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The Structure of the Milk Hauling Industry in New York and Pennsylvania

by

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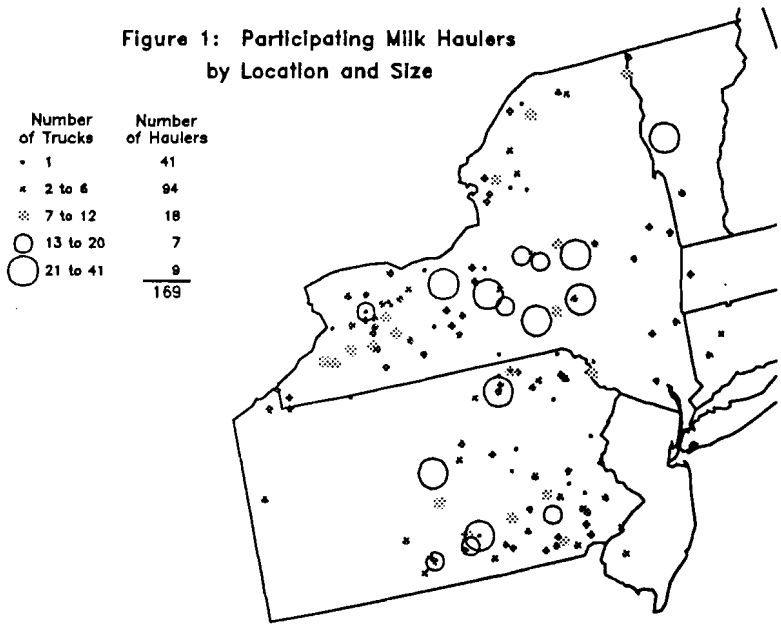
Figure 1: Participating Milk Haulers by Location and Size



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Acknowledgements

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Abstract

A survey of the milk haulers in New York and Pennsylvania was conducted to assess the changes in the northeast milk hauling industry since 1981. Detailed information was collected on characteristics of the hauling businesses as well as the equipment operated. Some of the general topics discussed include the number of hauling businesses, the size of hauling businesses, and the cost of milk hauling equipment. To address the subject of hauling efficiency, a section describing common measures of efficiency is included. Where possible, comparisons have been made to statistics obtained from a similar study completed in 1981.

Introduction

The dairy industry is a complex network of dairymen, consumers, businesses, and government. Despite all of the research undertaken by various institutions, little attention has been directed towards a vital and often overlooked group in the industry - milk haulers. They provide an essential service by transporting raw milk, a highly perishable product, from dairy farms to processing plants where the milk can be transformed into a number of products sought by the consumer. In the past decade, milk haulers have experienced price increases in nearly every item needed to operate a hauling business. The costs for such essentials as trucks, tractors, tanks and trailers, and wages for hired drivers have increased dramatically since 1981. In addition, escalating costs for associated items such as fuel, tires, and road taxes have further burdened haulers to the point where many contend that the current hauling fees paid by processors or cooperatives do not cover the costs of hauling. On the other hand, processors and cooperatives argue that the haulers are paid adequately for the task that they perform. Whether or not all parties involved will agree on equitable hauling rates is questionable and will continue to be a predominant issue in the dairy industry.

Although milk haulers are required to be licensed by the state in which they operate, there is surprisingly little data available to quantitatively describe this segment of the industry. One mission of the present study was to obtain detailed statistics about the milk hauling industry in the Northeast.

In 1981, a study of New York milk hauling was conducted and completed by Dr. Bruce L. Anderson of Cornell University[1]. The study answered many questions concerning the structure and the characteristics of milk hauling in New York State. There has been encouragement from groups such as the Federal Order No. 2 Market Administrators' Office, the Division of Dairy Industry Services, New York State Department of Agriculture and Markets as well as the Department of Agricultural Economics of Cornell University to investigate the changes in milk hauling in the Northeast since 1981. In the spring of 1992, a concerted effort was made by these groups to conduct such a study. Subsequently, the groups developed and distributed a milk hauling survey to all milk haulers in the state of New York as well as all non-New York operators hauling milk pooled in the New York-New Jersey Marketing Order (Federal Order No. 2). Milk haulers based in New York as well as those in central and eastern Pennsylvania constituted the majority of the haulers on the list. However, a smattering of haulers from neighboring states such as Vermont, New Jersey, Connecticut, and Massachusetts were also included in the survey, a slight departure from the exclusively New York-based survey of 1981. The list of milk haulers was divided into two groups prior to mailing the survey. A decision was made to label the haulers with six or fewer vehicles "small haulers" and the haulers with seven or more vehicles "large haulers". In early June, every hauler was sent a copy of the milk hauling survey along with a letter explaining the purpose and intent of the survey. Furthermore, the large haulers, as a result of the size and complexity of their

[1]Anderson, Bruce. 1981. *The Structure and Characteristics of the Milk Assembly System in New York State.* A.E. Res. 81-16. Cornell University Department of Agricultural Economics.

operations, were contacted by telephone in order to set up a personal interview. A follow-up letter was sent to non-responding haulers in July to encourage their participation. In August, a second follow-up letter was sent to non-responding haulers along with a shortened and simplified survey form.

Of the 232 small haulers identified, 135 responded to the original survey or the shortened survey and indicated that they were currently hauling bulk milk. Of the 51 large haulers, 34 participated in the personal interview sessions. Fifteen of the haulers responded to the survey and indicated that they were no longer hauling bulk milk. However, it is expected that many of the non-responding haulers fall into this category as well.

The following analysis documents the findings of the milk hauling survey. Some of the information obtained from the survey has been omitted from this publication in order to concentrate on those issues and topics for which comparisons to the 1981 survey can be made. The results of the survey are divided into three sections. The first section reviews characteristics of the hauling businesses in the survey. The second section includes information submitted by haulers related to the vehicles and tanks they operate. The third section investigates measures of efficiency in milk hauling. As a reminder to the reader, the 1981 survey was geographically limited to milk haulers in the state of New York while the present study includes milk haulers from New York, Pennsylvania, New Jersey, Vermont, Connecticut, and Massachusetts.

Section I: Characteristics of Milk Hauling Businesses

Of the 283 milk hauling surveys sent out in June and July 1992, 169 haulers indicated that they were currently hauling milk in the designated area. From these haulers detailed information was obtained on 670 vehicles. Data was collected on a wide variety of topics such as make of vehicle, age of vehicle or tank, cost of vehicle or tank, and miles travelled per day per vehicle.

Size of Milk Hauling Businesses

Table 1 shows the size of hauling businesses in the survey. On the average, each business operates 2.75 straight chassis trucks, 4.9 tractors, and 5.0 trailers. The number of straight chassis trucks operated by a single hauler ranges from one to ten. Similarly for tractors, the range is one to thirty-eight. For trailers, the range is one to thirty-four.

Although there are many haulers with large operations, a majority of milk haulers manage operations with small fleets (Table 1). About three-fourths of all participating haulers operate six or fewer vehicles, a figure similar to that found in the 1981 survey. The number of single vehicle haulers is surprisingly high at 24%, but this is considerably fewer than the 35% reported in 1981. One possible reason for the decrease is that a large number of single-vehicle operators have exited the milk hauling business. A second reason is that some of the single-vehicle operators may have increased their fleet size and have moved to the multi-vehicle status. This is supported by the 16% increase in the

haulers operating two to six vehicles. Also notable is the increase in the number of milk haulers in the largest fleet size category, i.e. the "21 or more vehicles" category. The 1981 survey found only 3 haulers of this size; the present study identifies 9 such haulers or 5% of all participants. While they comprise a small percent of the haulers, this group accounts for 30% of all the vehicles in the survey. Additionally, if the two larger size categories are combined to form a single group (all haulers with 13 or more vehicles), the set comprises 9% of all haulers, but accounts for 41% of all vehicles in the survey.

Table 1: Size of Milk Hauling Businesses by Number of Vehicles

Number of Vehicles	Total Haulers	% Haulers
1	41	24
2 - 6	94	56
7 - 12	18	11
13 - 20	7	4
21 or more	9	5
Totals	169	100

Figure 1 shows the size and location of the participating haulers. As mentioned before, most of the haulers in the survey reside in New York or central and eastern Pennsylvania with a few participants from neighboring states. Figure 1 also shows that the distribution of haulers is not random; spatial differences are evident, particularly in western and central New York. Western New York is composed primarily of small to medium-sized haulers, while the center of the state is dominated by large haulers. The reasons for the spatial differences are not known, but they may be a function of farm size and location as well as final destination for the milk hauler. Haulers in western New York tend to service upstate plants in Buffalo and Rochester as well as manufacturing plants in southwestern New York while central New York haulers are more likely to service distant New York City facilities.

As fleet size increases, the fleet make-up tends towards tractors and away from straight chassis trucks. As shown in Table 2, there is approximately a 50-50 mix of straight chassis and tractor vehicles across all haulers operating 12 or fewer vehicles. Any specific hauler may, of course, have any mix of chassis types, ranging from 100% straight chassis trucks to 100% tractors. Businesses that operate more than 12

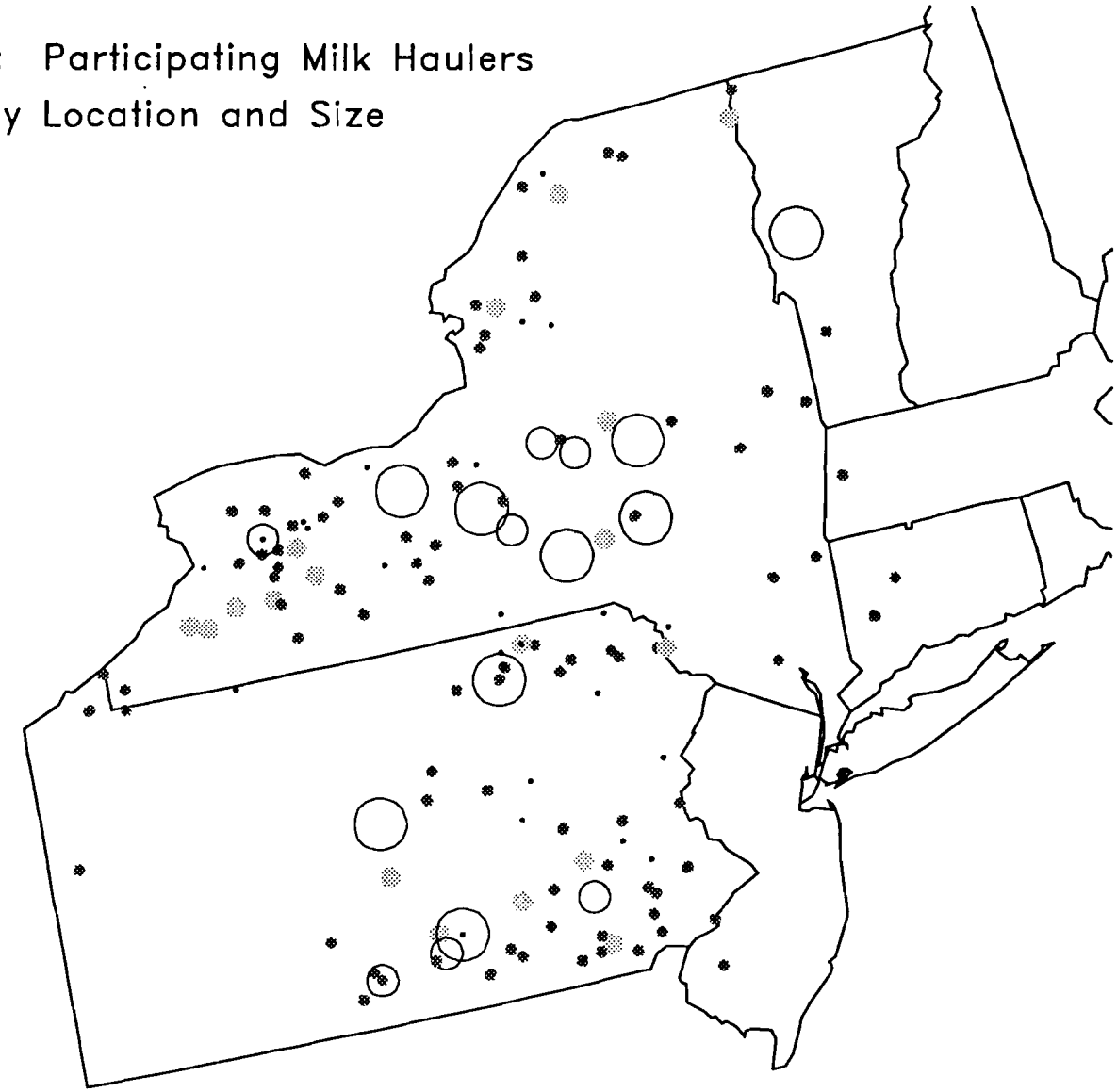
Table 2: Percent Make-Up of Fleets by Chassis Type

	Make-Up of Fleet (%)	
Number of Vehicles	Straight Chassis[1]	Tractor
1	56	44
2 - 6	41	59
7 - 12	55	45
13 - 20	21	79
21 or more	12	88

[1]Straight chassis vehicles include single, double, and triple axle chassis types.

Figure 1: Participating Milk Haulers by Location and Size

Number of Trucks	Number of Haulers
1	41
2 to 6	94
7 to 12	18
13 to 20	7
21 to 41	9
	169



vehicles are primarily composed of tractors, a characteristic that is more apparent in the largest size category. However, even the largest haulers report that their fleets continue to contain two or three straight chassis trucks for the purpose of picking up partial loads or travelling to hard-to-reach farms. Understandably, straight chassis trucks are preferred to tractors for these tasks.

Several reasons may explain the effort of haulers to move towards larger operations comprised primarily of tractors. First, dairy farms are becoming less numerous, and surviving farms are adding cows to increase herd size and boost the volume of milk production. The result is that haulers face larger milk pickups with greater distances between farms than a decade ago. Second, the number of milk processing plants in the Northeast has also been declining. With fewer processing plants, haulers are forced to move milk over longer distances after completing a milk assembly route. Considering these changes in the Northeast dairy industry, it becomes apparent that tractors-trailers are better suited to perform milk hauling tasks than straight chassis vehicles, barring any restrictions on load size and farm accessibility.

Chassis Type Breakdown

In contrast to the 1981 survey in which 63% of the vehicles were of the straight chassis variety, the most numerous chassis type reported in 1992 is the tractor (Table 3). Tractors comprise 67% of all vehicles while in 1981 tractors accounted for only 37% of all vehicles in the survey. Consequently, straight chassis trucks have fallen from 63% to 33% of all vehicles in the survey data base.

Table 3: Number and Percentage of Vehicles by Chassis Type

	1992		1981
Type of Chassis	Number of Chassis	% Chassis	% Chassis
Tractor	448	67	37
Single Axle Straight	8	1	7
Double Axle Straight	161	24	55
Triple Axle Straight	51	8	1
Total	668[1]	100	100

[1]Two of the 670 vehicles did not have a chassis type identified

Single-axle straight chassis trucks (single-axles) represent less than 1% of all operating vehicles. In 1981, single-axles made up 7% of all operating vehicles. Triple-axle straight chassis trucks (tri-axles) are trending in the opposite direction. Tri-axles totaled about 1% of all vehicles in 1981 and have increased in number to account for 8% of all survey vehicles. The trend for the two chassis types is consistent with the changing structure of the industry - as haulers exit the hauling business, the remaining operators build their fleets with vehicles capable of hauling larger payloads.

Make of Chassis

Table 4 lists the seven most popular makes of vehicles in the survey. Mack is clearly the dominant make in the milk hauling industry, although the proportion of Mack-made vehicles has slipped by about 15% since 1981. Hauler comments about Mack vehicles are favorable; comments concerning other brands tend to be more variable. Some haulers may elect to purchase brands other than Mack to take advantage of higher resale values. While the reputation of the maker may affect the purchasing decision of a hauler, accessibility to dealerships for servicing and replacement parts may also be a consideration.

Table 4: Make of Vehicles Across Chassis Type

Make of Chassis	Number of Vehicles	Percent of Vehicles
Mack	375	57
International	99	15
Ford	59	9
Freightliner	24	4
Peterbilt	21	3
Western Star	20	3
White	18	3
Other	46	6
Total	662[1]	100

[1]A make was not identified on 8 vehicles.

Additional Background Material

The natural daily, weekly, and seasonal fluctuations in farm milk production as well as inclement weather and equipment failures make it necessary for some haulers to provide reserve hauling capacity. Haulers who did not maintain reserve vehicles were asked to indicate the strategy used to meet hauling demands during flush periods. The most popular approach is to spread hauling demands over existing vehicles (Table 5).

Table 5: Reported Strategies for Meeting Additional Hauling Demands During Flush Periods

Strategy	% of Responses (1992)	% of Responses (1981)
Spread demands over existing vehicles	41	48
Request assistance from another hauler	13	28
Request assistance from milk dealer	13	7
Temporarily lease additional vehicles	30	14
Other	3	3
Total	100	100

Temporarily leasing additional vehicles also proves to be a viable and oft-used alternative, while requesting assistance from another hauler or from a milk dealer are significantly less popular options for haulers experiencing above-normal demands. Table 5 suggests that haulers in the present study are less likely to seek assistance from fellow milk haulers and more likely to temporarily lease vehicles or request assistance from milk dealers compared to 1981. Three reasons may explain the changes in strategies. First, it may be more profitable to lease additional vehicles or spread the demands over existing vehicles rather than request assistance from an outside source. Second, with the dynamic nature of the hauling industry, coordinating schedules with another hauling business may not be feasible. Third, contacting another business for help may be prohibitively time consuming and may not afford the flexibility desired by the hauling business experiencing above-normal demands.

Survey participants were also asked to list other uses for milk hauling equipment. Only 23 of the haulers indicated that their milk hauling equipment served other purposes. Although multiple responses were acceptable, the majority of haulers responding affirmatively listed only a single additional use for milk hauling equipment. In order of popularity, the other uses for equipment were: water hauling, dairy products, "for hire" work, liquid foods, and freight[2].

Milk Hauling Equipment: Types of Ownership and Financing

Nearly all milk hauling equipment is owned by the hauling business itself (Table 6). Only 6% of the vehicles and 18% of the trailers are owned by a business other than the hauling business. Self-ownership seems to be consistent with the results in the previous survey, and in fact, is more pronounced in 1992 than in 1981. In 1981, about 85% of the vehicles were owned by the hauling business itself, but today the proportion of self-owned vehicles is closer to 95%.

Table 6: Number and Percentage of Milk Hauling Equipment Under Various Types of Ownership

Type of Owner	Number of Vehicles	%	Number of Trailers	%
Owned by Self	700	94	417	82
Owned by Other Firm[1]	24	3	84	17
Owned by Leasing Firm	19	3	2	1
Totals	733	100	503	100

[1]Other firm includes proprietary and cooperative dealers, and other private individuals.

The primary method of financing milk hauling equipment is through a truck dealership loan (Table 7). Two popular alternatives are to obtain loans through a

[2]"Freight" involves the use of a tractor for transporting non-dairy related products.

commercial bank and to self-finance; obtaining loans through milk dealers or private lenders are infrequently used options for financing equipment. In the past decade, the proportion of businesses using commercial bank loans to purchase equipment has dropped by over 50%. In 1981, over half of the businesses opted for loans from commercial banks to finance new equipment, while in 1992 only 23% of all milk haulers reported financing through a commercial bank. Furthermore, there are fewer businesses opting for self-financing now (22% compared to 26% in 1981). Consequently, there are more businesses currently using other means of financing new equipment, namely, truck dealership loans. The proportion of haulers using truck dealership loans has nearly tripled since 1981.

Table 7: Number and Percentage of Milk Hauling Businesses Using Various Methods of Financing

Method of Financing	Number of firms	%
Financed by Firm	37	22
Financed by Commercial bank	39	23
Financed by Dealership[1]	69	41
No Response	24	14
Column Totals	169	100

[1]Dealership includes truck dealerships, milk dealers, and private lenders

Slightly more than 50% of the haulers responding submitted information on current loan interest rates. Many businesses do not have outstanding loans which explains the relatively low response rate. The average interest rate being paid is 10.1% with a high of 18% and a low of 6%.

Hauler and Dealer Relationships

Survey participants were asked to list the milk dealers for whom they haul on a regular basis. As seen in Table 8, nearly 80% of the dealers contract hauling work out with one, two, or three milk haulers. The remaining 20% of the dealers use as few as four and as many as thirty hauling businesses. Only slight differences in the number of haulers utilized by a milk dealer in 1992 are evident when compared to 1981. The most conspicuous difference is that there are now fewer milk dealers relying on a single hauler. It appears as though the dealers who formerly depended on a single hauler have moved to the 2 - 3 hauler category. One explanation for the resulting trend is that dealers have increased in size in the past decade and, therefore, may require more haulers to assemble and deliver the raw milk needed for plant operation.

The flip-side of haulers per dealer is dealers per hauler, that is, the number of milk dealers to which an individual hauling business provides service on a regular basis. A majority of haulers provide hauling service to a single milk dealer, but a significant proportion also haul for two or three dealers (Table 9). Only about 15% of the haulers service more than three dealers, and only a single hauler of all haulers surveyed reports hauling for more than seven milk dealers on a regular basis. Although there has been

a slight shift away from haulers providing service to a single milk dealer and towards multiple-dealer haulers, the structure of dealers per hauler has not changed much in the past 10 years. As might be anticipated, there is a strong positive correlation between the fleet size of the hauling business and the number of milk dealers served, i.e., as the operator's fleet becomes larger it is more likely that the operator is serving multiple dealers.

Table 8: Number and Percentage of Milk Dealers Served by Various Numbers of Hauling Businesses

Number of Haulers Per Dealer	Number of Dealers (1992)	% of Dealers (1992)	% of Dealers (1981)
1	62	55	63
2 - 3	25	23	15
4 - 5	12	11	9
6 - 10	6	5	7
11 - 15	4	4	4
16 - 20	6	2	0
21 - 30	4	<1	2
Totals	119	100	100

Table 9: Number and Percentage of Milk Haulers Providing Service to an Individual Milk Dealer

Number of Dealers Served	Number of Haulers (1992)	% of Haulers (1992)	% of Haulers (1981)
1	90	53	63
2	25	15	17
3	25	15	10
4	8	5	4
5	10	6	1
6	4	3	1
7 or more	3	<1	3
No Response	4	3	1
Totals	169	100	100

Density of Milk Haulers in New York and Pennsylvania by County

Nearly one-half of all haulers surveyed indicated that they have farm pickups in one, two, or three counties (Table 10). This figure is down from the 1981 survey in which 72% of the haulers reported having farm pickups in at most three counties. There appears to be a positive correlation between fleet size and number of counties with at least one farm pickup. Figure 2 depicts the location and volume of hauling activity by county in New York State. The map shows that most of the counties with high activity are located in the western portion of the state. The top six counties in the state as measured by the number of haulers having at least one farm pickup in each county are Wyoming, Genesee, Chenango, Erie, Livingston, and Madison. For Pennsylvania, the survey finds that the top seven counties in terms of hauling activity are Lancaster, Susquehanna, Berks, Bradford, Centre, Chester, and Lebanon. Four of the seven counties are located in the southeastern corner while two are located in the northeastern portion of the state. However, it would be misleading to conclude that these represent the top seven counties in the entire state of Pennsylvania since only haulers with Federal Order No. 2 milk pick-ups were included in the survey. For the same reason, no tabular or graphical representation for the number of haulers operating in Pennsylvania counties is provided.

Table 10: Numbers and Percentages of Haulers With at Least One Farm Pickup in New York Counties

Number of Counties	Number of Haulers (1992)	% of Haulers (1992)	% of Haulers (1981)
1	27	16	27
2	23	13	32
3	26	15	13
4	13	8	6
5 - 6	7	4	9
7 - 8	10	6	8
9 - 12	9	6	0
No NY pickups or no response	54	32	5
Totals	169	100	100

Wages Paid to Hired Drivers

Haulers were requested to indicate the wage rate paid to hired drivers. The survey provided three methods of compensation from which to choose - wage rate per hour, per day, or per week. The wage rates reported do not reflect the value of any fringe benefits provided for the hired drivers. The summarized results can be found in Tables 11 and 12. A flat wage per day is the most popular choice, followed by an hourly wage, and a weekly wage. Some haulers paying by the day or by the week calculate the wage rate based on a fixed rate per hour and an average number of hours worked. Wages paid to hired drivers in particular area may be influenced by the competition for drivers from other businesses outside of milk hauling as well as other competitive employment

Figure 2: Number of Haulers With One or More Farm Pickups in a County

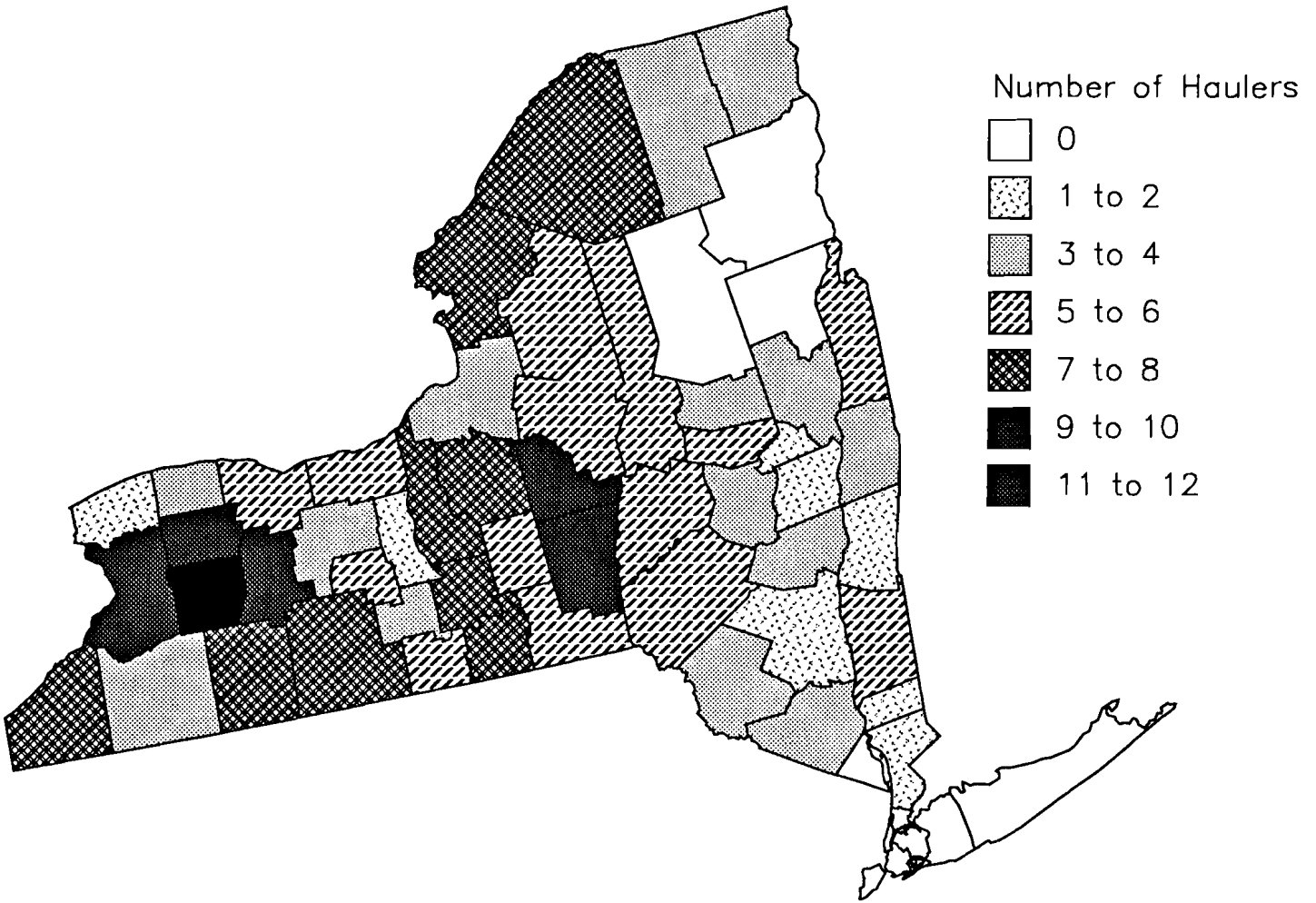


Table 11: Wages Paid to Hired Drivers by Milk Hauling Businesses on an Hourly Basis in 1992 and 1981.

	1992		1981
Wage Rate per Hour[1]	Number of Haulers	% of Haulers	% of Haulers
<$6.00	2	4	85
$6.00 - 6.99	3	6	2
$7.00 - 7.99	13	24	9
$8.00 - 8.99	17	31	4
$9.00 - 9.99	5	9	0
$10.00 and over	14	26	0
Total	54	100	100

[1]High = $12.00, low = $5.00, average = $8.45

opportunities. This phenomenon is more pronounced in areas bordering large cities. The wage rate may also be determined by the type of driving. Typically, drivers are paid an hourly wage for milk assembly, but they may be paid a daily or a weekly wage for transporting milk to distant processing plants, particularly if the plants are located in the vicinity of New York City.

Table 11 outlines the distribution of wages for drivers earning an hourly wage. The highest reported wage is $12.00 per hour, and the lowest is $5.00; the average for all drivers paid hourly is $8.45. As expected, the average hourly wage exceeds the average of $5.32 from the 1981 survey. In addition, 82% of the hauling businesses in 1981 paid between $4.00 and $6.00 per hour, whereas in 1992 only 4% of the businesses pay less than $6.00 per hour.

The most popular method of payment to hired drivers is a daily wage. Percentages of haulers are uniformly distributed across all payment levels; six of the seven categories contain between 10% and 20% of haulers reporting (Table 12). Consequently, there is no primary level of payment when drivers are paid on a daily basis. Drivers are paid an average of $87.00 per day. No comparison can be made with the 1981 survey since haulers were only asked to report the wages paid to drivers on an hourly basis.

The final category includes drivers who are paid by the week. There does not seem to be any consensus between hauling businesses on what a "week" constitutes. Some drivers work on a part-time basis but are paid by the week; other drivers are expected to drive six or seven days per week and are also paid weekly. Drivers in this category receive an average of $455.00 per week (Table 12). With this method of payment there is more variation between businesses than the two other methods, as

evidenced by the extreme levels of payment. The maximum salary reported is $1,000 per week, and the minimum is $200 per week. The greater variation in levels of compensation is probably a function of the differences in the definition of a "week".

Table 12: Wages Paid to Hired Drivers by Milk Hauling Businesses on a Daily or Weekly Basis.

Wage Rate per Day[1]	Number of Haulers	% of Haulers
<$60.00	4	6
$60.00 - 69.00	12	17
$70.00 - 79.00	8	11
$80.00 - 89.00	13	18
$90.00 - 99.00	11	15
$100.00 - 109.00	14	20
$110 and over	9	13
Totals	71	100

[1]High = $150.00, low = $42.00, average = $87.00

Wage Rate per Week[2]	Number of Haulers	% of Haulers
<$300.00	2	5
$300.00 - 399.00	9	23
$400.00 - 499.00	17	44
$500.00 - 599.00	6	15
$600.00 - 699.00	2	5
$700.00 and over	3	8
Totals	39	100

[2]High = $1,000.00, low = $200.00, average = $455.00

Section II: Destination, Age, Cost, and Capacity of Vehicles and Tanks

Primary Destination or Function of Vehicles

An analysis of vehicle destination or function by chassis type is shown in Table 13. Four possible responses were permitted:

1. Vehicle travels regularly to an in-state[3] or upstate New York facility,
2. Vehicle travels regularly to a New York City - Metro facility,

[3]The majority of "in-state" deliveries are Pennsylvania pickups traveling to Pennsylvania processing plants.

3. Vehicle travels regularly to an out-of-state facility,
4. Vehicle is used primarily as a reserve vehicle in times of high demand.

Vehicles were not required to make identical trips everyday; the primary use of the vehicle was of interest. Almost one-half of the trucks and tractors in the survey make trips to upstate New York facilities on a regular basis (Table 13). About 20% of the vehicles are used to deliver to a New York City - Metro facility, and 13% are used to make out-of-state runs. Only 7% of the vehicles see use as reserve vehicles.

Table 13: Primary Destination or Function of Vehicles by Chassis Type

	Primary Destination or Function					
Type of Chassis	In-state/ Upstate Facility	NYC-Metro Facility	Out of State Facility	Reserve Vehicle	No Response	Row Totals
Single Axle	6	0	0	1	1	8
Double Axle	128	0	8	15	10	161
Triple Axle	36	0	2	1	12	51
Tractor	146	126	75	21	80	448
Column totals	316	126	85	38	103	668[1]

[1]Two of the 670 vehicles did not have a chassis type identified

The primary function of a vehicle depends on the chassis type. Almost 80% of the double-axle straight chassis trucks (double-axles) are used to deliver to in-state or upstate New York facilities. The remaining double-axles are split between out-of-state deliveries (5%) and use as reserve vehicles (9%). The same pattern is true for tri-axles. Thirty-six of the thirty-nine tri-axles reporting a destination are used to deliver to in-state or upstate facilities, while only three tri-axles are used to deliver to out-of-state plants or see use as reserve vehicles. Tractors are used in more various capacities than straight chassis vehicles, but tend to be used more frequently than straight chassis vehicles for higher mileage routes. Tractors constitute about 46% of all vehicles with regular runs to upstate facilities, 100% of the New York City bound vehicles, 85% of the vehicles making out of state runs, and 55% of all reserve vehicles. When combined with double-axles, the two account for 87% of the vehicles destined for in-state or upstate New York plants.

One last note to add concerns the role of reserve vehicles. In 1981, 77 of the 672 vehicles were used as reserves. In contrast, only 38 of 670 vehicles are reported as being used as reserves in 1992. Clearly, haulers are maintaining fewer reserves. The reason may be that the cost of retaining a vehicle primarily for use during periods of high demand is prohibitively high, a reality understood by most haulers. Another explanation for the decrease in the number of reserve vehicles is related to the chassis type of the

reserve vehicles. Over 50% of reserve vehicles are tractors, and tractors tend to afford more flexibility to haulers than straight chassis trucks since tractors may be detached from trailers when needed for other functions.

Fuel Mileage and Price

Fuel mileage figures were requested for three vehicular uses - farm pickup, over-the-road, and all uses. "Farm pickup" refers to the number of miles traveled per gallon of fuel consumed during milk assembly, "over-the-road" refers to the number of miles traveled per gallon of fuel consumed during bulk milk transport and return trips. "All uses", the figure that most haulers were familiar with, is a combination of the two previous categories. Fuel mileage achieved by milk hauling equipment is summarized in Table 14. As anticipated, the average fuel mileage for over-the-road travel is higher than farm pickup or all uses fuel mileage.

Table 14: Number of Vehicles by Fuel Mileage Category for Various Vehicle Uses Across Chassis Type

	Vehicle Use		
Miles per Gallon	Farm Pickup	Over-the-road	All Uses
0.0 - 3.0	2	0	0
3.1 - 4.0	85	0	2
4.1 - 5.0	197	27	165
5.1 - 6.0	53	110	388
6.1 - 7.0	9	189	40
7.1 - 8.0	0	5	0
Over 8.0	0	0	0
MPG Averages	4.6	6.1	5.5

Newer model vehicles tend to perform better as a result of engine modifications by the manufacturer. Nonetheless, within use categories fuel mileage does not differ dramatically. In the "all uses" group 93% of the vehicles achieve between 4.1 and 6.0 miles per gallon. Similarly, 90% of the vehicles attain between 5.1 and 7.0 miles per gallon in the over-the-road category.

Fuel mileage differences between haulers may not be attributed strictly to differences in equipment, and specifically, differences in age of equipment. An advantage may be realized by the larger haulers who pick up milk from larger farms. Increased farm size translates to fewer stops to reach tank capacity and reduced milk assembly miles, both of which tend to decrease fuel mileage. In addition, drivers may also boost fuel mileage by exercising prudent driving techniques.

Of the participants in the survey, 90% use diesel fuel and pay an average of $1.20 per gallon with a high of $1.45 and a low of $0.95 per gallon. The price per gallon includes all relevant taxes. The remaining 10% of the haulers use gasoline and pay an

average of $1.19 per gallon with a high and low of $1.40 and $1.08 per gallon, respectively.

Since 1981, there has been a continued attrition of gasoline-powered vehicles in the milk hauling industry. The 1981 survey indicated that the price of fuel may be at least partially responsible for the shift from gasoline to diesel. However, as noted above, no real price advantage for either type of fuel is evident in the 1992 data. What, then, are the factors contributing to the replacement of gasoline-powered vehicles by diesel-powered trucks and tractors? There are three main reasons why diesel engines are preferred to their gasoline counterparts. First, diesel engines generate more pulling power than gasoline engines, a clear benefit in an industry where loads in excess of 50,000 pounds are not uncommon. Second, diesel engines consume less fuel than gasoline engines for comparable loads and running times. Third, diesel engines have an expected longevity far in excess of the expected longevity of a gasoline engine.

Age of Vehicles

A detailed breakdown of vehicle age by chassis type is given in Table 15. From the data, it appears as though tractors and tri-axles are being replaced more rapidly than double-axles or single-axles. This can be seen by comparing the percentages of vehicles that are no more than five years old for each of the chassis groups. For single-axles and double-axles the percentages are 12.5% and 38%, while the figures for tri-axles and tractors are 45% and 51%. In addition, all vehicles are not being replaced as rapidly as was found in the 1981 survey when 53% of the straight chassis trucks were no more than five years old. That number has dropped to 37% in 1992. With tractors, the same trend is apparent. In 1981 68% of the tractors were at most five years old, while only 50% of the tractors fit that description in 1992. Note that the tendency for tractors to be replaced more rapidly than straight chassis trucks was also evident in 1981.

The average age of vehicles by chassis type is also reported in Table 15. Single-axles have the highest average age of any chassis type, indicating again that as the older units wear out, they are not being replaced. Tractors have the lowest average at 5.4 years, followed by tri-axles (5.6 years) and double-axles (6.9 years). The average age for all straight chassis trucks is 6.7 years and is almost 1.5 years older than the comparable data for 1981. Likewise, the 5.4 year average for tractors in 1992 is about 1.5 years older than the 1981 counterpart. Two factors might explain the increasing average age of vehicles. First, hauling businesses were profitable in the late 1970's and early 1980's, enabling haulers to purchase new equipment more often. Additionally, changes in dairy policy and the dairy industry in the mid-1980's may have led to excess capacity in milk hauling as total milk supplies dropped. That is, there were an excessive number of vehicles available to haul milk for the volume of milk being produced. As a result, operations managers have been forced to restructure fleets to best utilize milk hauling equipment. Second, the current trend is to retain equipment longer than what was practiced in previous years. Prices of new equipment, lower resale values, and static hauling rates seem to have encouraged this practice.

Table 15: Vehicle Age in Years by Chassis Type

Age (years)	Chassis Type[1] SS	% SS	DS	% DS	TRI	% TRI	TRA	% TRA	Total[2]
0 - 3	1	12.5	27	17	17	33	124	28	169
4 - 5	0	0.0	31	19	6	12	103	23	140
6 - 7	3	37.5	50	31	9	18	77	17	139
8 - 11	2	25.0	26	16	8	16	67	15	103
12 - 19	1	12.5	3	2	1	2	4	1	9
Over 20	0	0.0	6	4	1	2	9	2	16
No Response	1	12.5	18	11	9	18	64	14	92
Totals	8	100	161	100	51	100	448	100	668
Average Age	10.4		6.9		5.6		5.4		

[1]SS=single axle straight chassis, DS=double axle straight chassis, TRI=triple axle straight chassis, TRA= tractor

[2]Two of the 670 vehicles did not have a chassis type identified

Table 16 indicates the relationship between age of vehicle and primary destination or function. Newer vehicles tend to make the longer runs, i.e. to New York City or out-of-state facilities. Table 16 shows that 70% of the New York City bound vehicles and 68% of the vehicles making out-of-state runs are no more than five years old. However, with vehicles serving in-state or upstate New York plants only 37% are no more than five years old, and nearly one-half are eight years old or older. Reserve vehicles tend to be the least numerous and the oldest of the four destination or function categories. Only 21% are at most five years old while two-thirds are eight years old or older.

Since 1981, the percentage of vehicles making in-state or upstate New York runs has dropped nearly 10%, and the percentage of vehicles serving in reserve capacity has dropped by about 5%. The percentage of vehicles making New York City or out-of-state runs has remained surprisingly constant from 1981 to 1992.

The average expected length of time to keep a chassis is 8.4 years with a high of twenty-five years and a low of three years. The haulers reporting a three year life expectancy work closely with leasing businesses and routinely trade-in vehicles after operating them for a three year period. The average expected number of years to keep a chassis is up from the 1981 survey in which haulers expected to retain each vehicle an average of 7.5 years. Vehicles making longer trips (New York City or out-of-state runs) have shorter life expectancies than vehicles used primarily for local deliveries. Mileage,

Table 16: Primary Destination or Function of Vehicle by Age and Across Chassis Type.

	Primary Destination or Function of Vehicle			
Age (years)	Upstate facility	New York City	Out of State	Reserve Vehicle
0 - 3	55	57	31	2
4 - 5	63	31	27	6
6 - 7	47	16	10	3
8 - 11	90	9	9	10
12 - 19	50	13	4	13
Over 20	4	0	0	2
No Response[1]	8	0	4	2
Column Total[2]	317	126	85	38

[1]Destination of vehicle was reported, but age was not reported

[2]104 vehicles did not have a destination reported

rather than age, seems to be a better indicator of when a vehicle will be replaced. Usually, a decision is made to determine if the vehicle will be kept, traded, or sold around the 500,000 mile mark. If the hauler decides to keep the vehicle, an out-of-frame rebuild[4] is usually required to ensure proper running condition.

Age and Destination of Tanks and Trailers

Table 17 lists the age of tanks or trailers by chassis type. Single-axles have the oldest tanks on the average (20.8 years), followed by double-axles (12.6 years), tractors (8.9 years), and tri-axles (8.3 years). Although tanks or trailers tend to be older than the accompanying vehicle, the pattern of ages by chassis type is similar to that described earlier for vehicles (see Table 15). Compared to the 1981 data, tanks and trailers in 1992 are much older. The average for straight chassis tanks in 1981 was 8.9 years; the average for 1992 is 11.8 years. Likewise, the average age for 1981 trailers was 4.9 years, but has increased to 8.9 years in 1992. Most haulers prefer to retain milk hauling equipment longer now than they did in the early 1980's; they point to escalating equipment costs and static hauling fees as the reasons for not purchasing new equipment as frequently.

The expected average life of tanks or trailers is 13.4 years with a high of 25 years and a low of 3 years. Again, haulers who travel longer distances tend to report shorter life expectancies than haulers delivering locally.

[4]An "out-of-frame rebuild" entails removing and servicing all major components of the vehicle's drivetrain.

Table 17: Tank or Trailer Age in Years by Chassis Type

Age (years)	Chassis Type[1] SS	% SS	DS	% DS	TRI	% TRI	TRA	% TRA	Total[2]
0 - 3	0	0.0	7	4.5	15	29	75	17	97
4 - 5	0	0.0	7	4.5	3	6	71	16	81
6 - 7	0	0.0	13	8	8	16	35	8	56
8 - 11	1	12.5	42	26	11	21.5	90	20	144
12 - 19	3	37.5	50	31	11	21.5	112	25	176
Over 20	4	50.0	21	13	3	6	16	3	44
No Response	0	0.0	18	13	0	0	49[2]	11	70
Totals	8	100	161	100	51	100	448	100	668
Average Age	20.8		12.6		8.3		8.9		

[1]SS = single axle straight chassis, DS = double axle straight chassis, TRI = triple axle straight chassis, TRA = tractor

[2]Some firms operated milk dealer-owned trailers and did not have access to trailer age information

[3]Two of the 670 vehicles did not have a chassis type identified

As with vehicles, it is of interest to see how tanks and trailers are assigned to destinations or functions based on age. Table 18 shows a breakdown of tanks and trailers by primary destination. Tanks and trailers being used for in-state or upstate New York deliveries or as reserve vehicles tend to be older than the tanks or trailers delivering to New York City or out-of-state facilities. The average age for tanks and trailers destined for in-state or upstate plants is 10.9 years, and the average age for those used in reserve capacity is 15.2 years. On the other hand, tanks and trailers making runs to New York City or to out-of-state plants averaged 7.6 years and 8.0 years, respectively.

In 1981, the average tank and trailer age was lower for all four primary destinations. For tanks and trailers going to in-state or upstate plants, the average age was 8.2 years; for tanks and trailers going to New York City the average age was 4.0 years. Out-of-state tanks and trailers averaged 6.2 years, while the reserve tanks and trailers averaged 8.2 years. Again, the inclination of haulers to retain milk hauling equipment longer than they had in the past is evident.

Cost of Milk Hauling Equipment

Haulers were asked to estimate the replacement cost at current prices of any milk hauling vehicle owned. Few haulers report a vehicle replacement cost less than $50,000

Table 17: Tank or Trailer Age in Years by Chassis Type

Age (years)	Chassis Type[1] SS	% SS	DS	% DS	TRI	% TRI	TRA	% TRA	Total[2]
0 - 3	0	0.0	7	4.5	15	29	75	17	97
4 - 5	0	0.0	7	4.5	3	6	71	16	81
6 - 7	0	0.0	13	8	8	16	35	8	56
8 - 11	1	12.5	42	26	11	21.5	90	20	144
12 - 19	3	37.5	50	31	11	21.5	112	25	176
Over 20	4	50.0	21	13	3	6	16	3	44
No Response	0	0.0	18	13	0	0	49[2]	11	70
Totals	8	100	161	100	51	100	448	100	668
Average Age	20.8		12.6		8.3		8.9		

[1]SS=single axle straight chassis, DS=double axle straight chassis, TRI=triple axle straight chassis, TRA= tractor

[2]Some firms operated milk dealer-owned trailers and did not have access to trailer age information

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Cost of Milk Hauling Equipment

Haulers were asked to estimate the replacement cost at current prices of any milk hauling vehicle owned. Few haulers report a vehicle replacement cost less than $50,000

Table 18: Primary Destination or Function of Tank or Trailer by Age and Across Chassis Type

	Primary Destination or Function of Tank or Trailer			
Age (years)	In-State/ Upstate Facility	New York City	Out of State	Reserve Vehicle
0 - 3	26	30	17	0
4 - 5	25	25	16	1
6 - 7	31	9	5	2
8 - 11	86	18	21	4
12 - 19	91	35	13	16
Over 20	24	0	3	6
No Response[1]	34	9	10	9
Column Total[2]	317	126	85	38
Average Age	10.9	7.6	8.0	15.2

[1]Destination of tank or trailer was reported, but age was not reported

[2]104 vehicles did not report a destination

for double-axles, tri-axles, or tractors; most agree that the cost for any of these three vehicles ranges from $60,000 to $80,000 (Table 19). On the average, tri-axles are the most costly to purchase ($71,580), followed by tractors ($68,499), double-axles ($67,603), and single-axles ($36,714). The average for all straight chassis vehicles is $67,494, which exceeds the straight chassis average from 1981 by more than $22,000. On a percentage basis, the cost of straight chassis trucks has increased about 50% since 1981. Similarly, the average for tractors in 1981 was $49,400 which is about $19,000 less than the average cost of replacing tractors in 1992. Using 1981 as a base, tractor purchase prices have increased by 39%.

Table 20 outlines the reported replacement costs for tanks and trailers at current prices. Tanks for single-axles average $22,167, the lowest of the four vehicle types. Tank costs for double- and triple-axles differ by about $1,800; the reported replacement costs are $27,195 and $28,987, respectively. Trailers are by far the most costly, averaging $50,682. Comparing the results of Table 20 with the 1981 data suggests that tank and trailer costs have escalated in much the same fashion as vehicle costs. The average straight chassis tank cost $19,900 in 1981. Today, the average purchase price is $27,468, a 38% increase over the 1981 figure. With trailers, the trend is equally visible. The average reported cost for a trailer in 1981 was $37,000. The current reported price for a trailer is $50,682, an increase of 37%. One place to look for an explanation to the increase in tank and trailer costs is the materials market, and more specifically, the stainless steel market. All tanks are constructed using stainless steel, and most cradles

Table 19: Estimated Replacement Costs of Vehicles by Chassis Type

	Chassis Type[1]			
Vehicle Cost	SS	DS	TRI	TRA
$0 - 30,000	1	0	0	0
$30,100 - 40,000	5	1	0	0
$40,100 - 50,000	1	5	2	5
$50,100 - 60,000	0	21	2	25
$60,100 - 70,000	0	69	28	236
$70,100 - 80,000	0	37	7	141
Over $80,000	0	7	10	3
No Response	1	21	2	38
Totals	8	161	51	448
Chassis Averages	$36,714	$67,603	$71,580	$68,499

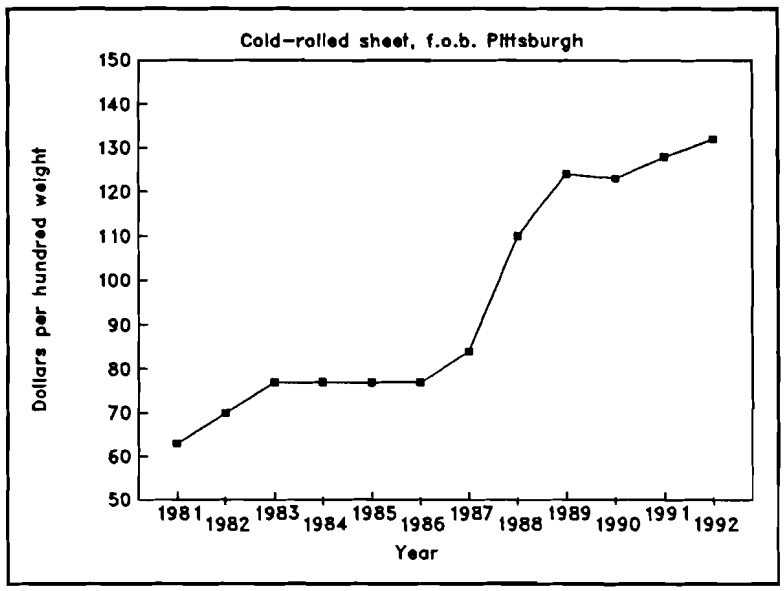
[1]SS=single axle straight chassis, DS=double axle straight chassis, TRI=triple axle straight chassis, TRA=tractor

Table 20: Estimated Replacement Costs of Tanks by Chassis Type

	Chassis Type			
Cost ($)	SS	DS	TRI	TRA
$0 - 20,000	5	7	0	0
$20,100 - 30,000	0	97	31	0
$30,100 - 40,000	0	17	12	7
$40,100 - 50,000	1	2	0	242
$50,100 - 60,000	0	0	0	101
$60,100 - 80,000	0	0	0	15
No Response	2	38	8	83[1]
Totals	8	161	51	448
Chassis Averages	$22,167	$27,195	$28,987	$50,582

[1]Some firms operated milk dealer-owned trailers and did not have access to trailer replacement cost information

are now being manufactured from the same material. In the mid-1980s, the price of stainless steel took a noticeable upswing. In fact, since 1981 the price of stainless steel has more than doubled (Graph 1). Consequently, tank and trailer prices have also escalated. To offset the increasing costs of tanks and trailers several haulers are investigating cost-cutting managerial practices, the most popular being to rebuild trailer cradles and frames and extend tanks rather than buy new tanks and trailers. All of the haulers exercising the option to rebuild or refurbish existing equipment report excellent results.



Graph 1: Stainless Steel Price Trends in the 1980s and 1990s.
Source: *Metal Statistics, 1992*

Tank Capacity

Table 21 describes the distribution of tank capacities among the survey participants. As noted earlier, the trend for milk haulers is to invest in larger capacity equipment. Using 1981 as a benchmark, the present study finds that tanks are now larger in volume. In addition, fewer tanks with modest capacities are currently in operation. For example, only 7% of the tanks have a capacity below 4,000 gallons. In 1981, the proportion of tanks with less than a 4,000 gallon capacity was 43%. Furthermore, in 1981 62% of the trailers had a reported capacity of 6,000 gallons or greater. The present study finds that 85% of the trailers have a capacity of 6,000 gallons or more. Previously, no trailers were reported with capacity in excess of 7,000 gallons, but the 1992 survey identifies forty-eight such tanks operating in the Northeast with the largest measuring 8,000 gallons. A relaxation of the gross vehicle weight and overload laws in some states have allowed for the apparent increase in tank capacities. However, some haulers with deliveries to out-of-state facilities report difficulties when crossing state lines. For example, Pennsylvania does not allow for overload capacity whereas overload permits are available in New York. Thus, a hauler must use the final destination to determine the size of the load as well as the size of the tank needed for milk transport.

Table 21: Capacities of Milk Hauling Tanks by Chassis Type

Tank Capacity (gallons)	Chassis Type[1] SS	DS	TRI	TRA
0 - 3,499	7	3	0	0
3,500 - 3,999	0	6	0	0
4,000 - 4,999	1	135	10	3
5,000 - 5,999	0	4	39	38
6,000 - 6,999	0	3	1	333
7,000 and over	0	0	1	48
No Response	0	10	0	26
Totals	8	161	51	448
Chassis Averages	2,488	4,266	5,113	6,202

[1]SS=single axle straight chassis, DS=double axle straight chassis, TRI=triple axle straight chassis, TRA=tractor

Section III: Measures of Efficiency in Milk Hauling

Several questions were asked of haulers to help gain insights about efficiency, that is, the answers to these questions may reveal how efficient a hauling operation is. The survey questions that fall into this category are:

1. Average number of loads moved per day,
2. Average number of farm stops per day,
3. Average pounds of milk hauled per day,
4. Average miles traveled per day,
5. Average number of vehicular operating hours per day.

For each of the questions, information was collected on two consecutive weekdays. The data was averaged to produce a "per day" figure.

Average Number of Loads Moved

A distribution of average number of loads moved is given in Table 22. Most straight chassis vehicles are able to move two loads per day or three loads every two days. Double-axle trucks have the highest average number of loads per day at 1.5,

followed by tri-axles (1.4 per day), and single-axles (1.4 per day). In 1981, all straight chassis trucks averaged 1.8 loads per day, but now only average 1.5 loads per day. This results because fewer straight chassis trucks are delivering three loads per day as compared to 1981. Five trucks are currently delivering three loads of milk per day, whereas in 1981 forty-four trucks were performing that task.

Table 22: Average Number of Loads Moved Per Day by Chassis Type

	Chassis Type[1]			
Average Number of Loads	SS	DS	TRI	TRA
3 loads per day	1	4	0	3
2 loads per day	2	54	14	37
3 loads every 2 days	0	26	14	25
1 load per day	0	49	16	342
1 load every other day	3	7	3	9
Reserve vehicle	2	19	4	30
No Response	0	2	0	2
Totals	8	161	51	448
Chassis Averages	1.4	1.5	1.4	1.1

[1]SS=single axle straight chassis, DS=double axle straight chassis, TRI=triple axle straight chassis, TRA=tractor

The data for tractors suggests that little improvement has been made in terms of loads of milk delivered per day. In 1981, tractors reportedly delivered an average of 1.1 loads of milk per day. Very few tractors deliver more than one load per day, and therefore, currently average only 1.1 loads per day. Roughly three-fourths of all tractors are reporting one load per day with the remaining tractors delivering two loads per day, three loads every two days, or operating in reserve capacity.

The apparent decrease in average number of loads delivered per day may be a function of not only the changes in vehicle capacity but changes in the dairy industry as well. When scheduling routes, most operators will try to pickup and deliver more than one load of milk per day. In many cases, route scheduling must be done at the convenience of the dairy farmer which inhibits the ability of a hauler to move multiple loads of milk in a single day. Furthermore, changes in density of milk production throughout the Northeast, increases in the number of miles travelled by haulers as a result of greater distances between farms, and unforeseeable time delays at processing plants may cause the goal of moving more than one load of milk per day to be unattainable for some haulers. One example of an area which has not been affected by changes in the dairy industry is near Lowville, New York. With a processing plant located in a town surrounded by dairy farms, most haulers in the area can pickup and deliver three loads per day and as many as four loads per day during flush periods.

Average Number of Farm Stops

A second measure of efficiency is the number of farm stops per day made during milk assembly. As shown in Table 23, tractors average about ten farm stops per day,

while all straight chassis trucks average twelve farm stops per day. Both measures show improvement, i.e., fewer stops to assemble a load of milk, over comparable figures from 1981 in which tractors and straight chassis trucks averaged 13.7 and 14.4 farm stops per day, respectively. Furthermore, in 1992 only 27% of all straight chassis trucks and 12.5% of all tractors have more than thirteen farm stops per day compared to 42% and 30%, respectively in 1981. A probable reason for the dramatic decrease in average number of farm stops is the increase in volume of milk output on farms. Although milk hauling equipment has become larger in the last decade, the growth in milk production on farms has increased at an even greater rate.

Table 23: Average Number of Farm Stops Per Day by Chassis Type

Average Number of Farm Stops per Day	Chassis Type[1] SS	DS	TRI	TRA
0 - 5	3	18	2	27
5.5 - 9	0	27	10	134
9.5 - 13	3	43	14	167
13.5 - 17	0	20	9	45
17.5 - 24	0	17	9	11
Over 24	0	5	0	0
No Response	2	31	7	64
Farm Stop Averages	7.1	11.9	13.1	9.9

[1]SS=single axle straight chassis, DS=double axle straight chassis, TRI=triple axle straight chassis, TRA=tractor

For vehicles traveling long distances to deliver milk, especially tractors delivering milk to New York City, it is imperative that the number of farm stops be held to a minimum. Regardless of farm size, a relatively constant amount of time is spent at each farm on tasks such as pulling, reading, and recording the milk dipstick, agitating the bulk tank, and connecting/disconnecting the fill hose. Using the New-York-City-bound tractors as an example, a full run consisting of milk assembly, delivery and return may take sixteen to eighteen hours to complete. Understandably, a hauler cannot afford to schedule more than ten or twelve farm stops on the route because the time spent on farms would become prohibitively long.

Average Pounds of Milk Hauled

Table 24 summarizes the amount of milk moved in a single day by different chassis types. Of all the vehicle types in the survey, tri-axles hauled the most milk on the average at 55,402 pounds per day. Tractors and double-axles hauled slightly less milk at 52,779 and 50,929 pounds per day, respectively. Single-axle vehicles hauled about half as much milk per day as the three major vehicle types. Load size is limited by road load limits, which may vary within states as well as between states.

It may seem curious that tractors do not haul the most milk per day, given the capacity advantage of tractors (see Table 21). However, as noted earlier, straight chassis trucks move about 1.5 loads of milk per day while tractors are limited to 1.1 loads per day. The overall capacity advantage of tractors is offset by the reduced number of loads moved per day. The result is that the daily volume of milk moved by tractors, double-axles, and tri-axles does not differ markedly between vehicle types. The average pounds of milk moved per day by all straight chassis trucks is 51,235 pounds which is over 3,500 pounds more than the 1981 average of 47,700 pounds. Tractors, however, do not differ significantly from the 1981 data; the averages are 52,779 pounds for 1992 and 53,300 pounds for 1981.

Table 24: Average Pounds of Milk Moved Per Day by Chassis Type

	Chassis Type[1]			
Pounds of Milk Per Day	SS	DS	TRI	TRA
0 - 20,000	3	11	2	2
20,100 - 40,000	0	34	10	31
40,100 - 60,000	3	37	14	326
60,100 - 80,000	0	38	12	21
80,100 - 100,000	0	4	6	17
Over 100,00	0	3	0	8
No Response	2	34	7	43
Pounds Per Day Averages	27,167	50,929	55,402	52,779

[1]SS=single axle straight chassis, DS=double axle straight chassis, TRI=triple axle straight chassis, TRA=tractor

Using the information from Tables 21, 22, and 24, straight chassis trucks in 1992 have more capacity, move fewer loads of milk per day, but deliver more pounds of milk per day than the straight chassis trucks in 1981. Likewise, tractors in 1992 have more capacity, move as many loads of milk per day, and deliver about the same amount of milk per day as the tractors of 1981. The implication is that tractors in 1992 may not be running full loads or at least as full as the tractors in 1981. Applying the same reasoning to straight chassis vehicles would suggest that the increase in tank volume is sufficiently large so that even if they are not running at maximum capacity in 1992, they are nonetheless hauling more milk per load than straight chassis trucks in 1981.

Average Number of Miles Traveled

All vehicles travel an average of 243 miles per day, including milk assembly, transport, and return mileage. Tractors log in the most mileage at 288 miles per day (Table 25). Double-axles have somewhat longer commutes than either tri-axles or single-axles. Nearly all straight chassis trucks travel less than 300 miles per day, but only about one-half of all tractors have pickup and delivery routes totaling fewer than 300 miles. Note that the average number of miles traveled is an inadequate indicator of how a vehicle is used. Most straight chassis trucks accumulate mileage by delivering more than a single load per day, whereas tractors accumulate mileage on a single run.

In comparison with the 1981 figures, the average number of miles traveled per day has increased by about 15% in the past 10 years. All vehicles averaged 216 miles per day in 1981 compared to an average of 243 miles per day in 1992. The disparity in the two figures is largely the result of a higher proportion of tractors in the 1992 survey; tractors typically cover more miles than straight chassis trucks. Eighty-five percent of the straight chassis trucks logged in less than 300 miles per day in 1981, but that number has fallen to seventy-nine percent in 1992. With tractors, 41% traveled less than 300 miles per day in 1981. Currently, 51% of all tractors cover less than 300 miles per day.

Table 25: Average Number of Miles Traveled Per Day by Milk Hauling Vehicles

	Chassis Type[1]			
Miles Traveled Per Day	SS	DS	TRI	TRA
0 - 150	5	75	27	106
151 - 300	1	47	19	120
301 - 500	0	9	0	126
Over 500	0	0	0	42
No Response	2	20	5	54
Totals	8	161	51	448
Chassis Averages	67	153	138	288

[1]SS=single axle straight chassis, DS=double axle straight chassis, TRI=triple axle straight chassis, TRA=tractor

Average Number of Operating Hours

Table 26 outlines the number of operating hours per day for all vehicle types. The average for all vehicles is 10.6 hours which is slightly less than the 11.2 hour average reported for 1981. Straight chassis trucks spend less time on the road than tractors (9 hours compared to 11.3 hours), but the result is expected given that the primary destination of almost one-half of the tractors is either a New York City or out-of-state facility (see Table 13). However, both averages for straight chassis trucks and for tractors have decreased from the 1981 data. Previously, straight chassis trucks operated an average of 9.3 hours per day while tractors saw use 14.4 hours per day. It is likely that the reduction in the number of farm stops in the past ten years has contributed, in part, to the decline in time necessary to assemble and deliver a load of milk.

Average Work Load

To understand the differences in tasks performed by each chassis type, a composite of two formerly presented tables is given to demonstrate the amount of work accomplished by each vehicle type (Table 27). The term "ton-miles" is simply the pounds of milk in a load multiplied by the distance that amount of milk is transported and divided by 2,000 pounds. Note that assembly miles and return miles (unloaded) are not included in the calculation. Table 27 verifies that although tractors do not haul as much milk per day as tri-axles, tractors clearly have an advantage in the amount of work performed. In fact, tractors average more than three times the work load than any other chassis type.

Summary

Over ten years have passed since the completion of Anderson's study of the Northeast milk hauling industry. Many changes have occurred in the hauling industry since that time. The present analysis makes repeated references to the 1981 study in an attempt to clarify some of the notable structural changes. In reviewing the prominent characteristics of milk hauling businesses, a number of points bear repeating:

- In comparison to 1981, milk haulers are declining in number while surviving hauling businesses are increasing the size of their fleets.
- Tractors are replacing straight chassis trucks as the mainstay of the hauling industry, a result of dairy farms becoming less numerous and more productive as well as processing plants becoming less numerous and larger in size.

Table 26: Average Number of Operating Hours for Milk Hauling Vehicles by Chassis Type

	Chassis Type[1]			
Hours Per Vehicle Per Day	SS	DS	TRI	TRA
0 - 5	3	19	4	24
5.1 - 9	2	37	11	99
9.1 - 13	1	56	28	134
13.1 - 17	0	13	1	110
17.1 - 24	0	1	0	36
No Response	2	35	7	45
Average Hours Per Day	5.0	9.0	9.4	11.3

[1]SS=single axle straight chassis, DS=double axle straight chassis, TRI=triple axle straight chassis, TRA=tractor

Table 27: Average Work Load Performed Each Day by Chassis Type

	Chassis Type[2]			
Ton-Miles[1]	SS	DS	TRI	TRA
0 - 1,000	4	76	23	62
1,001 - 2,000	0	36	11	70
2,001 - 3,000	0	4	3	65
3,001 - 4,000	0	1	0	45
4,001 - 5,000	0	3	1	32
5,001 - 6,000	0	1	0	49
Over 6,000	0	0	0	44
Chassis Average	275	1024	998	3223

[1]Ton-mile figure includes loaded transport miles only

[2]SS=single axle straight chassis, DS=double axle straight chassis, TRI=triple axle straight chassis, TRA=tractor

- Nearly all milk hauling equipment is owned by the hauling business and is financed primarily through loans from truck dealerships.

- Over 50% of the participating haulers work for a single dealer.

- Wage rates paid to hired drivers are highly variable across hauling operations.

★★★★★

Of all the hauling topics covered, few have changed more than the subjects covered in Section 2, namely, age of equipment, cost of equipment, and tank capacities. Most haulers are attempting to minimize large expenditures. For example, haulers prefer to retain milk hauling equipment longer now. The average age for trucks and tractors has increased by 1.5 years since 1981. The average age for trailers has increased by 4.0 years, while the average age for straight chassis tanks has increased by 2.9 years. Refurbishing existing equipment as an alternative to buying new equipment is also becoming a popular option. The primary reason for adopting these practices is related to the increasing cost of milk hauling equipment:

- Haulers report that replacement costs for tractors and straight chassis trucks have increased by 39% and 50%, respectively since 1981.

- Haulers report that replacement costs for trailers and straight chassis tanks have increased by 37% and 38%, respectively since 1981.

Insofar as tank capacity is concerned, tanks are generally larger in volume compared to the findings of the 1981 survey. Not only have tanks with capacities less than 4,000 gallons virtually disappeared, but there are tanks in operation now with capacities that were all but unheard of in 1981:

- The percentage of straight chassis tanks with capacities of less than 4,000 gallons has decreased from 43% to 7%.

- The percentage of trailers with capacities of 6,000 gallons or greater has increased from 62% to 85%.

- In 1981, no trailers were reported with a capacity of 7,000 gallons or greater. The 1992 survey identifies forty-eight trailers with capacities of 7,000 gallons or greater.

★★★★★

Some of the efficiency measures reviewed include the number of loads delivered per day, the average number of farm stops per day, the average number of miles traveled per day, and the average number of vehicular operating hours per day. With all of the changes in the milk hauling industry, one may wonder if any improvements in efficiency have been made. It is not clear if improvements have been made in each category since 1981:

- Tractors deliver the same number of loads per day as reported in 1981, but straight chassis trucks now deliver 0.3 fewer loads per day as compared to 1981.

- The average number of farm stops per day has fallen by 3.8 farm stops for tractors and 2.4 farm stops for straight chassis trucks.

- Straight chassis trucks have increased the average load size per day by 3,500 pounds over 1981 figures, while the average tractor load size per day has decreased by 521 pounds.

- The average number of miles traveled per day by all vehicles has increased by 15% since 1981.

- The average number of operating hours per day has decreased by 0.6 hours for all vehicles.

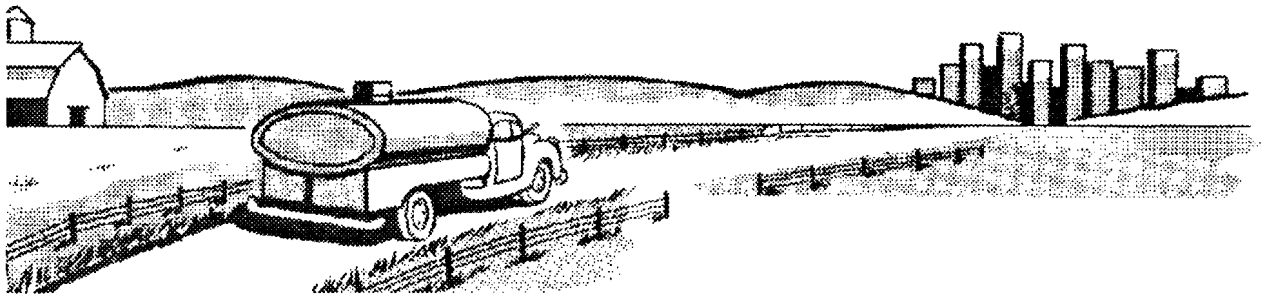
- Tractors average more than three times the work load of any other chassis type.

Appendix:

The Milk Hauling Survey

<CONFIDENTIAL>

Milk Hauling Survey



Respondent
Name: _____

Company
Name: _____

Address: _____

_____

Phone: _____
(area code)

Date: _____

Co-sponsored by:

Cornell University
NY-NJ Market Administrator
NYS Department of Agriculture & Markets

In order to help you, we need your help!

As we indicated in our cover letter, we will be using this survey information to assess the changes that have occurred in our bulk milk transportation system over the last decade and to update and enhance the milk hauling cost analysis computer program by adapting the software to current hauling practices. We will again publish the results in an extension bulletin that will be sent to all participants. Upon conclusion of the survey and updating of the computer program, we hope to hold several hauler meetings throughout the region to review and analyze the results with you.

Information from this survey will allow you to compare your business to regional averages and efficiency standards for similar businesses in your area. Additionally, by comparing how the industry has changed since the last analysis, you may get ideas on how to structure your milk hauling business for future growth and profitability. The information may also prove to be useful in your discussions with lenders and milk dealers.

You are an integral part of the bulk milk hauling system in this region. ***Therefore, please take a few minutes to fill out this survey as accurately as possible and return it in the enclosed envelope as soon as possible.*** Your help in getting this information is greatly appreciated.

All information about your business will be held in the strictest confidence. Information from your fellow milk haulers will be combined with yours, so no one will be able to extract individual business information from the combined published data.

If you have any questions concerning the survey, please contact Walter C. Wasserman at (315) 255-1183 or Edward W. Gallagher at (518) 452-4410. Thank you for your assistance.

1. Do you currently operate one or more milk trucks in New York, New Jersey and/or Pennsylvania? (Check one)
   - ❑ Yes. If yes, please complete the rest of the form
   - ❑ No. If no, return the survey in the self-addressed stamped envelope

2. Do you utilize your milk hauling vehicles for purposes other than milk hauling?
   - ❑ Yes. If yes, a) specify type of business _____
     b) what % of truck time is involved with this other business _____%
   - ❑ No.

3. Please indicate which milk dealers you regularly haul for. (list names)

   _____

   _____

   _____

   _____

4. Please list all states and counties in which you have one or more farm stops.

   _____

   _____

   _____

   _____

5. How many vehicles do you operate all year round?
   - _____ Number of straight chassis trucks used year round
   - _____ Number of tractors used year round
   - _____ Number of trailers used year round

6. Number of additional vehicles used during the flush period or as reserves?
   - _____ Additional straight chassis trucks
   - _____ Additional tractors
   - _____ Additional trailers

7. If you do not maintain reserve vehicles, how do you meet your needs in flush periods or when vehicles break down? (Check the appropriate answers)
   - ❑ Spread hauling demands over existing vehicles
   - ❑ Temporarily rent or lease additional vehicles
   - ❑ Request assistance from fellow milk hauler
   - ❑ Request assistance from milk dealer
   - ❑ Other (please specify) _____

8. What was the most recent price you paid for fuel?
   Gasoline $_____per gallon Diesel $_____per gallon

9. If you have hired drivers, please indicate the approximate average wage rate that applies to your situation.
   Wage rate $_____per hour;
   Wage rate $_____per day;
   Wage rate $_____per week

   Please indicate the value of fringe benefits on an hourly or percent of salary basis. Fringe benefits include social security contribution, workmen's Compensation, hospitalization insurance, unemployment insurance, bonuses, vacations, etc.

   Rate per hour $_____ Percent of wages _____%

10. Approximately what percent of your farm stops are *every day* pick ups?
    ON AVERAGE _____% SPRING _____% FALL _____%

11. Of the vehicles you operate, how many are owned by:

	Straight Chassis Trucks	Tractors	Trailers
Yourself or your firm	_____	_____	_____
A cooperative dealer	_____	_____	_____
A proprietary dealer	_____	_____	_____
An independent leasing firm	_____	_____	_____
Another private individual	_____	_____	_____
Other (please specify)			
_____	_____	_____	_____

12. Of the vehicles you own, how many were financed by:

	Straight Chassis Trucks	Tractors	Trailers
Yourself or your firm	_____	_____	_____
A loan through the truck dealership	_____	_____	_____
A loan through a commercial bank	_____	_____	_____
A loan through a private lender	_____	_____	_____
A loan through a milk dealer	_____	_____	_____
Other (please specify)			
_____	_____	_____	_____

13. What interest rate are you currently paying for financing milk hauling equipment?
_____% Other: _____

The remainder of the survey attempts to identify information about each straight truck and/or tractor-trailer used in your milk hauling operation. Therefore, in column #1, please indicate information about a chassis and a tank or trailer that is normally used together. Please give information in subsequent columns for each such truck that you regularly operate. If you have spare milk hauling equipment, include that information after you have entered information on all regularly used vehicles.

Our identification of each vehicle:	#1	#2	#3	#4	#5	#6
Your identification (optional):	_____	_____	_____	_____	_____	_____
14.Make of truck or tractor chassis: (i.e., Mack, International)	_____	_____	_____	_____	_____	_____
15. Model year of chassis:	_____	_____	_____	_____	_____	_____
16. Total number of years you expect to keep each chassis:	_____	_____	_____	_____	_____	_____
17. Type of chassis: (Check one)						
Single axle-straight chassis	_____	_____	_____	_____	_____	_____
Double axle-straight chassis	_____	_____	_____	_____	_____	_____
Tractor	_____	_____	_____	_____	_____	_____
Other (specify)						
_____	_____	_____	_____	_____	_____	_____

Our identification of each vehicle: Your identification (optional):	#1	#2	#3	#4	#5	#6
18. Maximum gross weight of each vehicle						
19. Type of fuel used: (G=gas; D=diesel)						
20. Average miles per gallon for all trucks:						
all uses						
farm pick up						
over-the-road						
21. Engine size (in hp):						
22. If you own the truck or tractor, approximate cost when it was new:						
23. Approximate cost to replace the truck or tractor today:						
24. Estimated salvage value when sold or traded:						
25. If you lease the truck or tractor, annual cost of the lease:						
26. Tank capacity (gallons):						
27. Milk pump capacity: (gallons/minute)						
28. What is the model year of the tank or tank trailer:						

Our identification of each vehicle: Your identification (optional):	#1	#2	#3	#4	#5	#6
29. Total number of years you expect to keep each tank or tank trailer:						
30. If you own the tank or tank trailer, approximate cost when it was new:						
31. Approximate cost to replace each tank or tank trailer today:						
32. If you lease the tank or tank trailer, annual cost of the lease:						
33. Estimated salvage value of tank or tank trailer:						
34. The PRIMARY & SECONDARY function of each vehicle are: (P=primary; S=secondary)						
Farm pickup to reload station						
Farm pickup to upstate plant						
Farm pickup to metropolitan New York City plant						
Farm pickup to out-of-state plant						
Upstate plant to another upstate plant						
Upstate plant to metropolitan New York City plant						

Our identification of each vehicle:	#1	#2	#3	#4	#5	#6
Your identification (optional):						

34. (CONTINUED)
The PRIMARY & SECONDARY function of each vehicle are: (P=primary; S=secondary):

Upstate plant to out-of-state plant						
Reserve or backup vehicle						
Other (specify) _____						

35. Average number of loads hauled by each vehicle **throughout the year** (check one)

3 loads per day						
2 loads per day						
3 loads every 2 days						
1 load per day						
1 load every other day						
Occasional use						

Questions 36–41 ask for information about the milk routes that you normally run. Only information about bulk fluid milk hauling is desired (either farm assembly and delivery to a plant or plant to plant transfers). For questions 36–42, do not give information for loads of cream, water or other non bulk fluid milk hauling operations. Many trucks run different routes on different days. Please answer these questions for any two consecutive weekdays (for example, a recent Tuesday and Wednesday, or a recent Wednesday and Thursday). If multiple loads are picked up the same day, combine the information and enter it on the appropriate line (either on first day or second day). Additional information on multiple loads and plant-to-plant hauls is included on the last page.

Our identification of each vehicle:	#1	#2	#3	#4	#5	#6
Your identification (optional):						

Consecutive Weekdays (continued)

36. Number of drivers per day						
First day						
Second day						
37. Name of plant or reload station						
First day						
Second day						
38. Daily mileage:						
Assembly:						
From garage to last farm stop						
First day						
Second day						
Transport:						
From last farm to plant (or reload)						
First day						
Second day						
From plant (or reload) to garage						
First day						
Second day						
39. Daily time for milk assembly [minutes]						
First day						
Second day						
Time from end of assembly to plant (or reload) [minutes]						
First day						
Second day						

Our identification of each vehicle:	#1	#2	#3	#4	#5	#6
Your identification (optional):						

39. Daily time (minutes) for milk assembly (continued)

Total time at plant						
First day						
Second day						
Time waiting to unload						
First day						
Second day						
Time from plant (or reload) to garage						
First day						
Second day						

40. Number of farm stops

First day						
Second day						

41. Total pounds hauled

First day						
Second day						

Seasonal variation in load size:
high_____ low_____

Please indicate your best estimate of current operating costs for these vehicles. Only include information for those vehicles used in the hauling of bulk fluid milk (this does not include cream). If individual truck data is not available, please include your best estimate of total fleet cost and allocate on a per truck basis.

42. Annual insurance per truck						
43. Annual registration fees (include overweight limit permits)						
44. Annual fixed or overhead costs: (i.e., office, garage, fleet management, accounting, etc.)						

Our identification of each vehicle: Your identification (optional):	#1	#2	#3	#4	#5	#6
45. Cost of new radial tire						
46. Cost of recapping (if used)						
47. Number of miles per tire (new tire plus 1 recap)						
48. Average repair cost/mile for parts and labor over life of new truck						
49. Average PM per mile including routine maintenance (oil, filters, labor, etc.)						
50. Daily tolls: First day						
Second day						
51. Annual federal highway tax						
52. Other state taxes (i.e., TMT, etc.)						

☞ ***See back of this page for comments section.*** ☞

Additional information for questions 36-41 and for trucks hauling more than one load per day.

For the first load, assembly miles and time are those from the trucks garage to the last farm stop. Transport miles and time are those from the last farm stop to the plant or reload station. If the truck runs another load on that day, the assembly miles and time for the second load are those from the plant or reload to the last farm stop for that load. Transport miles and time are those from the last farm stop to the plant or reload station. In case a third load is assembled during the day, the procedure is the same as for the second load. For truck's last load of the day, list the miles and time from the plant to the garage separately. Do not include with assembly.

Milk transported from a reload or plant to another plant.

If you transport milk from a reload or plant to another plant, identify the information under the appropriate truck that is used for this movement. Please answer the appropriate questions in 36-42. For miles and time to the plant, indicate the information on the appropriate lines "From last farm to plant (or reload)" and "Time from end of assembly to plant (or reload)". Also include information on miles and time from plant of delivery to the garage and the time at the plant.

53. Additional comments about your milk hauling situation:

_____

_____

_____

_____

Thank you for your cooperation.

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