything, underestimate the reduction in costs possible by reorganization.

In this first stage of reorganization, it should be kept in mind that no substantial change is involved in "self-hauled" milk. The only modifications are that some producers may be expected to haul their milk somewhat farther in order to have it picked up by a commercial route. No change is made for producers delivering direct to dealers' plants.

Expressed as a percentage of the original charge levied (including estimate for self-haulers) the potential savings through the various stages of reorganization are shown in Table III. Savings from putting into operation the first plan of reorganization would vary from 34.7 per cent in Nashua to 5 per cent in Laconia, averaging 11.5 per cent for the area. Differing opportunities for reduction of cost arise depending upon the relative importance of self-hauling (which is not affected in the first stage of reorganization), and upon the reduction possible in route numbers and distance traveled. In Nashua, these latter are of great importance; number of routes could be reduced from 16 to 6 and distance traveled from 344.2 miles to 188.9 miles. Because self-haulers are of small relative importance, the major gains through reorganization appear in Nashua with the first stage to a much greater extent than in any of the other three markets.

It cannot be too much emphasized that this comparison of operating costs before and after reorganization indicates **only** the savings possible through increased efficiency of the collection process and **does not in-**

Table III—Relative cost of hauling milk before and after each stage of reorganization in four New Hampshire markets, June, 1937.

Market	Present routes	First stage of reorganization	Second stage of reorganization	Third stage of reorganization
	per cent	per cent	per cent	per cent
Manchester	100	94.2	83.0	80.9
Nashua	100	65.3	56.9	57.2
Concord	100	90.2	59.0	51.3
Laconia	100	95.0	84.3	78.3
All	100	88.5	76.2	73.3

clude savings which might be made by eliminating monopoly elements from trucking charges.

Another approach to estimation of savings from reorganization would be to compare actual charges as they were before reorganization, and charges as they might be if they were set on new routes at competitive levels. Such a comparison would not only measure the reduction in costs brought about by route reorganization, but also the effect of the elimination of monopoly elements in trucking rates. Unfortunately, as indicated in the earlier study,[1] no trustworthy estimate of the degree of monopoly present in trucking charges could be obtained. Consequently, this approach cannot be used. It is important, however, to recognize that the potential savings indicated in Table III represent only a part of the maximum savings possible were reorganization accompanied by adjustment of rates to a competitive basis.

The Second Stage of Reorganization

ADVANCING one step further in the reorganization process, in this section will be included not only those now shipping milk on commercial truck routes, but also those now selling at wholesale, who either take their milk to the plant themselves, or exchange hauling with one or more of their neighbors. (See Fig. 3)

While a system of trucking which collects all of this milk is undoubtedly more efficient than the reorganized system discussed in the preceding section, a monetary measure of its savings is more difficult to obtain. This comes about from the difficulty, previously mentioned, of placing precise monetary valuations on the cost of hauling milk where no definite charge is made.

The routes, as they would be, following the second stage of reorganization are shown in Appendix Table III. The most striking accomplishment has been the reduction in individual farmer mileage from 3,052 to 749, with only slight increases in total number, or distance traveled, of commercial routes. A comparison with Appendix Table I, the description of routes in actual operation, shows that even with an increase of volume handled from 105,148 to 136,982 pounds, and number of producers from 591 to 782, there would be a reduction in number of routes from 52 to 38 and in route mileage from 2,086 to 1,609.

[1] MacLeod, et al., opus cit.

In terms of costs, Table III shows that by far the largest percentage reduction from the preceding stage is in the Concord market. This is to be expected, as that market had a very high proportion of milk "self-hauled" at the time the data were collected. Altogether, the additional savings possible through progressing from the first to the second stage of reorganization amount to about 12 per cent of the original costs. This is approximately equal to the saving made available by the first stage, making a total reduction of 24 per cent, if reorganization progressed through the second stage. When interpreting this figure, it should be kept in mind that the method of evaluating the costs of self-haulers placed very low values on such operations, and that the effect of reorganization on labor costs has not been taken into consideration. Both these items would, if included, increase the estimate of possible savings.

Other advantages, not taken into account in this estimate, are that farmers trucking milk would be enabled to make greater returns for their efforts and milk dealers would benefit through having milk arrive in better condition (trucks with better facilities for keeping milk cold, etc.) and with less congestion and irregularity of arrival at unloading rooms.

The Third Stage of Reorganization

IN the two preceding stages, no disturbance of producer-dealer relations has been involved except for the requirement that the same truckman might deliver milk to several different dealers. This third stage of reorganization involves the transferring of milk between milksheds. Accordingly, some dealer relationships must be disturbed. The extent of these disturbances is not great, however, and involves only 74 producers or 9.3 per cent of all those shipping to these four markets.

In making the reallocation of milk between milksheds several principles have been kept in mind.[1] First of all, changes have been kept at a minimum in order to disturb as few dealer-producer relationships as possible. Shifts of producers are made in such a way as to retain approximately the same total quantities of milk in each market.

The problem of determining whether or not the quantity of milk now entering a market is the quantity which under optimum conditions **should** enter that market is not discussed here. For instance, in at least two of the four markets, a considerable part of the milk is not consumed in the market but is reshipped to out-of-state markets. In turn, one of these markets receives a quantity of milk for local consumption from an area in the western part of the state about 100 miles distant. This distant milk has not come under the scope of this study. Undoubtedly a system of assembly whereby milk which is produced within direct-haul distance of a market is put through a receiving plant and reshipped to other markets while at the same time milk from outside the direct-haul area (and in the normal Boston milkshed) is passed through a receiving station and then hauled to a local market for consumption, offers opportunity for greater efficiency.

[1] For theoretical discussions of milkshed reallocation see Hammerberg, et al., opus cit. and Parker, opus. cit.

Another principle which has been kept in mind is that smaller markets should receive their milk from an area contiguous to the market. Proper routing of trucks makes this possible without adding to mileage traveled.

The transportation picture following this final stage of reorganization is shown in figure 4 and Appendix Table IV. Compared with the preceding stage, a reduction in number of routes from 38 to 35, a small saving in truck mileage, and a significant reduction in individual mileage are secured. In the preceding stage, a total of 782 producers would be visited by trucks, but following reallocation of markets this number would decline to 776, through the elimination of calls on the same producers by trucks from two different markets.

In contrast to the effects of the two preceding stages of reorganization, the savings possible by this final stage are small. This is because comparatively little intermingling of milksheds exists in this part of the state. Reallocation of milksheds offers possibilities of reducing materially assembly costs, only when intermingling of the milksheds is important.

Expressed as a percentage of the present costs, potential savings, compared with the preceding stage, amount to only 2.9 per cent. (See Table III.) This is in marked contrast to the effects of the two preceding stages of reorganization. However, compared with the assembly now in operation the total reduction in costs (excluding labor) by pushing reorganization the whole way would be 26.7 per cent.

Gains Through Reorganization of Routes and Reduction of Charges to Competitive Levels

IN this section are brought together the potentialities discussed not only in the preceding sections of this study, but in those of the earlier study.[1]

Considering first the gains possible from reorganization, the number of commercial routes can be reduced by about one-third, and the total mileage they travel by one-fourth. At the same time the total volume of milk hauled can be increased by 30 per cent and the number of producers 31 per cent. Because of this transfer of producers from hauling their own milk to commercial routes, mileage traveled by individuals has been reduced by 78 per cent.

The potential reduction in assembly costs has been presented in percentage terms in Table III. In order to have a yardstick from which to judge their absolute amounts, the total hauling costs, designated as 100 in the table, are presented at this point. Because of the non-inclusion of labor costs and the various assumptions made, these monetary costs are presented only as a total for the area. With these qualifications, the daily cost of assembly for June, 1937, amounted to $362. By complete reorganization this could be reduced by $97 or 27 per cent. Expressed on a yearly basis, keeping in mind that June is the month of greatest production but that costs based largely on mileage and equipment sufficient in size to accommodate peak production do not fluctuate

[1] MacLeod, et al., opus cit.

greatly, the savings would be in the neighborhood of $30,000 to $35,000. Expressed on a per farm basis this saving would average between $39 and $45 a year; or a saving of about seven cents per hundredweight of milk.

Two important sources of saving have not been considered in arriving at the above estimates. The first of these is the reduction in labor costs which a reorganization of routes would bring about. While some of the projected routes would require the use of large capacity trucks with consequent increase in labor cost per hour, the great reduction in both number of routes and mileage traveled would much outweigh such increases, and significant reductions in labor costs would be secured.

The second source of saving not taken into account in arriving at the estimates given above is reduction of charges on routes where they are above competitive levels. At the time of the study[1] there was found to be a very marked divergence of actual charges from those which might be expected were competitive forces active in adjusting rates. With the exception of a few routes, the rate structure appeared to be without plan and to be based more upon custom and bargaining power than upon services rendered.

Although these additional savings cannot be estimated in monetary terms, they are important and, for individual farmers, may often be even more important than the benefits from reorganization.

Methods of Reducing Hauling Charges

IT cannot be over-emphasized that the reductions outlined in this study are potentially within the power of producers to bring about. Unlike some of the other costs of distribution which are incurred at stages in the distributive process far removed from the producer, the cost of milk trucking is usually paid directly by the farmer in the form of a deduction from his check.

In some markets[2] where producers' cooperative organizations are active, there have been pronounced reductions in hauling costs. This has been particularly true where the cooperative exercised control over a large percentage of the milk delivered to a market. Without such control, or some arrangement whereby all distributors and producers cooperate, it is well-nigh impossible for the individual producer, distributor, or truckman to introduce such improvements in hauling. The economies outlined come not from individual but from collective action and depend on the willingness of all in the market (or at least all the producers) to work together.

In markets where producers' cooperatives are not in a position to introduce or maintain efficiency in milk assembly, county planning committees, in cooperation with the extension service and the persons directly concerned, may be able to bring about the desired conditions. While it may be difficult to bring about the necessary changes by any method short of regulation by an authorized public agency, such procedure should be used only after all voluntary methods have been tried.

[1] MacLeod, et al, opus cit.
[2] See Weldon, et al., opus cit. and Bartlett, et al., opus cit.

While reorganizations such as those suggested in this study would reduce the total number of trucks, they would increase the daily returns for those trucks operating, and would result in their being operated more nearly to full capacity.

As indicated earlier, reductions in trucking rates, while immediately accruing to farmers, would in time be shared by consumers. When such a situation had come about, not only would farmers have retained a part of the advantage of the reduced rates in price, but through somewhat lowered prices to consumers, would be selling increased quantities of milk for consumption in fluid form (assuming that distributors' spreads were not altered).

APPENDIX

Methods of analysis used in the study.

Data obtained regarding truck routes included the following:

1. Type of operator (whether by dealer, independent hauler, transporting co-operative, and so forth) and contract made.
2. Description of route. This included the plotting on a map of the actual route taken by the truck in collecting milk and the location of the stops. From the map, estimates were made of the total distance traveled, of the distance between the first and last stop, and of that traveled without making stops, and of the distance traveled on hard roads and on unpaved roads.
3. Services rendered—whether ice was furnished by the trucker and, if so, when and how much; the number of stops made at individual farms and at collection points on the main road. If any additional services were rendered, they were noted.
4. The amount of milk carried by each truck in June, 1937.
5. Description of the truck, including any other uses to which it was put.
6. The time from the truck's leaving the garage until its arrival at the dealer's plant.
7. The number of men sent on the truck.
8. The charges made for transporting milk. Variations in charges for different producers on the same truck route and any special charges made were noted.

These data were usually obtained either from truck drivers or plant officials. In a few instances it proved impossible or impracticable to reach either of these sources of information and these data are sometimes estimated or incomplete.

Using maps upon which all producers shipping milk were located, together with detailed road conditions, various stages of reorganization of truck routes were worked out. Upon completion of route reorganizations on these maps, any portions of the suggested routes which were not along hard-surfaced roads were actually driven over and road conditions were noted. Where the projected route traveled over a road not deemed adequate for year-round travel of a 1½-ton truck, changes were made.

In estimating the savings possible from reorganization, the differences in costs before and after reorganization were obtained by applying adjusted cost data from the Motor Truck Red Book. These differences were then expressed as a percentage of the original charge levied, not of the original costs as determined by applying Motor Truck Red Book data. This procedure was believed to give a realistic estimate of the savings possible from reorganization alone, all other factors affecting rates remaining constant.

Appendix Table II—Description of routes following first stage of reorganization.

Route	Capacity of truck	Amount milk	Number producers	Number stops	Distance traveled	Individual farmer mileage
Manchester	pounds	pounds	number	number	miles	miles
1	8000	8446	42	13	80.0	23.0
2	8000	8295	44	17	52.7	28.0
3	8000	8294	38	25	84.5	79.2
4	7000	7957	44	29	72.2	68.4
5	6000	6777	41	20	134.0	35.0
6	5000	5057	39	34	61.8	5.0
7	4000	4535	22	20	77.5	11.4
8	3000	3237	23	21	57.5	20.0
9	3000	2815	14	14	20.0	–
10	3000	2596	13	13	45.5	1.4
11	2000	2107	12	12	31.0	2.2
	57000	60116	332	218	716.7	273.6
Stub route 1	3000	3044	15	14	18.8	4.4
2	3000	2994	14	14	13.5	13.0
3	2000	1840	12	12	23.5	–
4	2000	1766	9	7	20.2	13.0
5	2000	1396	11	11	19.5	6.8
6	1000	835	6	3	23.5	29.0
7	1000	656	5	5	13.5	3.0
	14000	12531[1]	72[1]	66	132.5	69.2
Self-haulers		12687	68	–	–	964.0
Total Manchester	71000	72803	400	284	849.2	1306.8
Nashua						
1	4000	4262	17	17	46.8	7.0
2	4000	3914	22	21	27.0	1.1
3	4000	3873	16	16	31.2	1.1
4	4000	3730	18	18	34.5	13.4
5	3000	3115	12	12	28.5	–
6	3000	2521	11	11	20.9	–
	22000	21415	96	95	188.9	23.2
Self-haulers		5466	34	–	–	330.0
Total Nashua	22000	26881	130	95	188.9	353.2
Concord						
1	3000	2500	18	18	23.0	3.0
2	2000	2250	17	17	29.5	7.1
3	1000	700	5	1	11.5	4.4
4	1000	452	4	1	16.5	–
	7000	5902	44	13	80.5	14.8
Self-haulers		8373	46			640.0
Total Concord	7000	14275	90	43	80.5	654.8
Laconia						
1	5000	5572	41	34	75.5	49.4
2	4000	4375	28	16	48.6	48.0
3	4000	4275	30	28	131.5	25.0
4	3000	3493	20	19	18.1	11.0
	16000	17715	119	97	303.7	133.1
Stub route	2000	1563[1]	10[1]	8	10.5	–
Self-haulers		8132	65	–	–	604.0
Total Laconia	18000	25847	184	105	314.2	737.4
GRAND TOTAL	118,000	139,806	804	527	1432.8	3052.2

[1] Included in main route.

Appendix Table I—Truck routes operating before reorganization, June, 1937.

Route	Rated truck capacity	Amount milk	Number producers	Number stops	Distance traveled	Individual farmer mileage
Manchester	pounds	pounds	number	number	miles	miles
1	5000	7113	29	23	64.5	51.2
2	4000	6574	37	18	61.0	37.0
3	4000	6390	28	15	87.5	60.0
4	6000	5000	29	18	136.0	33.2
5	4000	4624	26	21	105.5	19.4
6	4000	4118	26	22	93.0	5.0
7	3000	3200	17	15	66.0	11.2
8	3000	2696	14	13	44.5	–
9	3000	2686	12	12	43.0	–
10	3000	2447	15	15	38.0	–
11	3000	1991	11	11	28.5	2.6
12	2000	1953	11	10	34.5	–
13	3000	1768	13	12	82.0	10.4
14	3000	1720	5	5	17.0	–
15	3000	1677	13	10	58.8	4.4
16	2000	1620	12	12	28.0	2.8
17	1000	1548	9	6	68.5	33.0
18	2000	1045	13	13	31.5	–
19	1000[1]	1000	6	6	37.5	6.0
20	3000	946	6	3	43.5	31.4
	62000	60116	332	260	1168.8	307.6
Stub route 1	1000	1290	5	5	12.5	–
2	1500	645	4	4	13.5	–
3	3000	559	5	5	12.0	–
	5500	2494[2]	14[2]	14	38.0	0.
Self-haulers		12687	68	–	–	964.0
Total Manchester	67500	72803	400	274	1206.8	1271.6
Nashua						
1	4000	3200	9	9	36.7	–
2	3000	2500	11	11	27.5	–
3	3000	1935	12	12	24.0	–
4	3000	1700	6	6	45.0	4.0
5	2000[1]	1634	7	7	40.0	1.0
6	8000	1500	3	3	13.5	–
7	2000	1290	8	8	19.3	–
8	3000	1204	4	4	29.3	–
9	3000	1075	4	4	17.8	–
10	1000[1]	1000	5	5	23.0	–
11	1000	985	5	5	12.8	–
12	1000	867	6	6	11.0	–
13	1000	850	6	6	13.5	1.4
14	3000	785	4	4	10.8	–
15	1000	645	4	4	14.5	–
16	1000[1]	245	2	2	5.5	–
	40000	21415	96	96	344.2	6.4
Self-haulers		5466	34	–	–	330.0
Total Nashua	40000	26881	130	96	344.2	336.4
Concord						
1	3000	2250	17	17	36.0	–
2	3000	1200	11	11	18.5	–
3	3000	900	4	4	10.5	–
4	1000	700	5	5	11.5	4.4
5	1000[1]	452	4	4	16.5	–
6	1000[1]	400	3	3	13.0	–
	12000	5902	44	44	106.0	4.4
Self-haulers		8373	46	–	–	640.0
Total Concord	12000	14275	90	44	106.0	644.4
Laconia						
1	3000	5500	38	26	107.0	44.4
2	3000	5160	30	27	139.0	18.0
3	3000	2455	22	22	52.0	14.4
4	3000	2250	14	12	45.5	5.0
5	1000	1750	11	11	53.0	11.0
6	3000	600	4	4	16.0	7.0
	16000	17715	119	102	412.5	99.8
Stub route	1000[1]	935[2]	6[2]	6	16.0	–
Self-haulers		8132	65	–	–	604.0
Total Laconia	17000	25847	184	108	428.5	703.8
GRAND TOTAL	136,500	139,806	804	522	2085.5	2956.2

[1] Rated truck capacity estimated.

[2] Included in main route.

Appendix Table III—Description of routes following second stage of reorganization (all producers).

Route	Capacity of truck	Amount milk	Number producers	Number stops	Distance traveled	Individual farmer mileage
Manchester	pounds	pounds	number	number	miles	miles
1	8000	8732	46	19	52.7	28.0
2	8000	8447	42	13	80.0	23.0
3	8000	8429	39	26	84.5	81.4
4	7000	7957	44	29	72.2	68.4
5	6000	6777	41	20	134.0	35.0
6	5000	5450	26	25	57.5	20.0
7	5000	5290	27	27	27.2	2.2
8	5000	5177	23	23	48.5	1.6
9	5000	4990	24	22	77.5	16.4
10	4000	3859	23	20	36.5	10.4
11	4000	3666	30	30	53.5	1.2
12	3000	3071	24	19	24.0	12.4
	68000	71845	389	273	748.1	300.0
Stub route 1	3000	3044	15	14	18.8	4.4
2	3000	2994	14	14	13.5	13.0
3	2000	1840	12	12	23.5	–
4	2000	1766	9	7	20.2	13.0
5	2000	1396	11	11	19.5	6.8
6	1000	835	6	3	23.5	29.0
7	1000	656	5	5	13.5	3.0
	14000	12531[1]	72[1]	66	132.5	69.2
Self-haulers		958	11	–	–	27.6
Total Manchester	82000	72803	400	339	880.6	396.8
Nashua						
1	5000	5767	29	28	54.0	18.0
2	4000	3914	22	21	27.0	1.4
3	4000	3766	23	22	30.1	12.0
4	3000	3335	15	14	37.0	9.0
5	3000	3237	12	12	20.3	6.4
6	3000	3115	12	12	28.5	–
7	3000	2521	11	11	20.9	–
	25000	25655	124	120	217.8	46.8
Self-haulers		1226	6	–	–	9.4
Total Nashua	25000	26881	130	120	217.8	56.2
Concord						
1	3000	3199	19	19	32.3	9.4
2	3000	3154	26	25	27.3	18.0
3	3000	3047	17	16	31.5	15.0
4	3000	2514	12	11	23.0	8.8
5	3000	2361	16	15	25.0	26.0
Total Concord	15000	14275	90	86	139.1	77.2
Laconia						
1	5000	5045	35	32	41.2	17.2
2	5000	4755	34	22	48.6	48.0
3	4000	4206	30	28	129.0	28.0
4	4000	4008	27	27	26.3	29.6
5	4000	3947	29	23	67.4	46.0
6	3000	3246	24	23	48.0	5.0
	25000	25207	179	155	360.5	173.8
Stub route 1	2000	1433[1]	10[1]	8	10.5	23.6
Self-haulers		640	5	–	–	21.0
Total Laconia	27000	25847	184	163	371.0	218.4
GRAND TOTAL	149,000	139,806	804	708	1608.5	748.6

[1] Included in main route.

Appendix Table IV—Description of routes following third stage of reorganization (reallocation).

Route	Capacity of truck	Amount milk	Number producers	Number stops	Distance traveled	Individual farmer mileage
Manchester	pounds	pounds	number	number	miles	miles
1	10000	9479	50	17	54.0	32.8
2	8000	8484	39	26	82.5	81.4
3	7000	7957	44	29	72.2	68.4
4	7000	7219	45	23	134.0	45.4
5	6000	5769	30	27	77.5	6.2
6	6000	5743	28	28	27.2	2.2
7	5000	5735	34	32	77.8	10.0
8	5000	5450	26	25	57.5	20.0
9	5000	4794	24	24	33.3	4.2
10	4000	4087	25	21	36.5	13.4
11	4000	3666	30	30	53.5	1.2
12	3000	3071	24	19	24.0	12.4
	70000	71454	399	301	730.0	297.6
Stub route 1	4000	3827	23	21	43.5	28.8
2	2000	1837	7	7	9.2	–
3	2000	1396	11	11	19.5	6.8
4	1000	835	6	3	23.5	29.0
5	1000	656	5	5	13.5	3.0
	10000	8551[1]	52[1]	47	109.2	67.6
Self-haulers		958	11	–	–	27.6
Total Manchester	80000	72412	410	348	839.2	392.8
Nashua						
1	5000	5277	26	25	50.6	18.0
2	4000	4159	17	17	41.7	4.6
3	4000	3914	22	21	27.0	1.4
4	4000	3766	23	22	30.1	12.0
5	3000	3237	12	12	20.3	6.4
6	3000	2746	9	9	23.3	–
7	3000	2521	11	11	20.9	–
	26000	25620	120	117	213.9	42.4
Self-haulers		1226	6	–	–	9.4
Total Nashua	26000	26846	126	117	213.9	51.8
Concord						
1	4000	4067	21	20	39.5	13.0
2	4000	3931	21	20	36.5	14.8
3	3000	3397	20	20	30.3	7.0
4	3000	2849	22	22	27.3	4.0
Total Concord	14000	14244	84	82	133.6	38.8
Laconia						
1	5000	5121	34	28	71.0	32.0
2	5000	4572	32	19	48.6	48.0
3	4000	4465	26	24	22.8	8.4
4	4000	4328	32	32	40.5	8.6
5	4000	3719	25	25	26.3	8.0
6	3000	3459	24	24	117.0	4.4
	25000	25664	173	152	326.2	109.4
Stub route	2000	1433[1]	10[1]	8	10.5	23.6
Self-haulers		640	5	–	–	21.0
Total Laconia	27000	26304	178	160	336.7	154.0
GRAND TOTAL	147,000	139,806	798	707	1523.4	637.4

[1] Included in main route.