OPERATIONS OF FOR-HIRE LIVESTOCK TRUCKING FIRMS

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ABSTRACT

Various aspects of livestock truckers' operations were examined. Factors studied were firm stability, vehicle use, seasonality of livestock shipments, loss and damage claims, rates charged, the backhaul situation, nonlivestock trucking activity and the effects of the fuel shortage situation on for-hire livestock truckers. Firms appeared to be relatively stable. Equipment use was good, considering the level of seasonality. The rate of loss and damage claims was low. Rates charged increased considerably between 1972 and 1974. The fuel shortage situation reduced equipment use and increased costs.

Key Words: Transportation, livestock, trucking, seasonality, stability, rates, backhaul and fuel shortage.

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PREFACE

This report is one of a series on the economics of livestock transportation conducted by the U.S. Department of Agriculture. The total research effort was initiated at the request of cattlemen, livestock dealers, and livestock truckers. There were three phases of the project. The first phase, the development of estimated cost for livestock trucking firms, was begun in 1971. That work was reported in Cost of Operating Trucks for Livestock Transportation, Economic Research Service (ERS), U.S. Department of Agriculture, Marketing Research Report No. 982. The second phase considered (1) the level and quality of livestock transportation as perceived by livestock shippers and (2) the rates paid by these firms. A survey of livestock handlers and cattle feeders was conducted in the fall of 1973. An ERS report entitled Livestock Trucking Services: Quality, Adequacy and Shipment Patterns, Agricultural Economic Report No. 312, resulted from this work.

This publication is based on data collected in the third phase. A survey of livestock truckers was conducted in the fall of 1974 to examine their operating characteristics, pricing policies and rate levels, and some aspects of their operating cost.

CONTENTS

SUMMARY

Livestock truckers surveyed in 1974 appeared to be relatively stable entrepreneurs, having been in business an average of 18.3 years. Whether they operated in States with or without intrastate regulation of livestock trucking did not appear to affect their stability.

Truckers experienced considerable seasonal variation in their operations. During the peak shipping period of September-November 1973, shipments numbered 45 percent higher than in the low period, February-April 1973. Substantial differences in seasonal movements existed among the regions. Firms in the South and West faced about twice as much seasonality as those in the Midwest. These figures suggest the seasonal nature of livestock trucking is a serious problem for livestock trucking firms.

Their trucks averaged 83,000 miles per year. Considering the problem of seasonality and the relatively short average round-trip length, this figure indicates a good level of equipment use. But such use could be raised considerably if it were not for seasonality.

About 95 percent of all loads hauled resulted from direct contact between truckers and shippers. The amount of load availability information was rated scarce by 35 percent of the firms and the quality of information was rated poor by 32 percent. Loss and damage claims were filed against truckers for less than 1 percent of their loads.

Truckers could obtain loaded backhauls for only about 10 percent of their trips. The degree of loaded backhauling appeared to be closely related to the length of the trip; longer trips had a much higher percentage of loaded backhauls than shorter trips. Backhaul rates reported were significantly lower than rates for the initial hauls.

About 38 percent of the firms reported operating nonlivestock vehicles. Truckers reported very little seasonality in such operations, indicating that most were not taken on to increase the use of drivers and truck-tractors during extended periods of low livestock shipments. Approximately 9 percent of the firms leased their vehicles to other firms when not hauling livestock.

The average of all rates reported increased 19.6 percent between 1972 and 1974. There was a significant difference in the level of rates charged for different sizes of trucks. Rates did not appear to differ significantly by region. Medium-sized firms charged significantly lower rates than small ones.

Intrastate regulations determined rates most often--44 percent. Approximately 21 percent were determined through truckers' expenses plus a reasonable profit. Thirty-two percent of the methods firms listed were related to the competition found in the marketplace.

The fuel shortage crisis of 1973-74 and the resulting 55 mile per hour speed limit had repercussions for livestock truckers. Over one-half of the firms reported that the new speed law reduced the level of driver and

equipment use. About 57 percent of the firms indicated the new speed law had no effect on fuel consumption, 34 percent reported reduced miles per gallon, and 9 percent reported increased miles per gallon. Firms reported that the rise in fuel cost per gallon increased total operating cost by 5 to 6 percent, which amounted to about half of the increase in rates charged by truckers between 1973 and 1974.

Firms averaged about five tractors and trailers in size. Only some 1 percent leased equipment on a short-term basis. About 12 percent of the tractors and 10 percent of the trailers were owned by the drivers and were operated under contract with the livestock trucking firms.

OPERATIONS OF FOR-HIRE LIVESTOCK TRUCKING FIRMS

By Patrick P. Boles 1/

INTRODUCTION

The livestock industry has become almost completely dependent on trucking for its transportation needs. Shipments of feeder cattle, which make up a significant part of all livestock shipping requirements, are highly seasonal. In some years this situation has resulted in a demand for a larger number of livestock trucks than are available during certain months. As a result, some livestock shippers have reported difficulty in obtaining service when desired from livestock truckers during these months. While most livestock truckers probably enjoy relative prosperity in such months, some firms have charged that competition is so intense and rates so low (during months of low livestock movements) that many truckers are being forced out of business. It has also been charged that livestock trucking firms as a group are highly unstable businesses.

Some livestock truckers and shippers have proposed that livestock trucking be brought under economic regulation by the Interstate Commerce Commission (ICC). Legislation to put interstate livestock under regulation by the ICC has been introduced in recent sessions of the U.S. Congress.

An earlier survey of livestock handlers and cattle feeders resulted in a research report on the quality and adequacy of livestock trucking as perceived by the shippers (2). 2/ The purpose of the current study is to examine livestock truckers' operations as they relate to the for-hire trucking needs of livestock shippers. Specific objectives are to (1) analyze various characteristics of livestock truckers' operations, such as vehicle utilization, load information, and backhaul situation; (2) compare rates charged by livestock truckers by region and firm size during 1972, 1973, and 1974; (3) examine the stability of livestock trucking firms as reflected by years in business; and (4) report the effects of the fuel shortage crisis on livestock truckers' operations. Information concerning the scope of the study and the methodology used appears in the appendix.

SIZE AND NATURE OF TRUCKING OPERATIONS

Years in Business 3/

One of the most common charges made against the exemption of livestock truckers from interstate regulation is that these firms move frequently in

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1/ Agricultural Economist, National Economic Analysis Division, Economic Research Service.

2/ Underscored numbers in parentheses refer to items in References at the end of this report.

3/ Mail survey data were used in this section. See appendix.

and out of business. This condition allegedly results in an unstable market situation for the users of these truckers' services. To test this claim, data showing the number of years in business were analyzed. Of the 684 firms that answered the mail questionnaire, 664 indicated the number of years that they had been in business. On the average, these firms had been in business 18.3 years. The range was from 1 to 64 years and the median was 16 years. The average number of trucks operated per firm was 6.3.

There were some regional differences. Truckers in the South averaged 16.4 years in business and those in the Midwest, 19.0 years (table 1).

Table 1.--Average number of years in business for livestock truckers, by region, and firm size, 1974 survey

Firm size No. of trucks	South	Midwest	Southwest	West	Total
			Years		
1-4	16.3	16.5	14.6	15.4	16.0
5-10	17.9	22.0	20.3	19.6	21.0
11 or more	15.7	24.6	16.2	22.1	20.4
Total	16.4	19.0	17.1	18.7	18.3

Larger firms tended to have been in business longer than smaller firms. The average number of years in business for firms operating from 1 to 4 trucks was 16.0 and for firms operating 11 or more trucks, 20.4 years.

About 13 percent of the firms had been in business for 3 years or less (table 2). The South and Midwest had fewer young firms (in business for 3 years or less) than did the other two regions. Young firms averaged 4.2 trucks per firm. These figures do not indicate an excessive number of young and very small firms in the business.

Table 2.--Percentage of livestock truckers in firm age categories, by region, 1974 survey

Region	Firm age			
	1 year	2 years	3 years	More than 3 years
		Percent		
South	6.4	--	6.4	87.2
Midwest	4.6	2.7	3.5	89.2
Southwest	3.9	5.3	5.3	85.5
West	1.4	8.3	5.6	84.7
Total	4.2	3.9	4.5	87.4

An analysis was made to determine if there was a difference between firms located in States with intrastate economic regulation of livestock trucking and those located in States without this type of regulation. 4/ There were 579 firms averaging 18.1 years in business located in States with regulation (table 3). The 85 firms located in States without regulation had been in business an average of 19.5 years. An analysis of variance test of the hypothesis that no difference existed between the age distribution of firms located in States with and without regulation yielded an F value of .95. The hypothesis of no difference was accepted at the .05 level of significance. This analysis indicates that intrastate economic regulation of livestock trucking has not added to the longevity of livestock trucking firms in the group of States where it applies.

Table 3.--Average number of years in business for livestock truckers located in States with and States without economic regulation, by region and firm size, 1974 survey

Firm size No. of trucks	South	Midwest	Southwest	West	Total
		States with economic regulation			
1-4	18.0	16.4	14.6	17.4	16.0
5-10	5.0	22.0	20.2	18.0	20.7
11 or more	11.3	23.2	16.2	22.8	19.9
Total	13.3	18.7	17.0	19.0	18.1
		States without economic regulation			
1-4	15.9	18.6	--	11.9	16.1
5-10	21.6	22.2	25.0	26.0	22.5
11 or more	17.5	35.2	--	19.5	22.1
Total	17.5	23.0	25.0	17.9	19.5

Firm Size 5/

Data collected in the field survey were expanded to reflect the universe from which the sample was drawn.

4/ The source for determining intrastate regulation (4) lists five main criteria for determining economic regulation of for-hire agricultural truckers: (1) A certificate of public convenience and necessity; (2) hearings to obtain the certificate of public convenience and necessity; (3) regulation of rates; (4) regulation of routes; and (5) insurance requirements. In this report, firms that operate in States that only require insurance were considered non-regulated, since insurance requirements could include personal liability, bodily injury, property damage, cargo, and a bond.

5/ Data from the field survey are used throughout the remainder of the report. See appendix.

Firms in the South tended to operate more vehicles. They operated an average of 8.6 tractors and 9.2 trailers per firm (table 4). Midwest firms had less equipment on the average than firms in the other regions. In all regions, firms operated more trailers than truck-tractors. For all firms operating tractors and trailers, the average was 5.2 trailers and 4.7 truck-tractors.

Table 4.--Percentage of firms operating straight trucks and truck-tractors and trailers, and average number of such vehicles in 1973, by region, 1974 survey

Region	Firms operating straight trucks	Average number of trucks per operating firm	Firms operating tractor-trailers	Average number of tractors per operating firm	Average number of trailers per operating firm
	Pct.	No.	Pct.	No.	No.
South	28	1.6	93	8.6	9.2
Midwest	72	1.6	75	3.6	4.0
Southwest	14	1.2	94	7.3	7.6
West	13	1.4	100	6.1	6.6
Total	55	1.6	81	4.7	5.2

Firms reported using five major types of trailers (app. fig. 1). The "pot" or drop-center trailer was the most popular type used, accounting for 56 percent of all trailers reported (table 5). The flatbed trailer with one deck was used by a number of firms in the Midwest and Southwest to haul fat cattle from feedlots to slaughterhouses. The cattlebox and pull trailer and double trailers were used extensively by firms in the West, accounting for 70 percent of all trailers reported there.

Table 5.--Percentage of each type of vehicle operated by livestock trucking firms in 1973, by region, 1974 survey

Region	Type of vehicle					
	Flatbed, 1 deck	Flatbed, 2 decks	Pot trailer	Cattle-box and trailer	Double trailers	Other trailers
	Percent					
South	3	43	51	--	--	3
Midwest	22	7	62	9	--	--
Southwest	24	17	57	--	1	1
West	4	3	23	43	27	--
Total	19	13	56	8	3	1

Nature of Operations

Nearly all vehicles were owned or under long-term lease arrangements. Vehicles under short-term lease arrangements accounted for only 1 percent of the tractors and trailers and none of the straight trucks. Thus, very few firms depend on short-term rentals to increase their fleet size during periods of peak demand for their services. Approximately 12 percent of the truck-tractors and straight trucks and 10 percent of the trailers were owned by owner-operators. 6/ Owner-operators were most widely employed in the Midwest, while none were reported by firms in the West.

Nineteen percent of all firms operated straight trucks only. This type of operation was more prevalent in the Midwest than elsewhere. Forty-five percent of all firms operated tractors and trailers only and 36 percent operated both types.

All interviewed firms hauled cattle in 1973. Seventy-one percent hauled hogs, 29 percent hauled sheep, and 9 percent hauled other animals. Cattle made up 74 percent of all loads hauled. Hogs accounted for 22 percent of all loads; sheep, 3 percent; and other animals, 1 percent.

Forty-eight percent of all loads reported were hauled by firms operating from 1 to 4 trucks. Twenty-six percent were hauled by firms operating from 5 to 10 trucks and 26 percent by firms operating 11 or more trucks. Seventy-six percent of all loads reported were hauled in tractor-trailers and 24 percent in straight trucks.

Vehicle Utilization

The average number of trips per truck per year was 243 (table 6). Smaller firms averaged more trips per truck than the larger firms. Straight trucks tended to average more trips per year than tractor-trailers. Firms in the South had fewer trips per truck than did the other regions.

Firms reported that most of their trips were 300 miles one way or less (table 7). However, such length was more pronounced in the Midwest than in other regions. Firms in the South had only slightly less than one-half of their trips in categories of 300 miles or more. For midwestern firms, only about 18 percent of their trips averaged over 300 miles.

The average round trip length for all trips was 344 miles (table 8). Tractor and trailer trip lengths averaged over four times as long as for straight trucks. For the latter, about 86 percent of all trips were 50 miles or less, while over 32 percent of all trips by tractor and trailer were over 300 miles. The larger firms tended to make trips of much longer average length than smaller firms. Over 56 percent of trips by the smallest firms

6/ Owner-operator refers to the ownership of the vehicle by the driver. The trucking firm provides certain services for a share of the revenue. In some cases, the trucking company owns the trailer and the owner-operator provides the truck-tractor.

Table 6.--Average number of trips of livestock trucks in 1973 by truck types, firm size, and region, 1974 survey

Region and truck type	Firm size (trucks)			All firm sizes
	1-4	5-10	11 or more	
		Trips		
South				
Trailers	151	208	97	123
Straight trucks	575	73	197	373
All trucks	236	201	100	137
Midwest				
Trailers	305	185	182	235
Straight trucks	318	202	499	311
All trucks	312	187	189	259
Southwest				
Trailers	274	209	225	229
Straight trucks	119	277	487	196
All trucks	262	211	226	228
West				
Trailers	248	327	251	287
Straight trucks	--	461	456	460
All trucks	248	333	256	292
All regions				
Trailers	290	215	194	228
Straight trucks	317	231	423	311
All trucks	301	216	197	243

Table 7.--Percentage of livestock truckers' 1973 trips within specific mileage categories, by region, 1974 survey

Miles	South	Midwest	Southwest	West	Total
			Percent		
1-25	4.5	27.6	6.1	9.7	18.9
26-50	6.8	20.8	9.0	8.9	15.8
51-100	8.2	15.1	18.6	11.7	15.4
101-300	31.6	18.0	33.2	37.6	24.7
301-500	14.8	9.5	14.6	15.0	11.7
501-1,000	21.6	7.3	10.3	12.9	9.3
1,000 or more	12.5	1.7	8.2	4.2	4.2
Total	100.0	100.0	100.0	100.0	100.0

Table 8.--Average round trip distance for livestock trucks in 1973 by truck type, firm size, and region, 1974 survey

Region and truck type	Firm size (trucks)			All firm sizes
	1-4	5-10	11 or more	
	Miles			
South				
Tractor-trailers	848	598	954	836
Straight trucks	104	176	94	106
All trucks	514	592	922	744
Midwest				
Tractor-trailers	214	484	534	346
Straight trucks	102	120	50	102
All trucks	160	452	508	260
Southwest				
Tractor-trailers	316	418	524	446
Straight trucks	212	78	98	134
All trucks	312	410	524	440
West				
Tractor-trailers	598	344	418	392
Straight trucks	--	110	142	120
All trucks	598	330	408	380
All regions				
Tractor-trailers	260	436	558	412
Straight trucks	102	114	78	102
All trucks	194	416	542	344

were 50 miles or less while about 46 percent of all trips by the largest firms were over 300 miles. Average trip lengths for firms in the South were considerably longer than those for firms in other regions. For southern firms, only about 11 percent of their trips were 50 miles or less, whereas for those in the Midwest, over 48 percent of trips were 50 miles or less.

The average yearly mileage per truck for all firms in the survey was about 83,000 miles in 1973 (table 9). This total compares favorably with the average of 80,077 miles per year in 1973 reported by class I motor carriers in the United States (3, p. 12). 7/ Yearly mileage for tractor and trailers was about three times that of straight trucks. Larger firms had considerably greater average yearly mileages per truck than smaller firms. Firms in the West averaged the most, about 112,000 miles per truck.

7/ The average yearly mileage for class I motor carriers was obtained by dividing "total miles operated--all vehicles in intercity highway service" by "total number of power units--intercity revenue service."

Table 9.--Average yearly mileage of livestock trucks in 1973 by truck type, firm size, and region, 1974 survey

Region and truck type	Firm size (trucks)			All firm sizes
	1-4	5-10	11 or more	
	1,000 miles			
South				
Tractor-trailers	128.4	124.3	92.8	102.7
Straight trucks	60.3	12.9	18.7	39.4
All trucks	114.8	118.2	91.0	99.2
Midwest				
Tractor-trailers	68.7	85.0	107.8	83.7
Straight trucks	32.7	24.8	27.2	32.0
All trucks	50.9	78.8	106.0	67.5
Southwest				
Tractor-trailers	82.2	92.1	113.5	100.8
Straight trucks	24.9	21.3	43.7	25.4
All trucks	77.8	90.6	113.2	96.7
West				
Tractor-trailers	148.7	112.2	105.2	113.7
Straight trucks	--	51.0	65.0	55.0
All trucks	148.7	109.3	104.3	111.8
All regions				
Tractor-trailers	77.3	93.2	107.6	94.3
Straight trucks	32.9	26.5	32.8	32.2
All trucks	59.0	88.9	106.5	82.9

Seasonal Variation

One problem that most livestock truckers face year after year is that livestock shipments vary by season. The result is considerable underutilization of equipment and drivers during some months each year. And it probably causes rates that are higher than would be expected if shipments were more regular throughout the year. The cost per mile for operating a livestock truck tends to decrease as the yearly level of vehicle use increases (1, p. 19). Also, many shippers have reported difficulties in obtaining enough for-hire trucks during the periods of peak movements (2, pp. 13-15).

Shipments of truckers interviewed in the survey varied considerably by month during the September-November period than in the February-April period. However, the extremes between the high and low months show the seriousness of the problem of driver and equipment utilization. Firms hauled about 74 percent more loads during October than during February. Thus, if all livestock truckers were hauling at 100 percent capacity during October, driver and

vehicle utilization for hauling livestock during February would have been at approximately 57 percent of capacity. 8/

Regions differed substantially by season for movements. Although all regions had heavy movements during the fall, some regions experienced more seasonality than others. The Southwest and West had some increase in shipments during May and June. Overall, truckers in the South faced almost twice as much seasonal variation as those in the Midwest, and truckers in the West experienced over twice as much seasonal variation as those in the Midwest. 9/

Table 10.--Percentage of trips for each month in 1973, by region, 1974 survey

Month	Region				Total
	South	Midwest	Southwest	West	
	Percent				
January	6.1	8.4	7.2	6.8	7.5
February	5.8	7.7	6.3	5.4	6.8
March	6.8	7.8	7.7	5.4	7.4
April	6.5	7.3	7.5	7.6	7.3
May	7.0	7.6	9.1	11.2	8.5
June	7.2	7.3	9.4	9.5	8.3
July	9.6	6.8	8.0	6.2	7.4
August	11.3	8.3	8.8	6.9	8.6
September	11.0	9.1	9.3	10.3	9.5
October	10.8	11.6	12.0	12.5	11.8
November	10.0	9.9	9.3	10.5	9.8
December	7.9	8.2	5.4	7.7	7.1

Most of the seasonality in cattle shipments appears to be due to the movement of feeder cattle and cull breeding or excess stock from farms and ranches during certain periods each year. The extent to which such seasonal marketing adversely affects the supply of for-hire trucks for hauling fat cattle and hogs is not known. However, cattle feeders surveyed in 1973 reported less difficulty in obtaining trucks than did livestock handlers (2, pp. 13-15). Shippers will probably continue to face the present rate structure and difficulty in finding enough trucks during peak periods as long as current seasonal patterns of marketing feeder cattle and cull breeding stock continue.

8/ The estimated vehicle utilization of 57 percent does not include the 1 percent of tractors and trailers reported to be under short-term lease arrangements.

9/ This statement is based on each region's total plus and minus monthly deviations in number of loads from the average per month.

Load Availability Information

It has been suggested that livestock truckers have a very poor system of determining where and when loads are available to haul. Truckers interviewed indicated that 95 percent of all loads hauled resulted from direct contact between the truckers and shippers. Only 1 percent of all loads were arranged by truck brokers and 2 percent by truckers other than the one interviewed. Other sources, such as contract hauling and loads obtained at auction barns, accounted for the remaining 2 percent.

Firms were asked to rate the quantity and quality of load availability information. Quantity was rated plentiful by 33 percent of the firms, acceptable by 32 percent, and scarce by 35 percent. Quality was rated good by 37 percent of the firms, acceptable by 31 percent, and poor by 32 percent. Thus, at least one-third of the firms felt that they would benefit if load information could be increased and improved.

Loss and Damage Claims

Charges have been made that many livestock truckers do not take proper care of their cargo, resulting in considerable loss and damage. If this is so, these firms should have a number of loss and damage claims lodged against them each year. The average number of claims reported by all firms in the survey was less than 1 percent of the loads hauled (table 11). The average rate of claims ranged from 0.5 percent in the West to 3.5 percent in the South. However, an analysis of variance test assuming no difference between regions resulted in an F value of .49. The hypothesis of no difference in the rate of claims between regions was accepted at the .05 level of significance. An analysis of variance test of no difference among firms of various size groups was also made. The test yielded an F value of .03, and the hypothesis of no difference among firms of certain size groups was accepted at the .05 level of significance.

Table 11.--Percentage of loads with loss and damage claims in 1973, by region and firm size, 1974 survey

Region	Firm size (trucks)			All firm sizes
	1-4	5-10	11 or more	
	Percent			
South	2.3	1.1	5.4	3.5
Midwest	0.9	1.1	0.4	0.8
Southwest	1.2	0.6	0.9	0.9
West	0.7	0.4	0.8	0.5
Total	0.9	0.8	1.1	0.9

The difference in the rate of claims associated with region and firm size shown in table 11 would suggest a possible relationship between the number of

claims and the distance traveled (table 7). Survey responses were for the total number of claims made, not for specific trips or trip distances. Therefore, no direct test of the relationship between rate of claims and distance traveled could be made. However, a test of the relationship between rate of claims and average trip distance per firm was made. Firms were divided into two groups, those with average trip distances of 200 miles or less and those with trip distances of 201 miles or more. An analysis of variance test of no difference between the two groups resulted in an F value of .98. The hypothesis of no difference between the two groups was accepted at the .05 level of confidence.

There are factors in livestock trucking, such as the actual distance traveled; species, type, or size of animal; and condition of animals before loading, that may influence the rate of claims. However, these factors were not tested because of data limitations.

The survey of livestock shippers conducted in 1973 found that livestock handlers' losses were only about 35 out of every 100,000 head of cattle hauled (2, p. 22). Thus, many claims reported in this survey were for injuries or other problems and not for intransit death loss. Overall, the low rate of claims reported indicates that loss and damage are not serious problems in livestock trucking.

The most widely used means of compensating shippers for loss and damage was through cargo insurance (table 12). Cargo insurance was more widely used

Table 12.--Percentage of loss and claims paid to livestock shippers in 1973, by type of compensation and region, 1974 survey

Region	Paid by cargo insurance	Paid by trucker	Paid by cargo insurance and by trucker	Other
		Percent		
South	23	27	48	2
Midwest	72	17	1	10
Southwest	34	41	25	--
West	26	55	11	8
Total	51	27	16	6

in the Midwest than in the other regions. Many firms used their own funds to compensate for loss and damage claims. Several firms used a combination of cargo insurance and company funds. A few firms had other means for settling the claims, such as that of having the trucker pay for half the loss and the livestock owner assume the other half.

Nonlivestock Trucking Activity

Nonlivestock Vehicles

The highly seasonal nature of livestock marketing could make it beneficial for some livestock truckers to engage in other trucking activities in the off seasons. About 38 percent of the livestock truckers interviewed operated nonlivestock vehicles. The percentage of firms owning nonlivestock trucks and/or trailers was almost twice as high in the Midwest and West as in the South and Southwest.

The firms owning nonlivestock vehicles averaged 3.6 of these vehicles per firm. The most popular vehicle was the grain truck or trailer, accounting for 40 percent of the nonlivestock vehicles. The refrigerated van trailer was second at 12 percent. Tank trailers and straight trucks (unspecified) each accounted for 11 percent. Dry van trailers made up 10 percent and flatbed trailers accounted for 8 percent of the nonlivestock equipment. The remaining equipment consisted of feed van trailers, fertilizer trailers, truck tractors, and other unspecified vehicles.

Truckers reported less monthly variance in the use of their nonlivestock vehicles--about one-third of that for their livestock trucks. If the firms are using these vehicles to supplement their livestock vehicles, in most cases it apparently occurs on a day-to-day or week-to-week basis rather than during the extended periods of low livestock shipments.

Truck Leasing

One method for fuller utilization of drivers and equipment is to lease vehicles for short periods, with or without the drivers' services, to other trucking firms. However, slightly less than 9 percent of the livestock truckers interviewed used this method in 1973. Of firms leasing their vehicles, about 55 percent furnished the driver.

RATES AND RATEMAKING

Rates Charged

Firms were asked to report the rates they charged for trips of specific lengths, ranging from 25 to 1,000 miles one way for 1972, 1973, and 1974. Rates were reported in the following ways: (1) per head; (2) per hundredweight; (3) per full load; (4) per mile; and (5) other. These rates were also reported for type of vehicle used.

All rates reported as full load and per mile were converted to hundredweights for this report through use of an estimated hundredweight per load for each type of vehicle used in each State where the firm was located. Rates reported per head and for unspecified or partial loads were not converted and are not presented.

The truckers reported approximately 6 rates per firm for each of the 3 years. Charges for straight trucks accounted for about 23 percent of the

rates. Of the 77 percent of the rates reported for trailers and trailer combinations, about 40 percent were for pot trailers. Some 69 percent of all rates reported came from firms operating in the Midwest; 19 percent from firms in the Southwest; 8 percent, firms in the West; and 4 percent, firms in the South. Firms operating 11 or more trucks reported about 8 percent of the rates; firms with 5 to 10 trucks, 24 percent of the rates; and firms with 1 to 4 trucks, 68 percent of the rates.

The average rate reported increased 19.6 percent between 1972 and 1974. Rates for the shorter and longer trips tended to increase more than those for the medium-length trips (table 13). The pot trailer had the largest increase in average rates with 19.7 percent, while the cattlebox and pull trailer had the smallest at 15.9 percent.

Table 13.--Average hundredweight rates charged by livestock truckers in 1972-74, by type of vehicle, for specific one-way trip distances, 1974 survey

One-way trip distance (Miles)	Straight truck	Flatbed trailer, 1 deck	Flatbed trailer, 2 decks	Pot trailers	Cattlebox and trailer	Double trailers	All vehicles
			Dollars per hundredweight				
1972							
25	0.14	0.15	0.12	0.11	0.12	0.12	0.13
50	.22	.21	.20	.17	.18	.18	.20
100	.33	.29	.30	.27	.27	.27	.29
300	.85	.71	.58	.59	.62	.64	.64
500	1.59	1.21	.90	.88	.92	.98	.98
1,000	1/	2.70	1.58	1.60	1.98	2.01	1.76
1973							
25	.15	.16	.12	.11	.14	.13	.14
50	.23	.22	.21	.20	.19	.19	.21
100	.35	.31	.31	.29	.28	.28	.31
300	.92	.75	.60	.63	.65	.67	.68
500	1.75	1.28	.96	.94	1.03	1.07	1.05
1,000	2.48	2.77	1.72	1.76	2.18	2.18	1.91
1974							
25	.17	.19	.15	.13	.15	.15	.16
50	.26	.25	.23	.23	.22	.22	.24
100	.40	.35	.34	.32	.31	.33	.34
300	1.02	.84	.67	.69	.72	.75	.76
500	1.92	1.40	1.09	1.05	1.15	1.20	1.17
1,000	2.60	3.03	1.98	1.99	2.44	2.45	2.15

1/ Less than three unexpanded observations.

Truckers tended to charge higher per hundredweight rates for straight trucks and flatbed trailers with one deck. The pot trailer tended to have

lower rates for shorter trips, and the flatbed trailer with two decks had lower rates for longer trips.

A series of statistical tests were made to determine if 1973 rates charged for trucks of various sizes differed significantly. Each truck size was compared with the next larger truck size, and trailers with one deck were also tested against pot trailers. 10/ Rates were paired for the same firm and drawn from the mileage category that had the most paired rates for the truck types to be analyzed. There were 443 paired rates from the expanded data.

Of the comparisons made, rates charged for different truck sizes differed significantly except for the flatbed trailer with two decks and the pot trailer. The results of the t-tests are as follows:

Truck size 11/		Number of paired observations	Mileage category	Average rate per hundredweight		t value
X_1	X_2			X_1	X_2	
1	2	186	25	.162	.157	6.44
2	3	18	300	.810	.668	9.46
3	4	58	300	.643	.643	0
4	5	0	--	--	--	--
5	6	25	300	.669	.667	2.82
2	4	156	300	.748	.604	12.17

For pot trailers, firms located in the South tended to charge lower rates than those elsewhere except for the longest trips (table 14). 12/ Rates in the West tended to be the highest for most trips; those in the Midwest were the lowest for the longest trips.

Several t-tests were conducted to determine if there were significant regional differences among rates charged by firms. Each region was analyzed with every other region for pot trailers for the 300-mile trip category. In this analysis there were uneven numbers of rates among the regions, and the "pooled" observations method was used to obtain the standard deviations.

The results of the t-tests indicate no significant difference in rates charged among the various regions for pot trailers on the 300-mile trips:

10/ Flatbed trailers with one deck and pot trailers were tested against each other because pot trailers and flatbed trailers with two decks had approximately the same weight restrictions in all States.

11/ Truck sizes: (1) Straight trucks; (2) flatbed trailers with one deck; (3) flatbed trailers with two decks; (4) pot trailers; (5) cattlebox and pull trailers; and (6) double trailers.

12/ Rates charged for pot trailers were used to compare rates between regions and firm size to eliminate the differences caused by truck size.

Region 13/		Number of observations		Average rate per hundredweight		t value
X_1	X_2	X_1	X_2	X_1	X_2	
1	2	20	370	.60	.62	.612
1	3	20	140	.60	.60	0
1	4	20	19	.60	.61	.232
2	3	370	140	.62	.60	1.485
2	4	370	19	.62	.61	.294
3	4	140	19	.60	.61	.345

For pot trailers, the smallest and medium-sized firms tended to charge higher rates than the large firms except for the longer trips (table 15). 14/

Table 14.--Average hundredweight rates charged by livestock truckers for pot trailers in 1972-74, by region, 1974 survey

One-way trip distance (Miles)	South	Midwest	Southwest	West	Total
		Dollars per hundredweight			
1972					
25	0.08	0.11	0.11	0.12	0.11
50	.13	.18	.16	.19	.17
100	.20	.28	.25	.30	.27
300	.52	.59	.62	.61	.59
500	.77	.84	1.01	1.00	.88
1,000	1.69	1.47	1.78	1.93	1.60
1973					
25	.08	.11	.12	.12	.11
50	.13	.20	.17	.19	.20
100	.21	.30	.27	.30	.29
300	.58	.62	.64	.61	.63
500	.83	.90	1.06	1.03	.94
1,000	1.86	1.65	1.90	2.05	1.76
1974					
25	.11	.13	.13	.16	.13
50	.16	.24	.19	.22	.23
100	.26	.33	.29	.36	.32
300	.66	.70	.70	.70	.69
500	.96	1.03	1.14	1.11	1.05
1,000	2.15	1.90	2.09	2.21	1.99

13/ Regions: South, Midwest, Southwest, and West.
14/ See footnote 12, page 14.

Table 15.--Average hundredweight rates charged by livestock truckers for pot trailers in 1972-74, by firm size, 1974 survey

One-way trip distance (Miles)	Firm size (trucks) 1-4	5-10	11 or more	Total
	Dollars per hundredweight			
1972				
25	0.11	0.12	0.08	0.11
50	.18	.15	.13	.17
100	.27	.28	.25	.27
300	.61	.56	.58	.59
500	.87	.87	.94	.88
1,000	1.48	1.58	1.89	1.60
1973				
25	.11	.13	.09	.11
50	.21	.16	.15	.20
100	.29	.29	.28	.29
300	.64	.59	.62	.63
500	.93	.93	.99	.94
1,000	1.68	1.70	2.10	1.76
1974				
25	.13	.15	.11	.13
50	.24	.20	.18	.23
100	.32	.32	.32	.32
300	.71	.67	.68	.69
500	1.06	1.03	1.09	1.05
1,000	1.97	1.87	2.23	1.99

Tests were made to determine if rates differed significantly by size of firms in 1973. Each of the three firm size categories was analyzed with the other two size categories. Rates analyzed were for pot trailers for the 300-mile trip category. As with the analysis of regions, the "pooled" method was used to obtain the standard deviations.

The results of the t-tests indicate no significant difference between the largest firms and firms in the other two categories. However, there was a significant difference between the medium-sized firms and the smaller firms. The results of the t-tests are as follows:

Firm size 15/		Number of observations		Average rate per hundredweight		t value
X_1	X_2	X_1	X_2	X_1	X_2	
1	2	49	136	.62	.58	1.95
1	3	49	352	.62	.64	.93
2	3	136	352	.58	.64	4.2

15/ Firm size groups: 11 or more trucks, 5-10 trucks, and 1-4 trucks.

Determination of Rates

Firms were asked to state how they determined the rates they charged. Some firms gave more than one answer to the question; however, in most cases they gave one answer for intrastate shipments and another for interstate shipments. Specific answers varied considerably, but many were enough alike to be classified into five general categories and one catch-all category (table 16).

Table 16.--Distribution of methods used by livestock truckers to determine rates charged in 1972-74, by region, 1974 survey

Methods used	South	Midwest	Southwest	West	Total
			Percent		
State regulation	--	25.4	62.1	67.4	44.3
Truckers' expenses plus profit	54.5	28.8	10.3	8.7	21.1
Going rate	9.1	25.4	12.1	10.9	15.7
Trucker competition	--	18.7	--	10.9	8.6
Negotiated with shipper	22.7	--	15.5	2.1	8.1
Other	13.7	1.7	--	--	2.2
Total	100.0	100.0	100.0	100.0	100.0

Intrastate regulation was the method most widely used to determine rates. However, no firms in the South and only about one-fourth of the firms in the Midwest reported using this method. The second most popular means of determining rates was on the basis of the trucker's expense plus a reasonable profit. The going rate and a rate set through trucker competition were methods used extensively by firms in the Midwest. A number of truckers in the South negotiated with shippers to determine rates.

Overall, about 32 percent of the bases given for determining rates were related to the competition found in the marketplace. Approximately 65 percent were set either by State regulatory commissions under their authority to control intrastate livestock trucking rates or by the truckers whose situations permitted them to determine the level of rates. The remaining 2 percent includes a combination of these two methods.

BACKHAULING

Loaded backhaul for the livestock trucker can be very beneficial both to the trucker and to the shippers. There is little additional expense of carrying a load over that of returning empty to the point of origin (1, pp. 13-17). Thus, if backhaul loads are readily available, truckers can bring charges for both hauls more in line with each other. Otherwise, they may offer low backhaul rates to attract customers.

The source of backhaul information was similar to that for initial hauls. Direct contact between the trucker and shipper accounted for 93 percent of the loads. Brokers and other sources each accounted for only 1 percent of the loads. Truckers, other than the ones interviewed, accounted for 5 percent of the loads.

Extent

Over 52 percent of all truckers interviewed had loaded backhauls on some of their trips. More truckers operating in the South, about 86 percent, tended to have loaded backhauls than in other regions. The smallest percentage of truckers with loaded backhauls were with midwestern firms; slightly under 50 percent of them reported loaded backhauls.

Only about 10 percent of all trips made in 1973 by the truckers interviewed involved loaded backhauls (table 17). The percentage varied considerably by region; firms in the South obtained about 19 percent loaded backhauls and firms in the Midwest obtained slightly less than 9 percent. The longer trips tended to produce more loaded backhauls; however, this finding did not hold for all regions.

Table 17.--Percentage of trips with loaded backhaul in 1973, by region, 1974 survey

One-way mileage	South	Midwest	Southwest	West	Total
			Percent		
25 or less	0	0.4	0	0.5	0.3
26-50	0	3.6	0	0	2.8
51-100	0.9	19.1	5.1	3.5	12.9
101-500	17.4	13.6	11.5	17.7	13.5
501-1,000	32.5	17.9	9.1	8.1	15.4
1,001 or more	45.1	2.6	28.3	1.9	21.9
Total	19.2	8.8	9.7	10.1	9.7

Types

About 98 percent of the firms reporting loaded backhauls hauled cattle on some of their return trips. Twenty-four percent reported hauling hogs; 5 percent sheep; and 4 percent, other animals. Approximately 15 percent of these firms carried products other than livestock on some of their backhauls. Items included onions, melons, field seeds, hay, feed, machinery, lumber, petroleum products, and various other goods.

Seasonal Variation

Occurrence of loaded backhauls was highly seasonal in 1973. Truckers reported 133 percent more backhauls in October than in February (table 18).

Table 18.--Percentage of trips with loaded backhaul for each month in 1973, 1974 survey

Month	South	Midwest	Southwest	West	Total
			Percent		
January	4.7	6.1	5.0	8.0	5.8
February	5.6	4.7	5.2	7.8	5.4
March	6.0	5.4	7.9	2.6	6.0
April	6.3	4.7	7.7	4.8	6.0
May	6.4	5.8	8.1	6.1	6.7
June	6.8	6.0	7.3	14.5	7.8
July	11.3	7.1	11.0	5.7	8.8
August	13.8	13.5	12.2	6.0	12.0
September	11.7	13.7	10.2	12.4	12.0
October	11.3	13.5	11.7	13.5	12.6
November	9.6	10.1	8.7	9.1	9.4
December	6.5	9.4	5.0	9.5	7.5

Loaded backhauls were more predominant during August, September, and October than other months in all regions except the West. There they were more predominant in June, followed closely by September and October.

More than twice as much seasonality was reported for loaded backhauls as for initial hauls. 16/ Loaded backhauls varied much more by season than did initial hauls in all regions. In the Midwest, the figure was more than three times greater.

Since the big increase in loaded backhauls occurred during late summer and early fall, the possibility for loaded backhauls is apparently greater when hauling feeder cattle over long distances.

Rates Charged

Firms were asked to report the rates they charged for backhaul loads of specific lengths, ranging from 25 to 1,000 one-way miles in 1973. These rates were reported in the same manner as were rates for the initial hauls. All rates were converted to a per hundredweight basis for presentation here. There were approximately 1.5 backhaul rates per firm reported in the survey.

For comparative purposes, backhaul rates reported here were restricted to those for pot trailers, and were paired with initial haul rates reported by individual firms. Backhaul rates tended to be lower than those for the initial haul, except for the shortest trip category where the rates were the same (table 19).

16/ See footnote 9.

Table 19.--Average hundredweight rates, paired for backhaul and initial haul by individual firms, charged by livestock truckers for pot trailers in 1973, by region, 1974 survey

One-way trip distance	South	Midwest	Southwest	West	Total
		Dollars per hundredweight			
		Backhaul rates			
25	--	0.07	1/	--	0.07
50	1/	.21	.18	1/	.20
100	1/	.25	.27	1/	.27
300	.59	.39	.63	1/	.47
500	.77	.72	1.02	1/	.81
1,000	1.18	1.24	1.57	1/	1.31
		Initial haul rates			
25	--	.07	1/	--	.07
50	1/	.23	.23	1/	.22
100	1/	.30	.27	1/	.30
300	.62	.53	.66	1/	.57
500	.82	.87	1.07	1/	.93
1,000	1.95	1.81	1.89	1/	1.85

1/ Less than three unexpanded observations.

For all firms in the survey reporting backhaul rates for pot trailers, the average backhaul rate was about 19 percent lower than the average rate for pot trailers on the initial haul. Firms in the South tended to have lower backhaul rates--about 28 percent less than the rates for the initial haul.

A t-test was made to determine if backhaul and initial haul rates differed significantly. Rates were limited to those for pot trailers for the 500-mile trip category. 17/ From the 208 expanded observations, the test yielded a t-value of 14.86. This test indicates a highly significant difference between backhaul and initial haul rates for pot trailers and all vehicles in the 500-mile trip category.

Determination of Rates

Firms were asked to state how they determined the backhaul rates they charged. Answers were classified into seven general categories and one catch-all category (table 20).

17/ Vehicles on the 500-mile category had the most paired observations and the least average difference (12.1 percent) between the backhaul and initial haul rates of the 3 longer mileage categories.

Table 20.--Distribution of methods used by livestock truckers to determine backhaul rates charged in 1973, by region, 1974 survey

Methods used	South	Midwest	Southwest	West	Total
			Percent		
State regulation	--	8.3	53.4	55.5	31.1
Truckers' expenses plus profit	11.1	16.7	20.0	11.1	15.6
Going rate	11.1	25.0	6.7	5.6	12.2
Negotiated with shipper	22.2	8.3	10.0	5.6	11.1
Set by shipper	38.9	8.3	--	--	10.0
Trucker competition	--	20.9	--	16.6	8.9
Same as regular haul	5.6	12.5	3.3	5.6	6.7
Other	11.1	--	6.6	--	4.4
Total	100.0	100.0	100.0	100.0	100.0

Intrastate regulation of rates was the method given most often for determining rates, but only 31 percent of the truckers cited this method. As the second most frequent choice, the trucker used expenses plus a reasonable profit. In several cases, the rates were set by the firms doing the shipping, such as packers. Charging the same rate for both initial and backhaul loads accounted for slightly less than 7 percent of the methods given by truckers.

Backhaul rates for pot trailers that truckers reported as set by shippers averaged approximately 17 percent lower than rates for the initial haul. All backhaul rates reported averaged about 19 percent lower than initial haul rates.

Overall, about 32 percent of the methods given for determining backhaul rates are related to the competition found in the marketplace. Approximately 63 percent were set by either State regulatory commissions under their authority to control intrastate livestock trucking rates or the truckers or shippers whose situations permitted them to determine what the rates would be. The rest of the methods in the catchall category would include both of the above methods of determining rates.

IMPACT OF THE FUEL CRISIS

Vehicle Utilization

The fuel shortage of late 1973 and early 1974 resulted in the reduction of maximum speed limits to 55 miles per hour. An expressed purpose of this law was to reduce fuel consumption on the Nation's highways. However, many trucker representatives expressed concern about the new speed limit because of

the possible adverse effects it could have on trucking operations. It was pointed out that the lower speed limit would reduce driver and vehicle efficiency by requiring longer hours to perform the same amount of service.

Livestock truckers were asked if the 55-mile per hour speed limit had reduced the number of miles they were able to operate their trucks each week. About 53 percent of the firms indicated that the new speed law had adversely affected their level of use. These firms indicated that it had reduced the miles per week for each truck by an average of 12.6 percent. The remaining 47 percent reported no adverse effects.

Fuel Consumption

All firms were asked to report the miles per gallon they obtained with their trucks at the 1973 speed limit and at the new speed limit. About 52 percent of the firms operating diesel trucks and 70 percent of the firms operating gasoline trucks indicated that the new speed limit had not affected how many miles they got per gallon (table 21). Of the firms that experienced changes in fuel consumption, about four times as many reported a decrease in miles per gallon as those that reported an increase.

Table 21.--Distribution of firms showing effects of 55 mile per hour speed limit on mileage per gallon, by region, 1974 survey

Effect on mileage per gallon	South	Midwest	Southwest	West	Total
			Percentage of firms		
Gasoline trucks					
No change	85.7	58.1	90.9	100.0	70.0
Decrease	14.3	35.5	--	--	24.0
Increase	--	6.4	9.1	--	6.0
Diesel trucks					
No change	57.7	42.5	46.2	66.7	51.8
Decrease	34.6	47.5	41.0	23.3	37.8
Increase	7.7	10.0	12.8	10.0	10.4

Miles per gallon were reported to have decreased an average of 8.2 percent for all gasoline trucks and 4.5 percent for all diesel trucks because of the change to the lower speed limit. Firms in the Midwest reported the largest decrease for gasoline trucks and firms in the South reported the largest for diesel trucks. Firms in the West were least affected.

The reduction in miles per gallon probably reflects a shortrun situation, where trucks were geared to run at maximum fuel efficiency at speeds above 55 miles per hour. Over the longrun, most truckers would be expected to make the necessary adjustments in their vehicles to obtain the maximum fuel efficiency at 55 miles per hour.

Fuel Cost

Firms interviewed were asked about the cost of their fuel purchased in bulk and on the road in 1973 and 1974. The average price per gallon was reported to have increased 44 percent for gasoline and 40.5 percent for diesel fuel between 1973 and 1974 (table 22). If the firms interviewed had traveled the same number of miles per year in 1974 as in 1973, the estimated fuel cost per firm would have risen an average of 47.8 percent.

Table 22.--Percentage increase in fuel cost per gallon and estimated total fuel cost for gasoline and diesel trucks between 1973 and 1974, by region, 1974 survey

Region	Gasoline trucks		Diesel trucks		All trucks
	Cost per gallon	Total fuel cost 1/	Cost per gallon	Total fuel cost 1/	Total fuel cost 1/
			Percent		
South	41.1	49.0	53.1	64.6	64.3
Midwest	44.0	56.6	36.8	42.6	44.6
Southwest	46.7	46.8	36.8	43.8	43.9
West	--	--	54.9	58.8	58.8
Total	44.0	56.1	40.5	47.2	47.8

1/ The data in this column represent the estimated weighted average percentage increase in total fuel cost for all firms reporting their fuel consumption. The weighting factor for each firm was its gross annual mileage in 1973.

The increase in fuel cost per gallon between 1973 and 1974 increased total operating costs an estimated 5 to 6 percent. The decrease in miles per gallon would have added another 1 percent. All haul rates rose about 12 percent during the same period. The increase in fuel cost per gallon thus appears to equal almost half the increase in rates charged between 1973 and 1974.

Linear regression equations were developed relating the differences between years in rates per hundredweight for pot trailers to distance. The results of the analyses appear below:

Year	Variables of regression		Coefficients of regression		
	Average difference in rates per hundredweight	Average distance	Intercept	Mileage coefficient	r^2
1972 and 1973	.0445	345.5	-.00696	.00149**	.396
1973 and 1974	.0877	347.5	-.0009	.000255**	.458

**Significant at .001 level.

In both equations, the intercept values were not significant at the .05 level and the mileage coefficients were significant at the .001 level. Rate increases were apparently caused primarily by increased variable cost, which would include fuel cost.

CONCLUSIONS

Data from the mail survey indicate that livestock trucking firms are not highly unstable businesses. Such a charge has been made by some truckers and shippers.

The average size of livestock trucking firms in the survey is relatively small--about five tractors and trailers per firm. Given the stability reflected by years in business, this finding indicates no large economies of scale are available to most livestock truckers under the present system.

The level of equipment use appears to be good, considering the amount of seasonal variation in livestock shipments. Equipment use found in the Midwest reflects the extensive use of vehicles there for shorter trips. Also, trip distances reported reflect patterns of livestock movement in the different regions.

Seasonal variation in livestock movements results in some problems for the livestock truckers and shippers. However, as long as the present seasonal patterns of cattle marketing continue, truckers will need considerable excess capacity during much of the year to meet the peak demands for their services, or the cattle shippers will not be able to hire all the trucks they want at a specific time.

Some type of improved load availability information system for livestock truckers and shippers would be desirable. Determining the feasibility of such a system and how it could be put into operation were beyond the scope of the study.

Loss and damage claims reported by truckers do not appear to be excessive. The number of firms that do not depend on cargo insurance to pay loss and damage claims would indicate that many truckers have found the cost of the insurance to be higher than the expected benefits.

The analysis of rates by truck size suggests that rates charged are closely associated with the cost of providing the service. Analysis of rates regionally indicates that livestock trucking is highly competitive throughout the four regions surveyed.

The backhaul situation reported by the truckers may offer some possibility of increased efficiency. With more and better backhaul information, truckers might be able to increase their level of loaded backhaul. However, any improvement would probably be limited because some of the products that could be backhauled in livestock trailers require operating rights. Beyond this problem, some areas from which livestock are shipped receive very few products from other areas of destination.

Nonlivestock trucking activity appears to be important to a number of livestock truckers. If this activity could be increased during the periods of low livestock shipments, the level of use of drivers and truck-tractors could be raised. More firms, especially in the South and Midwest, might benefit by developing nonlivestock trucking activities.

By and large, the effects of the 55-mile per hour speed law have been to lower driver and equipment use and to increase per mile fuel consumption for firms in the survey. For these firms, the increase in fuel cost has been responsible for about one-half the increase in rates charged between 1973 and 1974.

APPENDIX

Livestock truckers were sampled over a wide geographic area of the country. Truckers were interviewed in 22 States, ranging from Virginia to Texas and Oregon. However, this was not a representative national sample of all types of livestock truckers. It was developed to be representative of truckers used by the livestock shippers surveyed in 1973 (2).

Sample Frame Development

Each respondent in the 1973 survey of livestock handlers and cattle feeders was asked to list the livestock truckers the firm used in 1972. 1/ The respondent was asked to supply the trucker's name, address, and telephone number, if known. These firms supplied over 2,000 names of truckers located in 30 States. Removal of duplicates that could be readily determined reduced the list to 1,470 firms.

A mail questionnaire was sent to 951 firms on the trucker list to determine: (1) number of trucks operated, (2) number of years the firm had been in business, (3) correct address and telephone number, and (4) any remaining duplication. 2/ For nonrespondents, the mail survey was followed up with a telephone inquiry.

There were 684 firms that completed the questionnaire either by mail or telephone. There were 114 firms not located either by mail or telephone. Also, 153 firms were duplicates, did not haul livestock in 1974, or were no longer in business.

When these firm names were expanded to reflect the original universe of 1,470 firm names, they represented 1,110 firms located, 152 firm names not located, and 208 firms out of business or listed as duplicates. Thus, the universe for the personal interview survey represented 1,262 firms.

1/ See (2, pp. 2-4) for the details of the sample of livestock handlers and cattle feeders.

2/ Due to time and personnel constraints, mail questionnaires were sent to 117 of 468 firms in Iowa, 112 of 224 firms in Nebraska, and 113 of 169 firms in Texas. Mail questionnaires went to all 609 firms located in the other 27 States.

Sampling Procedure

Firm names were stratified into three size groups according to the number of trucks they reported operating and into one group whose size was not known: (1) 1 to 4 trucks; (2) 5 to 10 trucks; (3) 11 or more trucks; and (4) size not known. Five major types of trucks were included (app. fig. 1). For sampling purposes, the firms were grouped into four regions: (1) South; (2) Midwest; (3) Southwest; and (4) West (app. fig. 2). 3/ These two main classifications resulted in a 4 by 4 sampling frame. Sampling was done so as to give considerable weight to each cell in the sampling frame.

There were 171 firms drawn in the sample (app. table 1). The sampling level was the highest in the South with expansion factors ranging from 1.571 to 2.000. The sampling level was lowest in the Midwest; expansion factors ranged from 3.286 to 32.053.

Appendix table 1.--Sampling procedures for livestock trucker survey, 1974

Firm size	South	Midwest	Southwest	West	Total
No. of trucks		Firms in survey universe			
1-4	22	609	91	29	752
5-10	11	124	85	28	247
11 or more	16	46	35	14	111
Not known	2	82	65	5	152
Total	51	861	274	76	1,262
		Firms in sample			
1-4	11	19	16	12	58
5-10	7	17	15	11	58
11 or more	9	14	13	8	44
Not known	1	8	8	2	19
Total	28	58	52	33	171
		Expansion factors			
1-4	2.000	32.053	5.688	2.417	
5-10	1.571	7.294	5.667	2.545	
11 or more	1.778	3.286	2.692	1.750	
Not known	2.000	10.250	7.875	2.500	

Field Survey Response

The field survey was conducted by personal interviews with the livestock truckers in the sample. There were 153 livestock truckers, or 89 percent, who

3/ There were no livestock trucking firms located in the Northeast on the list furnished by shippers in the 1973 survey.

completed the questionnaire (app. table 2). The refusal rate was less than 2 percent. About 5 percent were beyond the scope of the study. 4/ About 4 percent of the firms were not located or could not be contacted by the enumerators.

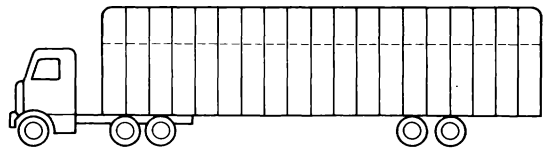
Appendix table 2.--Survey response for livestock trucker survey, 1974

Region	Firms in sample	Firms completing questionnaire	Non-cooperators	Beyond scope of survey	Unable to contact
South	28	27	--	1	--
Midwest	58	51	2	4	1
Southwest	52	44	1	3	4
West	33	31	--	1	1
Total	171	153	3	9	6

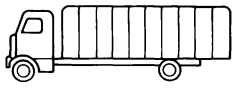
4/ Firms listed as beyond the scope of the study included one firm that did not haul for-hire in 1973, one active trucking firm that did not haul livestock in 1973, and seven firms that were out of business. Most of the seven firms out of business did not haul livestock in 1973, the year for which most of the data were requested.

TRUCKS AND TRAILERS USED BY LIVESTOCK TRUCKERS IN 1973 SURVEY

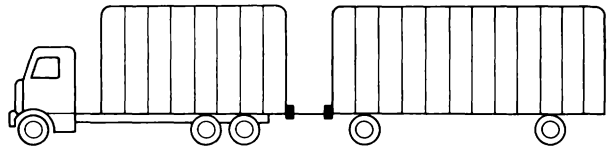
Flatbed livestock trailers, 1 or 2 deck



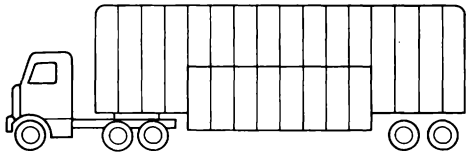
Straight truck



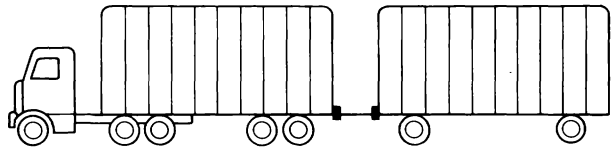
Cattlebox and pull-trailer



Pot trailer

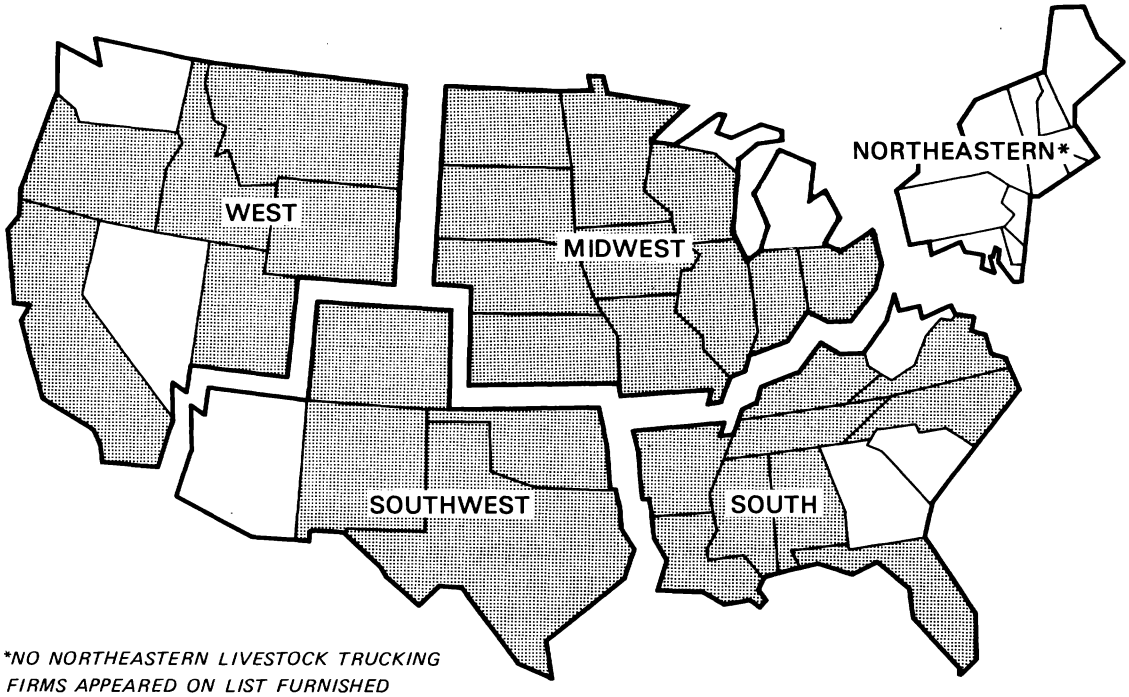


Double trailer



APPENDIX FIGURE 1

STATES WITH LIVESTOCK TRUCKERS IN SURVEY UNIVERSE AND SAMPLE, 1974



**NO NORTHEASTERN LIVESTOCK TRUCKING FIRMS APPEARED ON LIST FURNISHED BY SHIPPERS FOR THE SURVEYS.*

APPENDIX FIGURE 2

REFERENCES

(1) Boles, Patrick P.
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Livestock Trucking Services: Quality, Adequacy and Shipment Patterns. Agr. Econ. Rpt. 312, U.S. Dept. Agr., Econ. Res. Serv., 1975.

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Transport Statistics in the United States; Part 7. 1973.

(4) Wales, Robert G., D. C. Nelson, and C. W. Bullard
"An Inventory of State Economic Regulation of Agricultural Motor Carriers." UGPTI Rpt. 11, Upper Great Plains Transportation Inst., 1970.