

**MOTOR CARRIER TRANSPORTATION
OF AGRICULTURAL PRODUCTS
IN NORTH DAKOTA 1969**

By

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David C. Nelson**

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in cooperation with

**North Dakota State Highway Department
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and
The Federal Highway Administration
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TABLE OF CONTENTS

	<u>Page</u>
FOREWARD	vii
HIGHLIGHTS	viii
INTRODUCTION	1
Objectives	2
Procedure and Sources of Data	2
MOTOR CARRIER TRANSPORTATION OF SMALL GRAINS	7
Country Elevator Shipments	9
CRD 1	12
CRD 2	12
CRD 3	13
CRD 4	14
CRD 5	15
CRD 6	15
CRD 7	16
CRD 8	17
CRD 9	18
Direct Farm Shipments	18
SR 1	19
SR 2	19
SR 3	20
SR 4	20
SR 5	20
SR 6	20
SR 7	20
SR 8	20
MOTOR CARRIER TRANSPORTATION OF LIVESTOCK	21
Livestock Exports	21
SR 1	23
SR 2	25
SR 3	25
SR 4	26
SR 5	26
SR 6	27
SR 7	27
SR 8	28

	<u>Page</u>
Livestock Imports	29
SR 1	31
SR 2	32
SR 3	32
SR 4	33
SR 5	33
SR 6	33
SR 7	34
SR 8	34
MOTOR CARRIER TRANSPORTATION OF DAIRY PRODUCTS	35
CRD 1	37
CRD 2	37
CRD 3	37
CRD 4	38
CRD 5	38
CRD 6	38
CRD 7	38
CRD 8	39
CRD 9	39
MOTOR CARRIER TRANSPORTATION OF POTATOES AND SUGARBEETS	39
Potatoes	40
SR 3	42
SR 4	44
SR 5	44
SR 6	45
SR 7	45
SR 8	46
Sugarbeets	46
SR 4	47
SR 5	48
MOTOR CARRIER TRANSPORTATION OF AGRICULTURAL PRODUCTS, COMPARI- SONS, PRIMARY ROUTES	48
Primary Routes	49

LIST OF TABLES

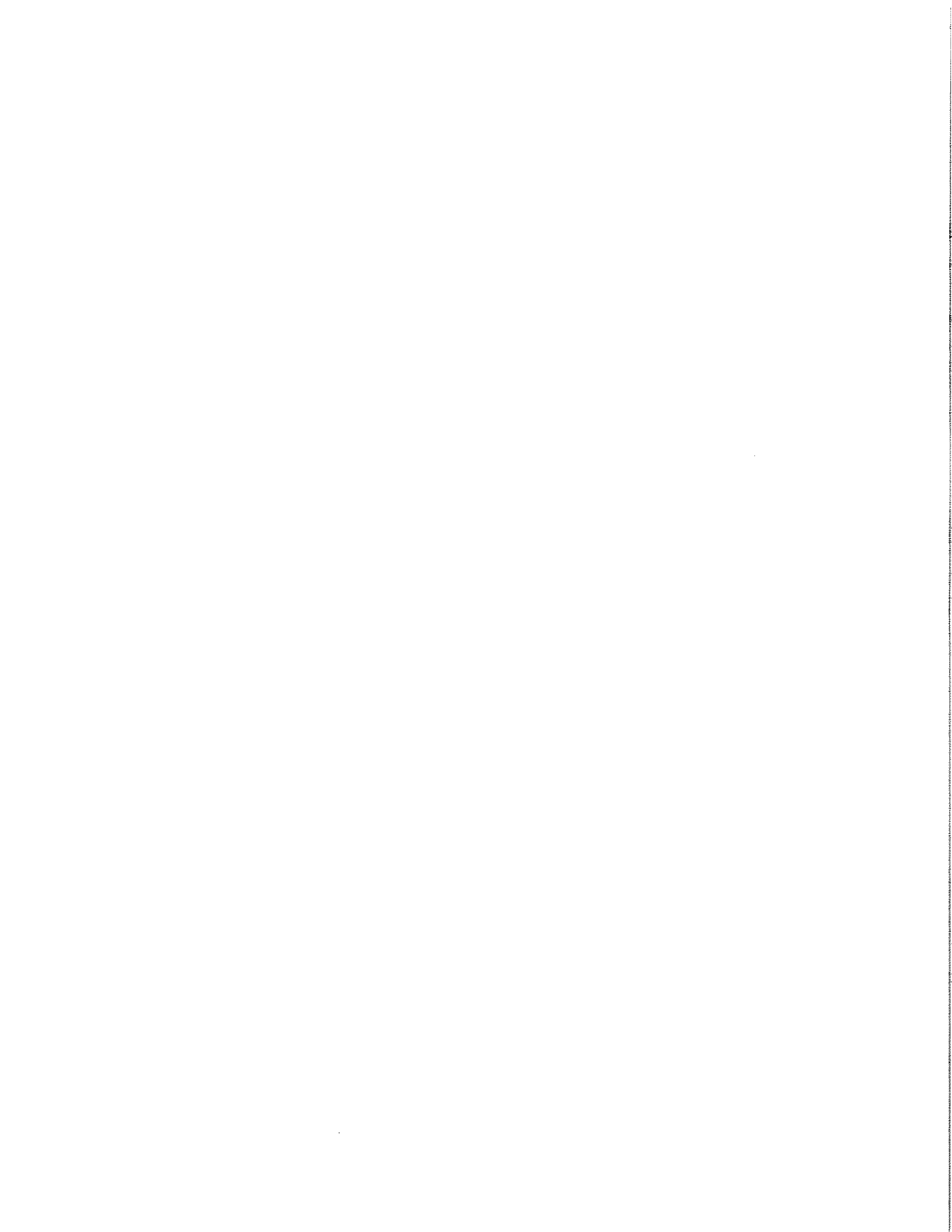
<u>Table Number</u>		<u>Page</u>
1	VOLUME, VALUE, AND VALUE ADDED BY MOTOR CARRIER TRANSPORTATION OF SMALL GRAINS TO FIRST MARKET DESTINATIONS FROM NORTH DAKOTA ORIGINS BY TYPE OF CROP DURING THE PERIOD OF AUGUST, 1968, THROUGH JULY, 1969 .	10
2	NORTH DAKOTA ELEVATOR SHIPMENTS OF SMALL GRAINS BY RAIL AND MOTOR CARRIER DURING THE PERIOD AUGUST, 1968, THROUGH JULY, 1969	11
3	VOLUME, VALUE, AND VALUE ADDED BY MOTOR CARRIER TRANSPORTATION OF SMALL GRAINS TO FIRST MARKET DESTINATIONS FROM NORTH DAKOTA ELEVATORS BY CROP REPORTING DISTRICT (CRD) DURING THE PERIOD AUGUST, 1968, THROUGH JULY, 1969	11
4	VOLUME, VALUE, AND VALUE ADDED BY MOTOR CARRIER TRANSPORTATION OF SMALL GRAINS TO FIRST MARKET DESTINATIONS DIRECT FROM NORTH DAKOTA FARMS BY STATE REGION (SR) DURING THE PERIOD JANUARY, 1969, THROUGH DECEMBER, 1969	19
5	VOLUME, VALUE, AND VALUE ADDED BY MOTOR CARRIER TRANSPORTATION OF LIVESTOCK TO OUT-OF-STATE DESTINATIONS FROM NORTH DAKOTA ORIGINS BY STATE REGION (SR) DURING THE PERIOD JANUARY, 1969, THROUGH DECEMBER, 1969	22
6	VOLUME, VALUE, AND VALUE ADDED BY MOTOR CARRIER TRANSPORTATION OF LIVESTOCK TO OUT-OF-STATE DESTINATIONS FROM NORTH DAKOTA ORIGINS BY TYPE DURING THE PERIOD JANUARY, 1969, THROUGH DECEMBER, 1969	24
7	THE TOTAL NUMBER OF LIVESTOCK SHIPPED BY MOTOR CARRIER TO OUT-OF-STATE DESTINATIONS FROM NORTH DAKOTA ORIGINS BY STATE REGION (SR) DURING THE PERIOD JANUARY, 1969, THROUGH DECEMBER, 1969	24
8	VOLUME, VALUE, AND VALUE ADDED BY MOTOR CARRIER TRANSPORTATION OF LIVESTOCK INTO NORTH DAKOTA FROM OUT-OF-STATE ORIGINS BY STATE REGION (SR) DURING THE PERIOD JANUARY, 1969, THROUGH DECEMBER, 1969	30
9	VOLUME, VALUE, AND VALUE ADDED BY TRANSPORTATION OF LIVESTOCK INTO NORTH DAKOTA FROM OUT-OF-STATE ORIGINS BY TYPE DURING THE PERIOD JANUARY, 1969, THROUGH DECEMBER, 1969	31

<u>Table Number</u>		<u>Page</u>
10	THE TOTAL NUMBER OF LIVESTOCK SHIPPED INTO NORTH DAKOTA BY MOTOR CARRIER FROM OUT-OF-STATE ORIGINS BY STATE REGION (SR) DURING THE PERIOD JANUARY, 1969, THROUGH DECEMBER, 1969	31
11	VOLUME, VALUE, AND VALUE ADDED BY MOTOR CARRIER TRANSPORTATION OF UNPROCESSED DAIRY PRODUCTS IN NORTH DAKOTA BY CROP REPORTING DISTRICT (CRD) DURING THE PERIOD JANUARY, 1969, THROUGH DECEMBER, 1969	36
12	VOLUME, VALUE, AND VALUE ADDED BY MOTOR CARRIER TRANSPORTATION OF POTATOES FROM NORTH DAKOTA ORIGINS BY STATE REGION (SR) DURING THE PERIOD JANUARY, 1969, THROUGH DECEMBER, 1969	41
13	MOTOR CARRIER SHIPMENTS OF POTATOES FROM NORTH DAKOTA TO OUT-OF-STATE DESTINATIONS DURING THE PERIOD JANUARY, 1969, THROUGH DECEMBER, 1969	43
14	SHIPMENTS OF SUGARBEETS BY MOTOR CARRIER FROM NORTH DAKOTA AND MINNESOTA ORIGINS TO NORTH DAKOTA AND MINNESOTA DESTINATIONS, 1969	47
15	VOLUME, VALUE, AND VALUE ADDED BY MOTOR CARRIER TRANSPORTATION OF AGRICULTURAL PRODUCTS TO FIRST MARKET DESTINATIONS BY COMMODITY DURING THE PERIOD JANUARY, 1969, THROUGH DECEMBER, 1969	49
16	ESTIMATED VOLUME, VALUE, AND VALUE ADDED BY MOTOR CARRIER AND RAIL TRANSPORTATION OF AGRICULTURAL PRODUCTS TO FIRST MARKET DESTINATIONS BY COMMODITY DURING THE PERIOD JANUARY, 1969, THROUGH DECEMBER, 1969	50

LIST OF FIGURES

<u>Figure Number</u>		<u>Page</u>
1	North Dakota State Regions as Used in This Study	3
2	North Dakota Crop Reporting Districts as Used in This Study	4
3	North Dakota Highways Discussed in This Study	5

<u>Figure Number</u>		<u>Page</u>
4	Volume (tons) of Agricultural Products Transported Over Various Sections of North Dakota Highways During 1969 .	52
5	Value (thousand dollars) of Agricultural Products Transported Over Various Sections of North Dakota Highways During 1969	53
6	Value Added by Transportation (thousand dollars) of Agricultural Products Transported Over Various Sections of North Dakota Highways During 1969	54



FOREWARD

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Many agencies were very helpful in providing data. Among these were the North Dakota Livestock Sanitary Board, Statistical Reporting Service of the U.S. Department of Agriculture, Union Stockyards Company at West Fargo, North Dakota, Red River Valley Potato Growers Association, North Dakota Public Service Commission, North Dakota Department of Agriculture, North Dakota State Wheat Commission, Midwest Motor Freight Company, American Crystal Sugar Company, and the Holly Sugar Company.

There are three reports which represent research completed under a general research project entitled "Volume of Commerce Hauled By Motor Trucks in North Dakota."

Ronald Q. Nichols and David C. Nelson, Motor Carrier Transportation of Agricultural Products in North Dakota, 1969, UGPTI Report No. 19 - Research Report No. 16, Upper Great Plains Transportation Institute, North Dakota State University, Fargo, October, 1971.

Gregory R. Binkley and David C. Nelson, Motor Carrier Transportation of Non-Agricultural Products in North Dakota, 1969, UGPTI Report No. 20 - Research Report No. 17, Upper Great Plains Transportation Institute, North Dakota State University, Fargo, November, 1971.

David C. Nelson, Gregory R. Binkley and Ronald Q. Nichols, Statistical Appendix: Motor Carrier Transportation of Agricultural and Non-Agricultural Products in North Dakota, 1969, UGPTI Report No. 21 - Statistical Report No. 3, Upper Great Plains Transportation Institute, North Dakota State University, Fargo, December, 1971.



HIGHLIGHTS

The general purpose of this study was to estimate the volume and value of agricultural products transported by motor carrier to, from, and within North Dakota.

A total of 3,936,733 tons of agricultural products was transported by motor carrier out of, into, and within North Dakota during 1969. These motor carrier shipments were valued at \$345,750,992, and the value added by transportation was \$30,590,511.

Analysis of small grain shipments from North Dakota origins during 1969 indicated that 25.7 percent of the total volume shipped was transported to first market destinations by motor carrier. A total of 2,030,801 tons of small grains was shipped by motor carrier to first market destinations during 1969. These motor carrier shipments were valued at \$98,107,107, and the value added by transportation was \$14,535,571.

About 95 percent (1,929,101 tons) of the total volume of small grains shipped by motor carrier from North Dakota origins during 1969 was shipped to Minnesota destinations. A large part of this volume went to Duluth-Superior (1,323,731 tons) and Minneapolis-St. Paul (564,621 tons). Motor carrier shipments to Minnesota destinations were transported primarily over Highways 94, 2, 11, and 13.

Analysis of livestock exports from North Dakota origins during 1969 indicated that 96.8 percent of the total volume shipped was transported to first market destinations by motor carrier. A total of 316,840 tons of livestock was shipped by motor carrier to first market destinations during 1969. These motor carrier shipments were valued at \$164,183,037, and the value added by transportation was \$4,926,923.

Over 90 percent of all cattle, calves, sheep, and lambs and about 62 percent of all hogs shipped from North Dakota origins during 1969 moved east and southeast. Motor carrier shipments of livestock to eastern and southeastern destinations were transported primarily over highways 2, 11, 13, 81, 83, 85, and 94.

A total of 17,128 tons of livestock was shipped into North Dakota from out-of-state origins during 1969. These motor carrier shipments were valued at \$9,910,865, and the value added by transportation was \$201,424.

All unprocessed dairy products were transported by motor carrier to first market destinations in North Dakota during 1969. A total of 497,174 tons of bulk milk and cream was transported over North Dakota roads during the period January, 1969, through December, 1969. These motor carrier shipments were valued at \$53,047,577, and the value added by transportation was \$3,301,903.

A total of 461,321 tons of bulk milk and cream was purchased for processing by North Dakota firms during 1969. These purchases were valued at \$49,873,584, and the value added by motor carrier transportation was \$3,095,175. Total purchases included 71,268 tons of whole milk imported from outside North Dakota. Whole milk imported into North Dakota was valued at \$6,588,466, and the value added by motor carrier transportation was \$410,934.

An additional 35,853 tons of whole milk were exported from North Dakota origins to out-of-state destinations during 1969. These motor carrier shipments were valued at \$3,173,993, and the value added by transportation was \$206,728.

Due to location of processing plants, Highways 2, 52, 81, 83, 85, 94, and 281 are the improved roads in North Dakota most extensively traveled by haulers of unprocessed dairy products.

Analysis of potato shipments from North Dakota origins during 1969 indicated that 43.8 percent of the total volume shipped was transported to first destination by motor carrier. A total of 286,379 tons of potatoes was shipped by motor carrier from North Dakota origins during 1969. These motor carrier shipments were valued at \$7,674,960, and the value added by transportation was \$6,170,891.

About 82 percent of the total volume of potatoes shipped by motor carrier from North Dakota origins during 1969 moved east and south. Motor carrier shipments of potatoes to eastern and southern destinations were transported primarily over Highway 81.

Analysis of sugarbeet transportation in North Dakota during 1969 indicated that 47.2 percent of the total volume shipped was transported to first destinations by motor carrier. A total of 788,411 tons of sugarbeets was shipped to processing plants by motor carrier over North Dakota highways during 1969. These motor carrier shipments were valued at \$12,827,446, and the value added by transportation was \$1,453,799.

All motor carrier shipments of sugarbeets terminated at processing plants along the North Dakota-Minnesota border. These shipments were transported primarily over Highways 2, 17, 44, 66, 81, and 94.

Motor carrier shipments of agricultural products in North Dakota during 1969 were transported primarily over Highways 2, 11, 13, 17, 44, 66, 81, 94, and 281. Exports of agricultural products by motor carrier moved primarily east and south to destinations in Minnesota and states east and south of North Dakota.

The largest proportion of the total volume of agricultural products shipped by motor carrier in North Dakota during 1969 was transported over Highways 2 and 94. About 44 percent (1,743,899 tons) of the entire volume (3,936,733 tons) of agricultural products transported by motor carrier in North Dakota during 1969 moved over the eastern section of Highways 2 (738,406 tons) and 94 (1,005,493 tons).

INTRODUCTION

Marketing includes those business activities involved in the flow of goods and services from production to consumption. Marketing is a major feature of developed societies and plays a dominant role in all economies that have reached a "high consumption" stage of development. Indeed, where an economic system is based upon a market system of enterprise, the entire system functions around the play of markets in the exchange of goods and more specifically in the allocation of economic resources to consumptive ends.¹

Transportation is a physical function; an integral part of the marketing process. The transportation function involves the movement of persons or things from one point to another. An economic analysis of the transportation function is concerned with the efficiency of this movement.

Knowledge of the value added to the product by transportation is an important element in an economic analysis of the transportation function. Greater efficiency of product movement can be achieved with improved knowledge about the total freight bill. It is difficult to make realistic estimates of this cost without an analysis of commodity movements within an economic unit, e.g., the State of North Dakota. Information concerning origin, destination, type of commodity, and routes is essential to this analysis. This information is important for several reasons:

1. Research resulting in more efficient means of transporting agricultural products may result in higher income to farm producers.²

¹Otteson, Schuyler, F., et al., Marketing: The Firm's Viewpoint, The Macmillan Company, New York, 1964, p. 1.

²Luessen, Frederick W., Wheat Distribution Patterns by Class, unpublished M.S. thesis, Department of Agricultural Economics, North Dakota State University, Fargo, September, 1968, pp. 3 and 4, states that, "Transportation costs make up a relatively large part of the price of a commodity if it is bulky, if it requires special service or if it moves a considerable distance. The social gain resulting from improved transportation is especially significant in the marketing of those commodities in which transportation costs constitute a large part of the total cost of production. The prices of these commodities, it follows, would prove very sensitive to any reduction of transport cost. Furthermore, the reduction in transport costs in any given case will reduce the total cost of the commodity and result in lower prices to consumers, higher prices to producers or both. Reduced transportation costs can result from improved marketing efficiency, reduced transportation rates or more and better knowledge on the part of producers, shippers, and consumers."

2. Individuals responsible for policy making and regulations concerning distribution cannot make well-informed decisions unless accurate knowledge about distribution patterns is available.

3. Priorities in the construction of highways and service roads can be established which more accurately reflect the needs and desires of the users and the general public when a basic knowledge about distribution patterns is available.

4. Economic planning and development are more successful when improved knowledge about the flow of commodities is available.

Objectives

The general purpose of this study is to estimate the volume of agricultural products transported by motor carrier to, from, and within North Dakota. The specific objectives are:

1. To determine the volume of agricultural products transported by motor carrier out of, into, and within North Dakota by type of commodity, by origin, and by destination.

2. To determine the total value of agricultural products and the total cost (value added) of transporting these products by motor carrier out of, into, and within North Dakota.

3. To identify routes or direction of movement of agricultural products transported by motor carrier out of, into, and within North Dakota.

Procedure and Sources of Data

The distribution of products was categorized by: (1) type of commodity, (2) origin, (3) destination, and (4) route or direction of movement. Data were aggregated by State Region (Figure 1) for farm shipments of small grains, livestock, potatoes, and sugarbeets. Data were aggregated by Crop Reporting District (Figure 2) for unprocessed dairy products and elevator shipments of small grains. The period of study corresponds to the 1969 calendar year except in the case of elevator shipments of small grains. These data correspond to the period August 1, 1968, through July 31, 1969.

Routes or direction of movement are based on the origin and destination of shipments of agricultural products transported by motor carrier in North Dakota during 1969. This study assumes carriers use minimum distance in moving product from origin to destination. The major highways discussed in this analysis appear in Figure 3.

Various sources of information were valuable in determining the kind of data currently available. Data made available by these sources and mail surveys were used in this analysis.

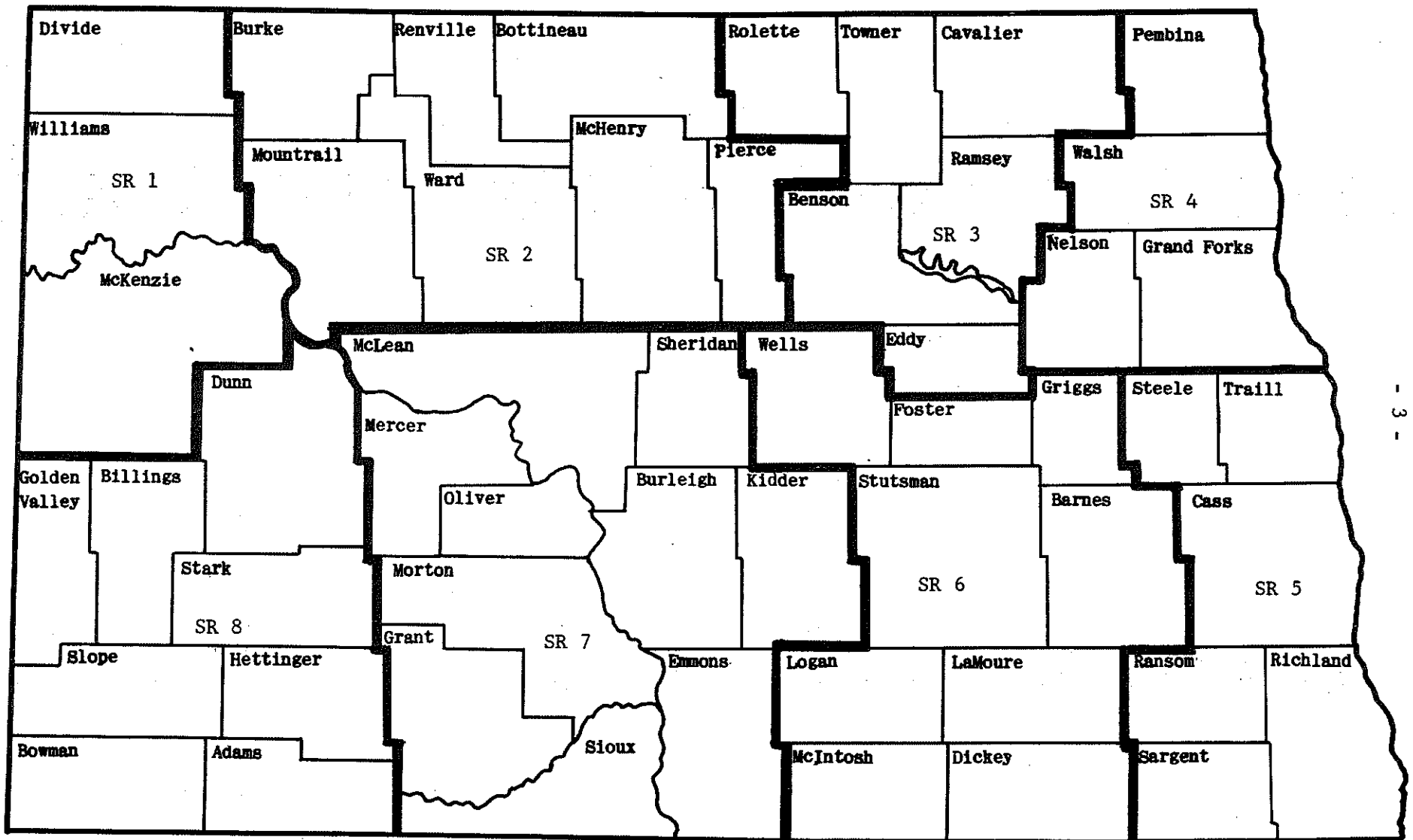


Figure 1. North Dakota State Regions as Used in This Study.

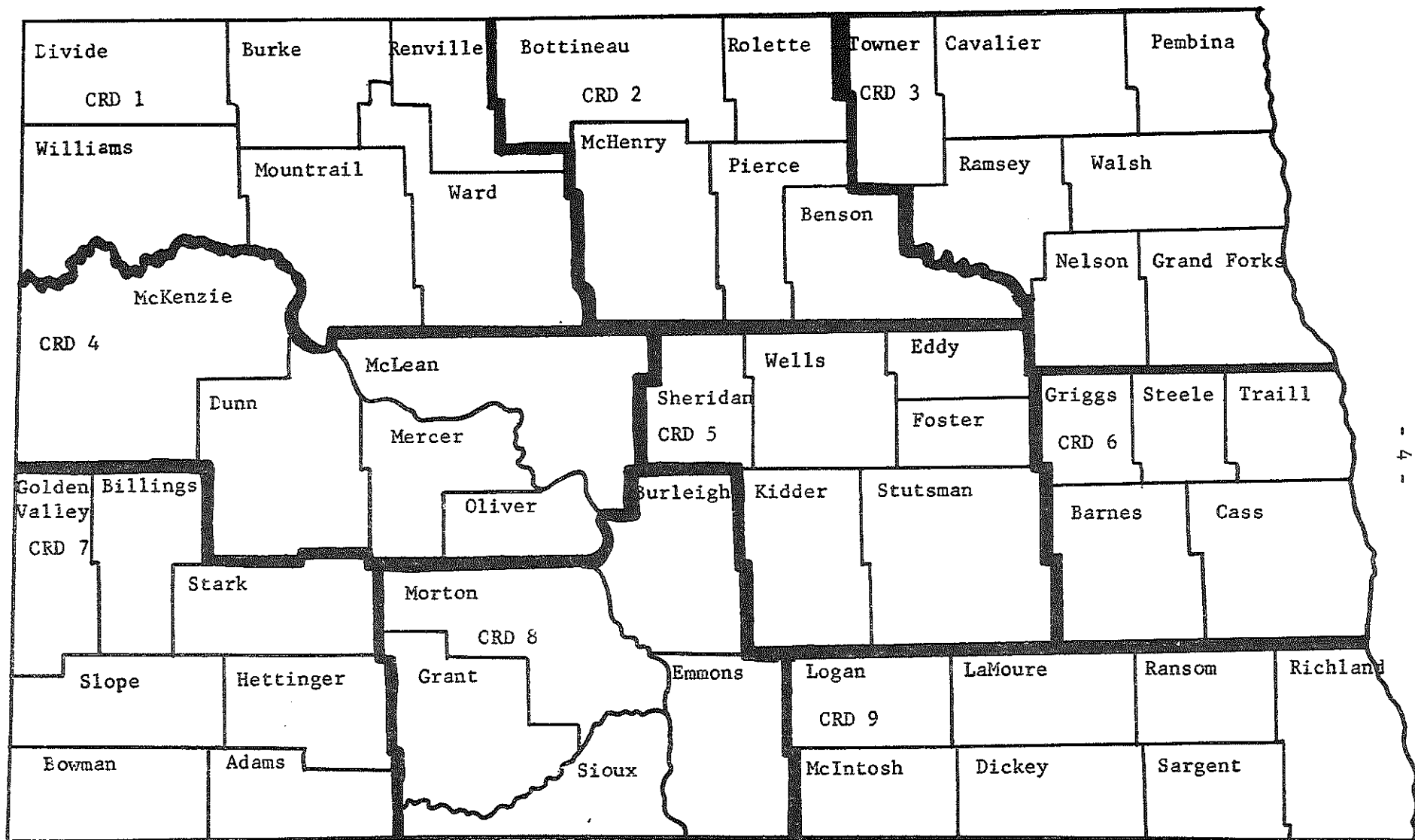


Figure 2. North Dakota Crop Reporting Districts as Used in This Study.

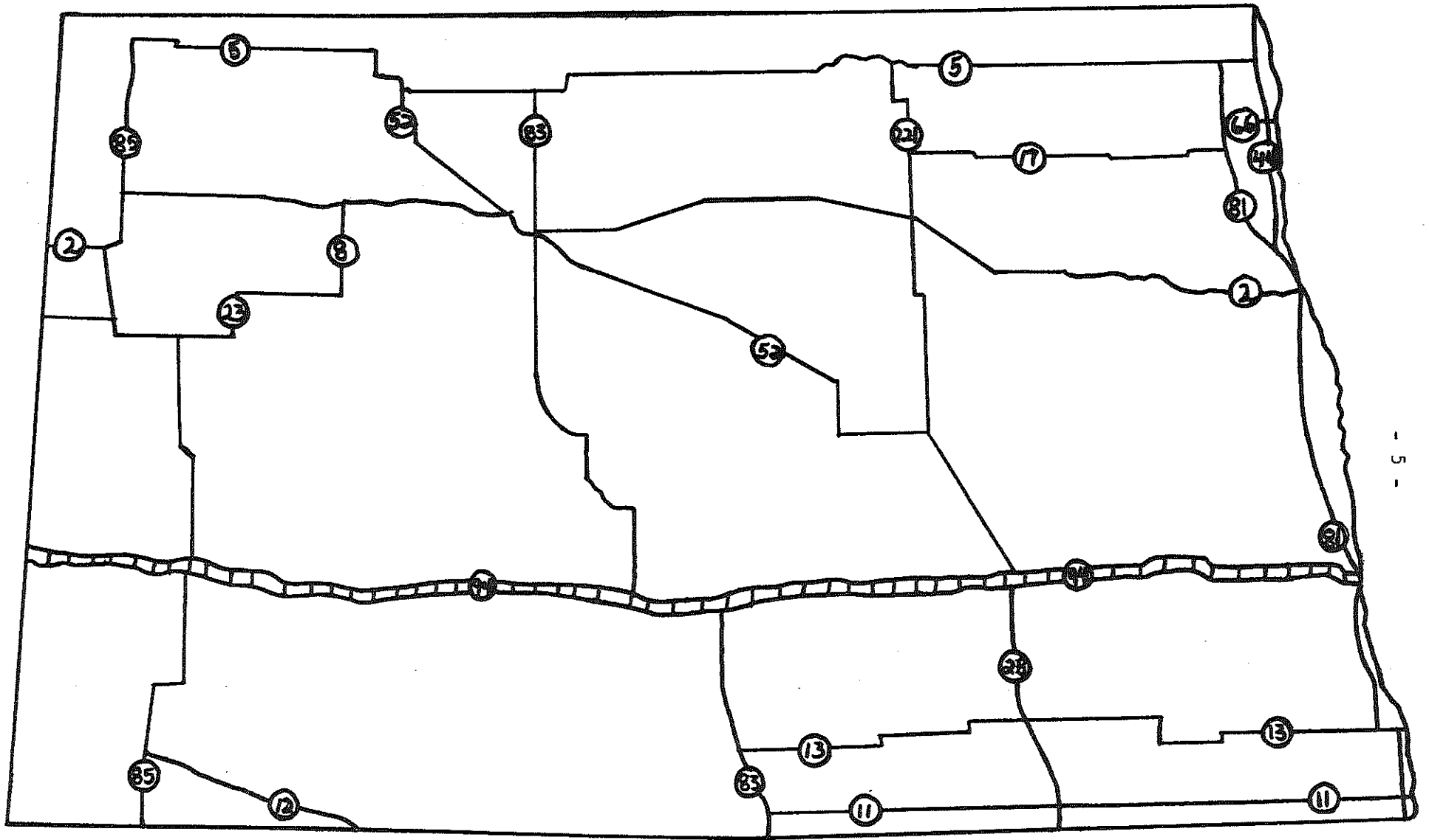


Figure 3. North Dakota Highways Discussed in This Study.

A mail survey of farm firms in North Dakota was conducted to discover the amount of direct farm to market shipments of small grains.

Records of the North Dakota State Wheat Commission provided information regarding size of operation of farm firms in North Dakota. Farms were classified by size³ according to nine acreage categories: 0-199, 200-499, 500-999, 1,000-1,999, 2,000-2,999, 3,000-3,999, 4,000-5,999, 6,000-7,999, and greater than 7,999. Farms were listed by size of operation in each county in North Dakota. Questionnaires (3,978) were mailed to a 10 percent sample of the farm population throughout the State. Farmers were asked to provide information concerning the marketing of small grains that bypassed local country elevators. Included in the list of small grains were wheat, durum, barley, flax, oats, rye, corn, soybeans, and other small grains.

Farm managers were asked to provide the following information: (1) the amount of each of the various small grains produced on their farm in 1969, (2) the amount of grain sold at local country elevators, (3) the amount of grain shipped directly to market or sold directly to truckers that bypassed local country elevators, and (4) the destination of grain shipped directly to market or sold directly to truckers that bypassed local country elevators. A ratio estimator was applied to expand the sample data to represent the total population.

A complete record of small grain shipments by North Dakota elevators was obtained from records of the Public Service Commission. These records list the movement of small grains from country elevators to various destinations.

Information concerning transportation of livestock was compiled from records of the North Dakota Livestock Sanitary Board and from the Statistical Reporting Service of the United States Department of Agriculture. The Livestock Sanitary Board, Office of the State Veterinarian, maintains records including data of livestock imports by state of origin, livestock exports⁴ by alphabetical order of consignee, and quarantines-in-transit⁵ by market origin. From these records a 10 percent sample⁶ was used to determine livestock movement by type, number, origin, and destination. Sample percentages were computed and

³Farm size refers to land owned plus land rented.

⁴Livestock imports and exports are recorded on State health certificates.

⁵The quarantine-in-transit allows the movement of livestock by motor carrier from one Federally inspected market to another.

⁶Every tenth health certificate and every tenth quarantine-in-transit were selected for this sample.

applied to information published by the Statistical Reporting Service to determine the total livestock movements out of and into North Dakota.

Information concerning shipments of livestock was obtained from the Union Stockyards Company at West Fargo. Livestock movement was recorded by type, number, and state of destination.

A mail survey was conducted of all (544) known potato growers in North Dakota. A questionnaire was sent to each grower to determine the amount of direct farm to market shipment of potatoes. Potato growers were asked to provide the following information: (1) the amount of potatoes each produced in 1969, (2) destination of potatoes shipped by motor carrier, and (3) the names and addresses of other shippers who purchased any part of their potato crop. A ratio estimator was applied to expand respondents' data to represent the total population.

Questionnaires were sent to all (80) known commercial potato shippers in the Red River Valley. Respondents supplied information concerning destination and mode of transportation used in shipping potatoes. Estimates for the total population were obtained by expanding sample data through the use of a ratio estimator.

Information concerning transportation of sugarbeets was provided by the American Crystal Sugar Company and the Holly Sugar Company.

Data pertaining to motor carrier transportation of unprocessed dairy products were obtained from records of the North Dakota Public Service Commission and the North Dakota Department of Agriculture.

A number of usable questionnaires, percentage of response, and ratio estimator for each commodity can be found in footnotes to appropriate tables in: D. C. Nelson, et al., Statistical Appendix: Motor Carrier Transportation of Agricultural and Nonagricultural Products in North Dakota, UGPTI Report No. 21--Statistical Report No. 3. Upper Great Plains Transportation Institute, North Dakota State University, Fargo, North Dakota, November, 1971.

MOTOR CARRIER TRANSPORTATION OF SMALL GRAINS

North Dakota ranks first among the states in the production of durum wheat, spring wheat, barley, and flaxseed and second among the states in the production of oats and rye.⁷ Receipts from the sale of these small grains provide about 45 percent of the total cash farm income from farm marketings in North Dakota.⁸

⁷Price, J. R. and Fred R. Taylor, North Dakota Crop and Livestock Statistics, Ag. Statistics No. 21, Statistical Reporting Service, United States Department of Agriculture and Department of Agricultural Economics, North Dakota State University, Fargo, May, 1970, p. 2.

⁸Ibid., p. 77.

The motor carrier is an important factor in the movement of North Dakota produced small grains to processing and consumption centers. A total of 2,030,801 tons of small grains was shipped to first market destinations (interstate and intrastate) by motor carrier from North Dakota origins during 1968-69.⁹ These motor carrier shipments were valued at \$98,107,107¹⁰ and the value added by transportation was \$14,535,571.¹¹

About 95 percent (1,929,101 tons) of the total volume of small grains shipped by motor carrier from North Dakota origins during 1968-69 was transported to Minnesota destinations. These motor carrier shipments were transported primarily over Highways 94 and 2. Some shipments also moved over Highways 13 and 11. A large part of the volume shipped by motor carrier to Minnesota destinations went to Duluth-Superior (1,323,731 tons) and Minneapolis-St. Paul (564,621 tons). Small grains shipped by motor carrier to Minnesota destinations were valued at \$94,433,032, and the value added by transportation was \$13,054,294.

An additional 0.9 percent (17,964 tons) of the total volume of small grains shipped by motor carrier from North Dakota origins during 1968-69 was transported to destinations in the Northwest States¹² and North Pacific Ports.¹³ These shipments were transported primarily over Highways 94 and 2. Small grains shipped by motor carrier to destinations in the Northwest States and North Pacific Ports were valued at \$712,328, and the value added by transportation was \$368,532.

The Southwest States¹⁴ received 0.4 percent (7,244 tons) of the total volume of small grains shipped by motor carrier from North Dakota

⁹See Table 1.

¹⁰Income received by producers. Additional income (market handling costs) totaling \$4,429,297 was received by country elevator operators in North Dakota during 1968-69. Based on information provided by elevator operators, market handling costs were set at \$.06 per bushel. A total of 73,821,613 bushels of small grains were shipped by motor carrier from North Dakota elevators during 1968-69 (see Table 3). $$.06 \times 73,821,613 = \$4,429,297$.

¹¹The value added by transportation is the cost of transporting small grains to first destinations by motor carrier from North Dakota origins.

¹²Montana, Idaho, Washington, and Oregon.

¹³Portland, Seattle, Astoria, Vancouver, Longview, Tacoma, and Kalama.

¹⁴Wyoming, Utah, Texas, Colorado, Arizona, New Mexico, Oklahoma, Nevada, and California.

origins during 1968-69. These shipments were transported primarily over Highways 94 and 85. Some shipments also moved over Highways 2, 8, and 23. Motor carrier shipments of small grains to the Southwest States were valued at \$222,131, and the value added by transportation was \$166,757.

Sioux City, Omaha, Kansas City, the Midland States,¹⁵ and states east and south of North Dakota¹⁶ received 0.8 percent (17,182 tons) of the total volume of small grains shipped by motor carrier from North Dakota origins during 1968-69. These shipments were transported primarily over Highways 81, 83, 281, and 94. Motor carrier shipments of small grains to Sioux City, Omaha, Kansas City, the Midland States, and states east and south of North Dakota were valued at \$713,347, and the value added by transportation was \$233,703.

Motor carrier shipments of small grains to in-state destinations totaled 1.1 percent (22,257 tons) of the total volume of small grains shipped by motor carrier from North Dakota origins during 1968-69. These shipments were valued at \$783,096, and the value added by transportation was \$111,285.

Motor carrier shipments of small grains to unknown destinations totaled 1.8 percent (37,053 tons) of the total volume of small grains shipped by motor carrier from North Dakota origins during 1968-69. These shipments were valued at \$1,243,180, and the value added by transportation was \$601,000.

Analysis of small grain shipments by type of crop indicated that 996,698 tons of wheat, 470,693 tons of durum, 147,193 tons of barley, 169,208 tons of oats, 187,316 tons of flaxseed, and 59,693 tons of rye were shipped by motor carrier from North Dakota origins during 1968-69 (Table 1).

Country Elevator Shipments

The volume of grain shipped by truck from North Dakota country elevators to first destinations increased from 4.8 percent in 1956-57

¹⁵ Nebraska, Kansas, Iowa, Missouri, and South Dakota.

¹⁶ Wisconsin, Illinois, Indiana, Michigan, Ohio, Pennsylvania, New York, Rhode Island, Vermont, Maine, New Hampshire, Massachusetts, Delaware, New Jersey, Connecticut, Maryland, West Virginia, Kentucky, Tennessee, North Carolina, Georgia, Florida, Alabama, Mississippi, Louisiana, Arkansas and Virginia.

TABLE 1. VOLUME, VALUE, AND VALUE ADDED BY MOTOR CARRIER TRANSPORTATION OF SMALL GRAINS TO FIRST MARKET DESTINATIONS FROM NORTH DAKOTA ORIGINS BY TYPE OF CROP DURING THE PERIOD OF AUGUST, 1968, THROUGH JULY, 1969

Type of Crop	Volume (tons)	Value	Value Added by Transportation
Wheat	996,698	\$44,089,319	\$ 6,896,143
Durum	470,693	23,176,295	3,416,773
Barley	147,193	5,139,975	1,138,755
Oats	169,208	5,328,499	1,438,272
Flaxseed	187,316	18,565,720	1,198,123
Rye	59,693	1,807,299	447,505
TOTAL	2,030,801	\$98,107,107	\$14,535,571

Source: Statistical Appendix Table 1, Upper Great Plains Transportation Institute Report No. 20, November 1971.

to 7.2 percent in 1957-58 to 13.9 percent in 1958-59 to 21.0 percent in 1963-64.¹⁷ This figure decreased to 19.7 percent in 1965-66.¹⁸

North Dakota country elevators shipped 289,577,618 bushels of grain during the period August, 1968, through July, 1969 (Table 2). Of this total, 25.5 percent, or 73,821,613 bushels, was shipped to first market destinations by motor carrier. This represents a substantial increase (5.9 percent) over the 19.7 percent shipped by motor carrier in 1965-66.

The motor carrier is transporting an increased volume and a larger share of small grain shipments in North Dakota. In 1965-66 about 51.6 million bushels (19.7 percent) were shipped by motor carrier to first market destinations, whereas in 1968-69 more than 73.8 million bushels (25.5 percent) were transported by motor carrier to first market destinations.

A total of 2,013,284 tons of small grains was shipped by motor carrier to first destination from North Dakota elevators during the period August, 1968, through July, 1969 (Table 3). These motor carrier shipments were valued at \$97,456,741, and the value added by transportation was \$14,433,042.

¹⁷ Nelson, David C., Truck Shipments of Grain by North Dakota Elevators with Comparisons, 1965-66, Agricultural Economics Report No. 57, Department of Agricultural Economics, Agricultural Experiment Station, North Dakota State University, Fargo, September, 1967, p. v.

¹⁸ Ibid.

TABLE 2. NORTH DAKOTA ELEVATOR SHIPMENTS OF SMALL GRAINS BY RAIL AND MOTOR CARRIER DURING THE PERIOD AUGUST, 1968, THROUGH JULY, 1969

Type of Crop	Rail Shipments (bushels)	Motor Carrier Shipments (bushels)	Total Shipments (bushels)
Wheat	80,168,087	33,061,421	113,229,508
Durum	54,101,624	15,589,047	69,690,671
Barley	54,897,267	6,025,220	60,922,487
Oats	18,742,574	10,575,481	29,318,055
Flax	5,098,442	6,689,863	11,788,305
Rye	2,748,011	1,880,081	4,628,092
ALL GRAINS	215,756,005	73,821,613	289,577,618

Source: David C. Nelson, Truck and Rail Shipments of Hard Red Spring and Durum Wheat from North Dakota Elevators, 1967-68 and 1968-69, UGPTI Report No. 14, Upper Great Plains Transportation Institute, North Dakota State University, Fargo, January, 1971, and David C. Nelson, Truck and Rail Shipments of Barley, Oats, Rye, and Flax from North Dakota Elevators, 1967-68 and 1968-69, UGPTI Report No. 16 - Research Report No. 13, Upper Great Plains Transportation Institute, North Dakota State University, May, 1971.

TABLE 3. VOLUME, VALUE, AND VALUE ADDED BY MOTOR CARRIER TRANSPORTATION OF SMALL GRAINS TO FIRST MARKET DESTINATIONS FROM NORTH DAKOTA ELEVATORS BY CROP REPORTING DISTRICT (CRD) DURING THE PERIOD AUGUST, 1968, THROUGH JULY, 1969

Crop Reporting District	Volume ^a (tons)	Value ^b	Value Added by Transportation ^c
1 (NW)	263,992	\$12,265,993	\$ 2,653,676
2 (NC)	246,384	12,307,520	2,134,936
3 (NE)	455,743	21,128,363	2,733,055
4 (WC)	93,339	4,578,901	809,329
5 (C)	153,912	8,416,858	1,006,365
6 (EC)	364,672	17,693,213	1,858,630
7 (SW)	168,006	7,354,378	1,407,504
8 (SC)	116,533	5,345,302	909,033
9 (SE)	150,703	8,366,213	920,514
TOTAL	2,013,284	\$97,456,741	\$14,433,042

^aSee Statistical Appendix Table 1.

^b"Season average prices received by North Dakota farmers for principle crops, by Crop Reporting District, North Dakota, Crop of 1968," North Dakota Crop and Livestock Statistics, Ag. Statistics No. 21, Statistical Reporting Service, United States Department of Agriculture and Department of Agricultural Economics, North Dakota State University, Fargo, May, 1970, p. 71.

^cSee Statistical Appendix Tables 1 and 2.

CRD 1

A total of 263,992 tons of small grains was shipped by motor carrier to first destinations from Crop Reporting District 1 during 1968-69. These motor carrier shipments were valued at \$12,265,993, and the value added by transportation was \$2,653,676.

About 241,966 tons of small grains were shipped east over Highway 2 to Minnesota destinations. A large part of the volume shipped by motor carrier to Minnesota destinations went to Duluth-Superior (188,801 tons) and Minneapolis-St. Paul (51,159 tons). Shipments to Minnesota destinations were valued at \$11,485,253, and the value added by transportation was \$2,274,481.

An additional 9,209 tons of small grains moved west over Highway 2 to destinations in the Northwest States and North Pacific Ports. These motor carrier shipments were valued at \$326,469, and the value added by transportation was \$190,755.

The Southwest States received 1,791 tons of small grains valued at \$53,706. These motor carrier shipments moved primarily over Highway 85, and the value added by transportation was \$41,228.

About 4,449 tons of small grains were transported over Highways 83, 94, and 281 to destinations in Sioux City, Omaha, and Kansas City. These motor carrier shipments were valued at \$193,336, and the value added by transportation was \$56,680.

The Midland States and states south and east of North Dakota received 1,351 tons of small grains valued at \$46,298. These shipments were transported over Highways 83 and 94. The value added by transportation was \$19,432.

In-state shipments of small grains by motor carrier totaled 1,218 tons during 1968-69. These motor carrier shipments were valued at \$41,115, and the value added by transportation was \$6,090.

Motor carrier shipments of small grains to unknown destinations totaled 4,008 tons valued at \$119,816. The value added by transportation was \$65,010.

CRD 2

A total of 246,384 tons of small grains was shipped by motor carrier to first destinations from Crop Reporting District 2 during 1968-69. These motor carrier shipments were valued at \$12,307,520, and the value added by transportation was \$2,134,936.

About 237,131 tons of small grains were shipped east over Highway 2 to Minnesota destinations. A large part of the volume

shipped by motor carrier to Minnesota destinations went to Duluth-Superior (202,889 tons) and Minneapolis-St. Paul (32,625 tons). Motor carrier shipments to Minnesota destinations were valued at \$11,999,419, and the value added by transportation was \$2,015,613.

An additional 1,291 tons of small grains moved west over Highway 2 to destinations in the Northwest States and North Pacific Ports. These motor carrier shipments were valued at \$53,529, and the value added by transportation was \$25,545.

The Southwest States received 1,998 tons of small grains valued at \$58,681. These motor carrier shipments were transported over Highways 2, 8, 23, and 85. The value added by transportation was \$45,994.

About 139 tons of small grains were transported over Highways 52 and 281 to destinations in Sioux City, Omaha, and Kansas City. These motor carrier shipments were valued at \$5,476, and the value added by transportation was \$1,771.

The Midland States received 666 tons of small grains valued at \$20,297. These shipments were transported primarily over Highways 52 and 281. The value added by transportation was \$8,751.

In-state shipments of small grains by motor carrier totaled 4,137 tons during 1968-69. These shipments were valued at \$131,098, and the value added by transportation was \$20,685.

Motor carrier shipments of small grains to unknown destinations totaled 1,022 tons valued at \$39,020. The value added by transportation was \$16,577.

CRD 3

A total of 455,743 tons of small grains was shipped by motor carrier to first destinations from Crop Reporting District 3 during 1968-69. These motor carrier shipments were valued at \$21,128,363, and the value added by transportation was \$2,733,055.

About 443,273 tons of small grains were shipped east over Highway 2 to Minnesota destinations. A large part of the volume shipped by motor carrier to Minnesota destinations went to Duluth-Superior (392,148 tons) and Minneapolis-St. Paul (48,112 tons). Motor carrier shipments to Minnesota destinations were valued at \$20,647,821, and the value added by transportation was \$2,570,280.

An additional 235 tons of small grains moved west over Highway 2 to destinations in the Northwest States and North Pacific Ports. These motor carrier shipments were valued at \$9,429, and the value added by transportation was \$5,081.

The Southwest States received 218 tons of small grains valued at \$6,684. These motor carrier shipments were transported over Highways 94 and 85. The value added by transportation was \$5,018.

About 530 tons of small grains were transported over Highway 81 to destinations in Sioux City, Omaha, and Kansas City. These motor carrier shipments were valued at \$21,545, and the value added by transportation was \$6,752.

The Midland States and states south and east of North Dakota received 270 tons of small grains valued at \$11,780. These shipments were transported primarily over Highway 81. The value added by transportation was \$3,725.

In-state shipments of small grains by motor carrier totaled 3,542 tons during 1968-69. These shipments were valued at \$159,802, and the value added by transportation was \$17,710.

Motor carrier shipments of small grains to unknown destinations totaled 7,675 tons valued at \$271,302. The value added by transportation was \$124,489.

CRD 4

A total of 93,339 tons of small grains was shipped by motor carrier to first destinations from Crop Reporting District 4 during 1968-69. These motor carrier shipments were valued at \$4,578,901, and the value added by transportation was \$809,329.

About 84,996 tons of small grains were shipped east over Highway 94 to Minnesota destinations. A large part of the volume shipped by motor carrier to Minnesota destinations went to Duluth-Superior (56,235 tons) and Minneapolis-St. Paul (26,977 tons). Motor carrier shipments to Minnesota destinations were valued at \$4,206,420, and the value added by transportation was \$680,123.

An additional 3,473 tons of small grains moved west over Highway 94 to destinations in the Northwest States and North Pacific Ports. These motor carrier shipments were valued at \$190,050, and the value added by transportation was \$72,401.

The Southwest States received 94 tons of small grains valued at \$3,012. These motor carrier shipments were transported over Highway 85, and the value added by transportation was \$2,164.

About 152 tons of small grains were transported over Highways 94 and 83 to destinations in Sioux City, Omaha, Kansas City, the Midland States, and states east and south of North Dakota. These motor carrier shipments were valued at \$6,137, and the value added by transportation was \$2,226.

In-state shipments of small grains by motor carrier totaled 2,013 tons during 1968-69. These shipments were valued at \$90,410, and the value added by transportation was \$10,065.

Motor carrier shipments of small grains to unknown destinations totaled 2,611 tons valued at \$82,872. The value added by transportation was \$42,350.

CRD 5

A total of 153,912 tons of small grains was shipped by motor carrier to first destinations from Crop Reporting District 5 during 1968-69. These motor carrier shipments were valued at \$8,416,858, and the value added by transportation was \$1,006,365.

About 146,323 tons of small grains were shipped east over Highway 94 to Minnesota destinations. A large part of the volume shipped by motor carrier to Minnesota destinations went to Duluth-Superior (98,903 tons) and Minneapolis-St. Paul (45,287 tons). Motor carrier shipments to Minnesota destinations were valued at \$8,167,918, and the value added by transportation was \$884,607.

An additional 1,335 tons of small grains moved west over Highway 94 to destinations in the Northwest States and North Pacific Ports. These motor carrier shipments were valued at \$42,295, and the value added by transportation was \$26,451.

The Southwest States received 610 tons of small grains valued at \$18,670. These motor carrier shipments were transported over Highways 94 and 85. The value added by transportation was \$14,042.

About 1,270 tons of small grains were transported over Highways 94, 83, and 281 to destinations in Sioux City, Omaha, Kansas City, the Midland States, and states east and south of North Dakota. These motor carrier shipments were valued at \$48,116, and the value added by transportation was \$16,725.

In-state shipments of small grains by motor carrier totaled 571 tons during 1968-69. These shipments were valued at \$19,093, and the value added by transportation was \$2,855.

Motor carrier shipments of small grains to unknown destinations totaled 3,803 tons valued at \$120,766. The value added by transportation was \$61,685.

CRD 6

A total of 364,672 tons of small grains was shipped by motor carrier to first destinations from Crop Reporting District 6 during

1968-69. These motor carrier shipments were valued at \$17,693,213, and the value added by transportation was \$1,858,630.

About 358,169 tons of small grains were shipped east over Highway 94 to Minnesota destinations. A large part of the volume shipped by motor carrier to Minnesota destinations went to Duluth-Superior (217,553 tons) and Minneapolis-St. Paul (133,946 tons). Motor carrier shipments to Minnesota destinations were valued at \$17,437,023, and the value added by transportation was \$1,759,944.

An additional 381 tons of small grains moved west over Highway 94 to destinations in the Northwest States and North Pacific Ports. These motor carrier shipments were valued at \$13,281, and the value added by transportation was \$8,049.

The Southwest States received 383 tons of small grains valued at \$12,830. These motor carrier shipments were transported over Highways 94 and 85. The value added by transportation was \$8,817.

About 699 tons of small grains were transported over Highway 81 to destinations in Sioux City, Omaha, Kansas City, the Midland States, and states east and south of North Dakota. These motor carrier shipments were valued at \$24,573, and the value added by transportation was \$15,611.

In-state shipments of small grains by motor carrier totaled 1,385 tons during 1968-69. These shipments were valued at \$57,217, and the value added by transportation was \$6,925.

Motor carrier shipments of small grains to unknown destinations totaled 3,655 tons valued at \$148,289. The value added by transportation was \$59,284.

CRD 7

A total of 168,006 tons of small grains was shipped by motor carrier to first destinations from Crop Reporting District 7 during 1968-69. These motor carrier shipments were valued at \$7,354,378, and the value added by transportation was \$1,407,504.

About 158,599 tons of small grains were shipped east over Highway 94 to Minnesota destinations. A large part of the volume shipped by motor carrier to Minnesota destinations went to Duluth-Superior (64,319 tons) and Minneapolis-St. Paul (78,643 tons). Motor carrier shipments to Minnesota destinations were valued at \$6,960,812, and the value added by transportation was \$1,268,936.

An additional 1,200 tons of small grains moved west over Highway 94 to destinations in the Northwest States and North Pacific Ports.

These motor carrier shipments were valued at \$49,666, and the value added by transportation was \$23,690.

The Southwest States received 78 tons of small grains valued at \$3,369. These motor carrier shipments were transported over Highways 94 and 85. The value added by transportation was \$1,796.

About 6,100 tons of small grains were transported over Highways 94, 85, 83, and 281 to destinations in Sioux City, Omaha, Kansas City, the Midland States, and states east and south of North Dakota. These motor carrier shipments were valued at \$273,314, and the value added by transportation was \$80,172.

Motor carrier shipments of small grains to unknown destinations totaled 2,029 tons valued at \$67,217. The value added by transportation was \$32,910.

CRD 8

A total of 116,533 tons of small grains was shipped by motor carrier to first destinations from Crop Reporting District 8 during 1968-69. These motor carrier shipments were valued at \$5,345,302, and the value added by transportation was \$909,033.

About 111,452 tons of small grains were shipped east over Highways 94, 13, and 11 to Minnesota destinations. A large part of the volume shipped by motor carrier to Minnesota destinations went to Duluth-Superior (59,512 tons) and Minneapolis-St. Paul (50,162 tons). Motor carrier shipments to Minnesota destinations were valued at \$5,173,903, and the value added by transportation was \$825,373.

An additional 840 tons of small grains moved west over Highway 94 to destinations in the Northwest States and North Pacific Ports. These motor carrier shipments were valued at \$27,609, and the value added by transportation was \$16,560.

The Southwest States received 688 tons of small grains valued at \$21,063. These motor carrier shipments were transported over Highways 94 and 85. The value added by transportation was \$15,838.

About 1,195 tons of small grains were transported over Highway 83 to destinations in Sioux City, Omaha, Kansas City, and the Midland States. These motor carrier shipments were valued at \$49,799, and the value added by transportation was \$15,270.

In-state shipments of small grains by motor carrier totaled 201 tons during 1968-69. These shipments were valued at \$7,138, and the value added by transportation was \$1,005.

Motor carrier shipments of small grains to unknown destinations totaled 2,157 tons valued at \$65,790. The value added by transportation was \$34,987.

CRD 9

A total of 150,703 tons of small grains was shipped by motor carrier to first destinations from Crop Reporting District 9 during 1968-69. These motor carrier shipments were valued at \$8,366,213, and the value added by transportation was \$920,514.

About 138,452 tons of small grains were shipped east over Highways 13 and 11 to Minnesota destinations. A large part of the volume shipped by motor carrier to Minnesota destinations went to Duluth-Superior (37,111 tons) and Minneapolis-St. Paul (95,228 tons). Motor carrier shipments to Minnesota destinations were valued at \$7,962,714, and the value added by transportation was \$716,293.

The Southwest States received 1,384 tons of small grains valued at \$44,116. These motor carrier shipments were transported primarily over Highways 281 and 83. The value added by transportation was \$31,860.

The Midland States and states east and south of North Dakota received 361 tons of small grains valued at \$12,676. These motor carrier shipments were transported over Highways 11, 13, and 281. The value added by transportation was \$6,588.

In-state shipments of small grains by motor carrier totaled 413 tons during 1968-69. These shipments were valued at \$18,599, and the value added by transportation was \$2,065.

Motor carrier shipments of small grains to unknown destinations totaled 10,093 tons valued at \$328,108. The value added by transportation was \$163,708.

Direct Farm Shipments

A total of 17,517 tons (622,281 bushels) of small grains was shipped by motor carrier to first destinations direct from North Dakota farms during 1969 (Table 4).¹⁹ These motor carrier shipments were valued at \$650,373, and the value added by transportation was \$102,529.

¹⁹A mail survey of North Dakota farmers was conducted to discover the amount of direct farm to market shipments of small grains. Questionnaires were mailed to 3,978 farmers (10 percent of the population) throughout North Dakota. Usable questionnaires returned (1,105) totaled 27.8 percent of the sample or 2.78 percent of the population. A ratio estimator of 35.97 ($100 \div 2.78$) was employed to expand sample data to represent the total population.

Direct farm to market shipments accounted for only 0.2 percent of the total volume of small grains transported by rail and motor carrier to first destinations during 1969-70.

SR 1

Results of this study indicate there were no direct farm to market shipments of small grains by motor carrier from State Region 1 during 1969.²⁰

SR 2

In-state shipments of small grains by motor carrier from State Region 2 during 1969 totaled 7,050 tons. These shipments were valued at \$203,950, and the value added by transportation was \$35,250.

TABLE 4. VOLUME, VALUE, AND VALUE ADDED BY MOTOR CARRIER TRANSPORTATION OF SMALL GRAINS TO FIRST MARKET DESTINATIONS DIRECT FROM NORTH DAKOTA FARMS BY STATE REGION (SR) DURING THE PERIOD JANUARY, 1969, THROUGH DECEMBER, 1969

State Region	Volume ^a (bushels)	Volume (tons)	Value ^b	Value Added by Transportation ^c
1	--	--	\$ --	\$ --
2	251,790	7,050	203,950	35,250
3	136,686	3,884	176,469	23,520
4	53,955	1,619	71,760	9,228
5	--	--	--	--
6	--	--	--	--
7	107,910	3,237	143,520	25,896
8	71,940	1,727	54,674	8,635
TOTAL	622,281	17,517	\$650,373	\$102,529

^aSee Statistical Appendix Table 3.

^bSee Statistical Appendix Table 3 and "Season average prices received by North Dakota farmers for principle crops, by Crop Reporting District, North Dakota, Crop of 1968," North Dakota Crop and Livestock Statistics, Ag. Statistics, No. 21, Statistical Reporting Service, United States Department of Agriculture and Department of Agricultural Economics, North Dakota State University, Fargo, May, 1970, p. 71.

^cSee Statistical Appendix Tables 2 and 3.

²⁰See Table 2 and Table 4. Direct farm to market shipments (622,281) bushels divided by total small grain shipments (290,199,899 bushels) equals .0021 (0.21 percent).

SR 3

A total of 3,884 tons of small grains was shipped by motor carrier to first destinations direct from farms in State Region 3 during 1969. These motor carrier shipments were valued at \$176,469, and the value added by transportation was \$23,520. Motor carrier shipments from State Region 3 were transported over Highway 2 to destinations in Duluth-Superior (3,021 tons) and Minneapolis-St. Paul (863 tons).

SR 4

Direct farm to market shipments of small grains by motor carrier from State Region 4 during 1969 totaled 1,619 tons valued at \$71,760. These motor carrier shipments were transported over Highways 2 and 81 to Minneapolis-St. Paul. The value added by transportation was \$9,228.

SR 5

Results of this study indicate there were no direct farm to market shipments of small grains by motor carrier from State Region 5 during 1969.

SR 6

Results of this study indicate there were no direct farm to market shipments of small grains by motor carrier from State Region 6 during 1969.

SR 7

Direct farm to market shipments of small grains by motor carrier from State Region 7 during 1969 totaled 3,237 tons valued at \$143,520. These motor carrier shipments were transported over Highway 94 to Duluth-Superior. The value added by transportation was \$25,896.

SR 8

In-state shipments of small grains by motor carrier from State Region 8 during 1969 totaled 1,727 tons. These shipments were valued at \$54,674, and the value added by transportation was \$8,635.

MOTOR CARRIER TRANSPORTATION OF LIVESTOCK

North Dakota ranks fourteenth among the states in the number of lambs produced; sixteenth in the number of calves produced; and twenty-second in the number of small pigs produced.²¹ Receipts from the sale of cattle, calves, sheep, lambs, and hogs provide about 25 percent of the total cash farm income from farm marketings in North Dakota.²²

The motor carrier is an important factor in the movement of North Dakota-produced livestock to market. A total of 333,968 tons of livestock was transported by motor carrier out of and into North Dakota during 1969.²³ These motor carrier shipments were valued at \$174,093,902,²⁴ and the value added by transportation was \$5,128,347.²⁵

Livestock Exports

A total of 316,840 tons of livestock was shipped by motor carrier to out-of-state destinations from North Dakota origins during the period January, 1969, through December, 1969 (Table 5). These motor carrier shipments were valued at \$164,183,037, and the value added by transportation was \$4,926,923.

About 35.9 percent (113,729 tons) of the total volume of livestock shipped by motor carrier to out-of-state destinations from North Dakota origins during 1969 was transported to Minnesota destinations. Motor carrier shipments to Minnesota destinations were transported east over Highways 2, 11, 13, 81, 83, 85, and 94. These shipments were valued at \$58,598,981, and the value added by transportation was \$1,416,992.

²¹Price and Taylor, op. cit., p. 2.

²²Ibid., p. 77.

²³See Table 5 and Table 8. The above figure denotes livestock exports and imports by motor carrier. Farm to market and other intra-state movement of livestock are not included in this analysis.

²⁴Income received by livestock producers. This income includes farm to market transportation expenses and market handling costs which are costs absorbed by the farm producer. These costs are not subtracted from producer income in this analysis.

²⁵The value added by transportation is the cost of transporting livestock to out-of-state destinations from North Dakota markets (exports) and the cost of transporting livestock to North Dakota destinations from out-of-state origins (imports).

TABLE 5. VOLUME, VALUE, AND VALUE ADDED BY MOTOR CARRIER TRANSPORTATION OF LIVESTOCK TO OUT-OF-STATE DESTINATIONS FROM NORTH DAKOTA ORIGINS BY STATE REGION (SR) DURING THE PERIOD JANUARY, 1969, THROUGH DECEMBER, 1969

State Region	Volume ^a (tons)	Value ^b	Value Added by Transportation ^b
1	6,676	\$ 3,603,117	\$ 159,274
2	22,792	12,055,600	460,620
3	249	121,038	3,652
4	87	47,927	1,146
5	131,761	65,949,892	1,811,905
6	47,787	25,074,795	503,066
7	44,280	23,736,654	740,068
8	63,208	33,594,014	1,247,192
TOTAL	316,840	\$164,183,037	\$4,926,923

^aSee Statistical Appendix Table 4 and North Dakota Crop and Livestock Statistics, Ag Statistics No. 21, Statistical Reporting Service, United States Department of Agriculture and Department of Agricultural Economics, North Dakota State University, Fargo, May, 1970, pp. 64, 66, and 68.

See Statistical Appendix Tables 6, 7, 8, and 9.

An additional 7.8 percent (24,733 tons) of the total volume of livestock shipped by motor carrier to out-of-state destinations from North Dakota origins during 1969 was transported to destinations in Illinois, Indiana, Michigan, Wisconsin, Ohio, Pennsylvania, and Georgia. Motor carrier shipments to eastern states were transported east over Highways 11, 13, 83, 85, and 94. These shipments were valued at \$12,929,911, and the value added by transportation was \$644,801.

The western states of Montana, Idaho, Nevada, and Washington received about 5.2 percent (16,495 tons) of the total volume of livestock shipped by motor carrier to out-of-state destinations from North Dakota origins during 1969. Motor carrier shipments to western states were transported west over Highways 2, 23, 85, and 94. These shipments were valued at \$7,564,592, and the value added by transportation was \$456,932.

About 46.2 percent (146,389 tons) of the total volume of livestock shipped by motor carrier to out-of-state destinations from North Dakota origins during 1969 was transported to destinations in Iowa, Nebraska, South Dakota, Texas, Kansas, and Missouri. Motor carrier shipments to destinations in states located south and southeast

of North Dakota were transported south over Highways 81, 83, 85, 94, 281, and 12. These shipments were valued at \$76,726,326, and the value added by transportation was \$2,024,599.

The Southwestern States of Arizona, Colorado, and Wyoming received about 4.9 percent (15,487 tons) of the total volume of livestock shipped by motor carrier to out-of-state destinations from North Dakota origins during 1969. Motor carrier shipments to Southwestern States were transported over Highways 2, 8, 23, 85, and 94. These shipments were valued at \$8,360,167, and the value added by transportation was \$383,544.

Less than 0.1 percent (7 tons) of the total volume of livestock shipped by motor carrier to out-of-state destinations from North Dakota origins during 1969 was transported to destinations in Canada. Motor carrier shipments to Canadian destinations were transported north over Highway 81. These shipments were valued at \$3,060, and the value added by transportation was \$55.

Analysis of livestock exports by type indicated that 265,813 tons of cattle and calves, 8,474 tons of sheep and lambs, and 42,553 tons of hogs were shipped by motor carrier to out-of-state destinations from North Dakota origins during 1969 (Table 6). Livestock shipped by motor carrier comprised 96.8 percent of the total volume of livestock shipped to out-of-state destinations from North Dakota origins during 1969. About 98.6 percent of all cattle and calves, 87.8 percent of all sheep and lambs and 88.6 percent of all hogs were shipped by motor carrier from North Dakota origins to out-of-state destinations during 1969.

State Region 5 ranked first (497,984 head) and State Region 8 second (283,898 head) among North Dakota State Regions in the number of livestock shipped by motor carrier to out-of-state destinations during 1969 (Table 7).

Over 90 percent of all cattle, calves, sheep, and lambs and about 62 percent of all hogs shipped from North Dakota origins to interstate destinations during 1969 moved east and southeast. Motor carrier shipments of livestock to eastern and southeastern destinations were transported primarily over Highways 2, 11, 13, 81, 83, 85, and 94.

SR 1

A total of 6,676 tons of livestock was shipped by motor carrier to out-of-state destinations from State Region 1 during 1969. These motor carrier shipments were valued at \$3,603,117, and the value added by transportation was \$159,274.

About 3,069 tons of livestock were shipped east over Highways 85 and 94 to Minnesota destinations. These motor carrier shipments were valued at \$1,656,355, and the value added by transportation was \$71,324.

TABLE 6. VOLUME, VALUE, AND VALUE ADDED BY MOTOR CARRIER TRANSPORTATION OF LIVESTOCK TO OUT-OF-STATE DESTINATIONS FROM NORTH DAKOTA ORIGINS BY TYPE DURING THE PERIOD JANUARY, 1969, THROUGH DECEMBER, 1969

Type of Livestock	Volume (tons)	Value	Value Added by Transportation
Cattle	212,676	\$107,024,663	\$3,142,229
Calves	53,137	34,841,740	904,674
Sheep	1,414	179,336	28,603
Lambs	7,060	3,677,022	142,854
Hogs	42,553	18,460,274	708,559
TOTAL	316,840	\$164,183,035	\$4,926,919

Source: Statistical Appendix Tables 4, 6, 7, 8, and 9.

TABLE 7. THE TOTAL NUMBER OF LIVESTOCK SHIPPED BY MOTOR CARRIER TO OUT-OF-STATE DESTINATIONS FROM NORTH DAKOTA ORIGINS BY STATE REGION (SR) DURING THE PERIOD JANUARY, 1969, THROUGH DECEMBER, 1969

Origin State Region	Cattle	Calves	Sheep	Lambs	Hogs	Total
- number of head -						
1	9,399	12,819	--	--	854	23,072
2	27,613	37,653	2,272	14,680	22,450	104,668
3	161	220	57	366	985	1,789
4	124	170	--	--	--	294
5	214,270	27,689	12,092	78,154	165,779	497,984
6	52,358	71,391	1,229	7,950	91,869	224,797
7	56,606	77,183	354	2,285	39,025	175,453
8	79,288	108,110	6,998	45,226	44,276	283,898
ALL	439,819	335,235	23,002	148,661	365,238	1,311,955

Source: Statistical Appendix Table 4.

An additional 832 tons of livestock valued at \$450,498 were transported over Highways 85 and 94 to destinations in Michigan and Wisconsin. The value added by transportation was \$32,433.

Montana received 953 tons of livestock valued at \$510,558. These shipments were transported primarily over Highways 85 and 23. The value added by motor carrier transportation was \$11,141.

About 1,822 tons of livestock were shipped south over Highways 85, 94, and 281 to destinations in Iowa, Nebraska, and South Dakota. These motor carrier shipments were valued at \$935,706, and the value added by transportation was \$44,376.

SR 2

A total of 22,792 tons of livestock was shipped by motor carrier to out-of-state destinations from State Region 2 during 1969. These motor carrier shipments were valued at \$12,055,600, and the value added by transportation was \$460,620.

About 6,641 tons of livestock were shipped east over Highways 83 and 94 to Minnesota destinations. These shipments were valued at \$3,302,584, and the value added by transportation was \$118,478.

An additional 2,055 tons of livestock valued at \$1,122,196 were transported over Highways 83 and 94 to destinations in Michigan and Wisconsin. The value added by transportation was \$68,237.

Montana received 247 tons of livestock valued at \$115,761. These motor carrier shipments were transported primarily over Highways 2, 85, and 23. The value added by transportation was \$4,367.

About 672 tons of livestock were shipped to Colorado over Highways 2, 8, 23, and 85. These shipments were valued at \$353,659, and the value added by transportation was \$18,597.

An additional 13,177 tons of livestock valued at \$7,161,400 were shipped to destinations in South Dakota, Iowa, and Nebraska. These shipments were transported primarily over Highways 83, 94, and 281. The value added by transportation was \$250,941.

SR 3

A total of 249 tons of livestock was shipped by motor carrier to out-of-state destinations from State Region 3 during 1969. These motor carrier shipments were valued at \$121,038, and the value added by transportation was \$3,652.

About 246 tons of livestock were shipped east over Highways 2, 81, and 94 to Minnesota destinations. These shipments were valued at \$119,378, and the value added by transportation was \$3,600.

Iowa received three tons of livestock valued at \$1,660. These shipments were transported over Highway 281, and the value added by transportation was \$52.

SR 4

A total of 87 tons of livestock was shipped by motor carrier to out-of-state destinations from State Region 4 during 1969. These motor carrier shipments were valued at \$47,927, and the value added by transportation was \$1,146.

About 82 tons of livestock were shipped east over Highways 81 and 94 to Minnesota destinations. These shipments were valued at \$45,103, and the value added by transportation was \$1,082.

South Dakota received five tons of livestock valued at \$2,824. These shipments were transported over Highway 81, and the value added by transportation was \$64.

SR 5

A total of 131,761 tons of livestock was shipped by motor carrier to out-of-state destinations from State Region 5 during 1969. These motor carrier shipments were valued at \$65,949,892, and the value added by transportation was \$1,811,905.

About 59,055 tons of livestock were shipped east over Highway 94 to Minnesota destinations. These shipments were valued at \$29,673,439, and the value added by transportation was \$508,057.

Canada received seven tons of livestock valued at \$3,060. These shipments were transported over Highway 81, and the value added by transportation was \$55.

An additional 48,210 tons of livestock were transported over Highway 81 to destinations in Iowa, Missouri, Nebraska, South Dakota, and Texas. These shipments were valued at \$24,569,846, and the value added by transportation was \$571,742.

Arizona, Colorado, and Wyoming received 2,089 tons of livestock valued at \$1,060,735. These shipments were transported primarily over Highways 94 and 85. The value added by transportation was \$96,398.

About 12,486 tons of livestock were shipped east over Highway 94 to destinations in Illinois, Indiana, Michigan, Ohio, Pennsylvania, and Wisconsin. These shipments were valued at \$6,256,779, and the value added by transportation was \$257,773.

An additional 9,914 tons of livestock were shipped west over Highway 94 to destinations in Idaho, Montana, Nevada, and Washington. These shipments were valued at \$4,386,033, and the value added by transportation was \$377,880.

SR 6

A total of 47,787 tons of livestock was shipped by motor carrier to out-of-state destinations from State Region 6 during 1969. These motor carrier shipments were valued at \$25,074,795, and the value added by transportation was \$503,066.

About 11,224 tons of livestock were shipped east over Highways 11, 13, and 94 to Minnesota destinations. These shipments were valued at \$5,938,840, and the value added by transportation was \$133,314.

An additional 935 tons of livestock were shipped east over Highways 11, 13, and 94 to destinations in Illinois and Wisconsin. These shipments were valued at \$516,209, and the value added by transportation was \$24,107.

Montana received 113 tons of livestock valued at \$62,398. These motor carrier shipments were transported over Highway 94, and the value added by transportation was \$2,088.

About 35,010 tons of livestock were shipped south over Highway 281 to destinations in Nebraska, South Dakota, Iowa, and Missouri. These shipments were valued at \$18,278,554. The value added by transportation was \$331,573.

Wyoming received 505 tons of livestock valued at \$278,794. These shipments were transported over Highways 94 and 85. The value added by transportation was \$11,984.

SR 7

A total of 44,280 tons of livestock was shipped by motor carrier to out-of-state destinations from State Region 7 during 1969. These motor carrier shipments were valued at \$23,736,654, and the value added by transportation was \$740,068.

About 14,404 tons of livestock were shipped east over Highway 94 to Minnesota destinations. These shipments were valued at \$7,764,847, and the value added by transportation was \$220,840.

An additional 3,085 tons of livestock were shipped east over Highway 94 to destinations in Georgia, Illinois, Michigan, and Wisconsin. These shipments were valued at \$1,691,586, and the value added by transportation was \$89,460.

About 81 tons of livestock valued at \$39,460 were shipped to destinations in Montana and Washington. These shipments were transported over Highway 94 and the value added by transportation was \$1,941.

Colorado and Wyoming received 3,410 tons of livestock valued at \$1,870,211. These motor carrier shipments were transported over Highways 94 and 85. The value added by transportation was \$74,027.

About 23,300 tons of livestock were shipped south over Highways 94 and 281 to destinations in Iowa, Kansas, Missouri, Nebraska, and South Dakota. These shipments were valued at \$12,370,550, and the value added by transportation was \$353,800.

SR 8

A total of 63,208 tons of livestock was shipped by motor carrier to out-of-state destinations from State Region 8 during 1969. These motor carrier shipments were valued at \$33,594,014, and the value added by transportation was \$1,247,192.

About 19,008 tons of livestock were shipped east over Highway 94 to Minnesota destinations. These shipments were valued at \$10,098,435, and the value added by transportation was \$360,297.

An additional 5,340 tons of livestock were shipped east over Highway 94 to destinations in Illinois, Michigan, and Wisconsin. These shipments were valued at \$2,892,643, and the value added by transportation was \$172,791.

Montana received 5,187 tons of livestock valued at \$2,450,382. These shipments were transported over Highway 94, and the value added by transportation was \$59,515.

About 8,811 tons of livestock valued at \$4,796,768 were shipped to destinations in Colorado and Wyoming. These shipments were transported primarily over Highways 94 and 85. The value added by transportation was \$182,538.

Iowa received 15,866 tons of livestock valued at \$8,590,615. These shipments were transported over Highways 94 and 281. The value added by transportation was \$320,935.

An additional 2,925 tons of livestock valued at \$1,577,999 were shipped to destinations in Texas and Nebraska. These shipments were transported primarily over Highways 94 and 83. The value added by transportation was \$70,160.

South Dakota received 6,071 tons of livestock valued at \$3,187,172. These shipments were transported primarily over Highways 85 and 12. The value added by transportation was \$80,956.

Livestock Imports

A total of 17,128 tons of livestock was shipped into North Dakota from out-of-state origins by motor carrier during the period January, 1969, through December, 1969 (Table 8). These motor carrier shipments were valued at \$9,910,865, and the value added by transportation was \$201,424.

About 34.8 percent (5,968 tons) of the total volume of livestock shipped by motor carrier from out-of-state origins to North Dakota destinations during 1969 was imported from Minnesota. Livestock imports from Minnesota origins were transported west over Highways 2, 81, 83, and 94. These motor carrier shipments were valued at \$3,502,907, and the value added by transportation was \$61,427.

An additional 7.5 percent (1,283 tons) of the total volume of livestock imported to North Dakota from out-of-state origins during 1969 was shipped west over Highways 2, 81, 83, 85, and 94 from origins in Illinois, Pennsylvania, Wisconsin, West Virginia, and Michigan. These motor carrier shipments were valued at \$706,564, and the value added by transportation was \$31,848.

About 19.1 percent (3,263 tons) of the total volume of livestock imported to North Dakota from out-of-state origins during 1969 was shipped east over Highways 2 and 94 from Montana origins. These motor carrier shipments were valued at \$1,859,640, and the value added by transportation was \$42,238.

About 1 percent (173 tons) of the total volume of livestock imported to North Dakota from out-of-state origins during 1969 was transported over Highways 85 and 94 from origins in Colorado and Wyoming. These motor carrier shipments were valued at \$95,133, and the value added by transportation was \$4,165.

An additional 27.8 percent (4,756 tons) of the total volume of livestock imported to North Dakota from out-of-state origins during

TABLE 8. VOLUME, VALUE, AND VALUE ADDED BY MOTOR CARRIER TRANSPORTATION OF LIVESTOCK INTO NORTH DAKOTA FROM OUT-OF-STATE ORIGINS BY STATE REGION (SR) DURING THE PERIOD JANUARY, 1969, THROUGH DECEMBER, 1969

State Region	Volume ^a (tons)	Value ^b	Value Added by Transportation ^b
1	2,715	\$1,529,484	\$ 36,024
2	412	235,581	7,417
3	226	128,230	3,365
4	340	199,402	4,541
5	6,153	3,569,308	53,808
6	3,102	1,814,059	34,653
7	2,290	1,340,281	31,790
8	1,890	1,094,520	29,826
TOTAL	17,128	\$9,910,865	\$201,424

^aSee Statistical Appendix Table 5 and North Dakota Crop and Livestock Statistics, Ag. Statistics No. 21, Statistical Reporting Service, United States Department of Agriculture and Department of Agricultural Economics, North Dakota State University, Fargo, May, 1970, p. 64.

^bSee Appendix Tables 5, 7, 8, and 9.

1969 was transported north over Highways 8, 12, 81, 83, 94, and 281 from origins in Iowa, Kansas, Nebraska, South Dakota, and Texas. These motor carrier shipments were valued at \$2,797,041, and the value added by transportation was \$46,889.

About 9.8 percent (1,685 tons) of the total volume of livestock imported to North Dakota from out-of-state origins during 1969 was shipped south over Highways 5, 20, 81, 83, and 85 from Canadian origins. These motor carrier shipments were valued at \$949,580, and the value added by transportation was \$14,857.

Analysis of livestock imports by type indicated that 15,173 tons of cattle and calves, 1,705 tons of sheep and lambs, and 250 tons of hogs were imported to North Dakota by motor carrier from out-of-state origins during 1969 (Table 9).

State Region 1 ranked first (45,213 head) and State Region 5 second (33,501 head) among North Dakota State Regions in the number of livestock imported from out-of-state origins by motor carrier during 1969 (Table 10).

TABLE 9. VOLUME, VALUE, AND VALUE ADDED BY TRANSPORTATION OF LIVESTOCK INTO NORTH DAKOTA FROM OUT-OF-STATE ORIGINS BY TYPE DURING THE PERIOD JANUARY, 1969, THROUGH DECEMBER, 1969

Type of Livestock	Volume (tons)	Value	Value Added by Transportation
Cattle & Calves	15,173	\$8,869,354	\$172,058
Sheep & Lambs	1,705	931,834	24,742
Hogs	250	109,676	4,623
TOTAL	17,128	\$9,910,864	\$201,423

Source: Statistical Appendix Tables 4, 7, 8, and 9.

TABLE 10. THE TOTAL NUMBER OF LIVESTOCK SHIPPED INTO NORTH DAKOTA BY MOTOR CARRIER FROM OUT-OF-STATE ORIGINS BY STATE REGION (SR) DURING THE PERIOD JANUARY, 1969, THROUGH DECEMBER, 1969

Destination State Region	Cattle & Calves	Sheep & Lambs	Hogs	Total
- number of head -				
1	5,442	37,923	1,848	45,213
2	1,301	1,252	560	3,113
3	706	331	672	1,709
4	1,233	--	168	1,401
5	21,284	10,817	1,400	33,501
6	11,175	2,067	280	13,522
7	8,325	754	336	9,415
8	6,530	1,855	1,736	10,121
ALL	55,996	54,999	7,000	117,995

Source: Statistical Appendix Table 4.

SR 1

A total of 2,715 tons of livestock was shipped into State Region 1 from out-of-state origins by motor carrier during 1969. These motor carrier shipments were valued at \$1,529,484, and the value added by transportation was \$36,024.

About 243 tons of livestock were shipped south over Highways 5 and 85 from Canadian origins. These shipments were valued at \$137,052, and the value added by transportation was \$3,480.

An additional 2,323 tons of livestock were shipped east over Highway 2 from Montana origins. These shipments were valued at \$1,314,624, and the value added by transportation was \$28,913.

About 149 tons of livestock valued at \$77,808 were transported over Highways 12, 94, and 85 from origins in South Dakota, Wyoming, and Wisconsin. The value added by transportation was \$3,631.

SR 2

A total of 412 tons of livestock was shipped into State Region 2 from out-of-state origins by motor carrier during 1969. These motor carrier shipments were valued at \$235,581, and the value added by transportation was \$7,417.

About 22 tons of livestock were shipped south over Highways 5 and 83 from Canadian origins. These shipments were valued at \$12,328, and the value added by transportation was \$227.

About 240 tons of livestock were shipped west over Highways 94 and 83 from Minnesota origins. These shipments were valued at \$140,801, and the value added by transportation was \$4,285.

An additional 150 tons of livestock valued at \$82,452 were transported over Highways 2, 94, and 83 from origins in Montana, South Dakota, Texas, and Wisconsin. The value added by motor carrier transportation was \$2,905.

SR 3

A total of 226 tons of livestock was shipped into State Region 3 from out-of-state origins by motor carrier during 1969. These motor carrier shipments were valued at \$128,230, and the value added by transportation was \$3,365.

About eight tons of livestock were shipped south over Highways 5 and 20 from Canadian origins. These shipments were valued at \$4,472, and the value added by transportation was \$55.

About 139 tons of livestock were shipped west over Highway 2 from Minnesota origins. These shipments were valued at \$78,128, and the value added by transportation was \$2,026.

An additional 79 tons of livestock valued at \$45,630 were transported over Highways 2, 81, and 281 from origins in Iowa, South

Dakota and Wisconsin. The value added by motor carrier transportation was \$1,284.

SR 4

A total of 340 tons of livestock was shipped into State Region 4 from out-of-state origins by motor carrier during 1969. These motor carrier shipments were valued at \$199,402, and the value added by transportation was \$4,541.

About 328 tons of livestock were shipped west over Highway 81 from Minnesota origins. These shipments were valued at \$192,334, and the value added by transportation was \$4,330.

An additional 12 tons of livestock valued at \$7,068 were transported over Highways 2 and 81 from origins in Montana and South Dakota. The value added by transportation was \$211.

SR 5

A total of 6,153 tons of livestock was shipped into State Region 5 from out-of-state origins by motor carrier during 1969. These motor carrier shipments were valued at \$3,569,308, and the value added by transportation was \$53,808.

About 1,403 tons of livestock were shipped south over Highway 81 from Canadian origins. These shipments were valued at \$790,652, and the value added by transportation was \$10,979.

About 3,924 tons of livestock were shipped west over Highway 94 from Minnesota origins. These shipments were valued at \$2,306,972, and the value added by transportation was \$33,712.

An additional 826 tons of livestock valued at \$471,684 were transported over Highways 81, 85, and 94 from origins in Montana, South Dakota, Colorado, and Wyoming. The value added by motor carrier transportation was \$9,117.

SR 6

A total of 3,102 tons of livestock was shipped into State Region 6 from out-of-state origins by motor carrier during 1969. These motor carrier shipments were valued at \$1,814,059, and the value added by transportation was \$34,653.

About 1,017 tons of livestock were shipped west over Highway 94 from Minnesota origins. These shipments were valued at \$597,765, and the value added by transportation was \$12,116.

About 1,491 tons of livestock were shipped north over Highway 281 from South Dakota origins. These shipments were valued at \$883,554, and the value added by transportation was \$10,088.

An additional 594 tons of livestock valued at \$332,740 were transported over Highways 85, 94, and 281 from origins in Montana, Nebraska, Pennsylvania, Wisconsin, and Wyoming. The value added by transportation was \$12,449.

SR 7

A total of 2,290 tons of livestock was shipped into State Region 7 from out-of-state origins by motor carrier during 1969. These motor carrier shipments were valued at \$1,340,281, and the value added by transportation was \$31,790.

About nine tons of livestock were shipped south over Highways 5 and 83 from Canadian origins. These shipments were valued at \$5,076, and the value added by transportation was \$116.

A total of 312 tons of livestock was shipped west over Highway 94 from Minnesota origins. These shipments were valued at \$183,339, and the value added by transportation was \$4,807.

About 1,411 tons of livestock were shipped north over Highway 83 from South Dakota origins. These shipments were valued at \$835,482, and the value added by transportation was \$14,044.

An additional 558 tons of livestock were transported over Highways 83, 85, 94, and 281 from origins in Colorado, Illinois, Iowa, Kansas, Michigan, Montana, Nebraska, Wisconsin, and Wyoming. These shipments were valued at \$316,384, and the value added by transportation was \$12,823.

SR 8

A total of 1,890 tons of livestock was shipped into State Region 8 from out-of-state origins by motor carrier during 1969. These motor carrier shipments were valued at \$1,094,520, and the value added by transportation was \$29,826.

About eight tons of livestock were shipped west over Highway 94 from Minnesota origins. These shipments were valued at \$3,568, and the value added by transportation was \$151.

About 891 tons of livestock were shipped north over Highways 83 and 94 from South Dakota origins. These shipments were valued at \$525,774, and the value added by transportation was \$11,799.

An additional 991 tons of livestock were transported over Highways 83, 85, and 94 from origins in Colorado, Illinois, Montana, Nebraska, West Virginia, and Wisconsin. These shipments were valued at \$565,178, and the value added by transportation was \$17,876.

MOTOR CARRIER TRANSPORTATION OF DAIRY PRODUCTS

North Dakota ranks twenty-seventh among the states in the volume of milk produced.²⁶ Receipts from the sale of milk and cream provide about 4.5 percent of the total cash farm income from farm marketings in North Dakota.²⁷

All unprocessed dairy products were transported to first market destinations by motor carrier in North Dakota during 1969. A total of 497,174 tons of bulk milk and cream was transported over North Dakota roads during the period January, 1969, through December, 1969 (Table 11). These motor carrier shipments were valued at \$53,047,577,²⁸ and the value added by transportation was \$3,301,903.²⁹

A total of 461,321 tons of bulk milk and cream was purchased for processing by North Dakota firms during 1969. These purchases were valued at \$49,873,584, and the value added by motor carrier transportation was \$3,095,175. Total purchases included 71,268 tons of whole milk imported from outside North Dakota.³⁰ Whole milk imported into North Dakota was valued at \$6,588,466, and the value added by motor carrier transportation was \$410,934.

An additional 35,853 tons of whole milk were exported from North Dakota origins to out-of-state destinations during 1969.³¹ These motor carrier shipments were valued at \$3,173,993, and the value added by transportation was \$206,728.

²⁶Price and Taylor, op. cit., p. 2.

²⁷Ibid., p. 77.

²⁸Income received by producers. This income includes farm to market transportation expenses for hauling of unprocessed dairy products by individual producers. These costs are absorbed by the farm producer.

²⁹The value added by transportation is the cost of transporting bulk milk and cream to the processing plants by contract haulers and individual farm producers.

³⁰See Statistical Appendix Table 13.

³¹See Statistical Appendix Table 16.

TABLE 11. VOLUME, VALUE, AND VALUE ADDED BY MOTOR CARRIER TRANSPORTATION OF UNPROCESSED DAIRY PRODUCTS IN NORTH DAKOTA BY CROP REPORTING DISTRICT (CRD) DURING THE PERIOD JANUARY, 1969, THROUGH DECEMBER, 1969

Crop Reporting District	Volume ^a (pounds)	Volume (tons)	Value ^b	Value Added by Transportation ^c
1 (NW)	33,622,433	16,811	\$ 1,963,181	\$ 108,745
2 (NC)	69,654,668	34,827	3,732,419	237,048
3 (NE)	85,919,004	42,960	4,798,131	273,770
4 (WC)	18,188,804	9,094	1,045,206	68,272
5 (C)	79,985,934	39,993	3,512,471	256,452
6 (EC)	348,328,403	174,164	16,407,179	1,028,117
7 (SW)	67,359,235	33,680	3,357,088	214,547
8 (SC)	155,466,588	77,733	11,661,967	678,202
9 (SE)	135,823,368	67,912	6,569,935	436,750
TOTAL	994,348,437	497,174	\$53,047,577	\$3,301,903

^aSummary of "volumes" in Statistical Appendix Tables 10-16 (Source: Biennial Report of the Department of Agriculture, State of North Dakota, July 1, 1968, to June 30, 1970, pp. 57-63).

^bSummary of "values" in Statistical Appendix Tables 10-16 (Source: Biennial Report of the Department of Agriculture, State of North Dakota, July 1, 1968, to June 30, 1970, pp. 57-63).

^cSummary of "values added by transportation" in Statistical Appendix Tables 10-16. The "value added by transportation" of unprocessed dairy products is the total value added by transportation of this commodity.

Bulk milk and cream marketed in North Dakota are transported, to a large extent, over unimproved³² country roads. Improved³³ roads are used when possible, but farm pickup of milk and cream by contract haulers and delivery by individual producers result in widespread use of unimproved roads.

Crop Reporting District 6 ranked first (174,164 tons) and Crop Reporting District 8 ranked second (77,733 tons) among all crop reporting districts in the volume of unprocessed dairy products transported by motor carrier to first market destinations.³⁴

³²Gravel surface.

³³Paved or oiled surface.

³⁴See Table 11.

Crop Reporting District 6 ranked first among all crop reporting districts in the volume (52,327 tons) of whole milk imported from out-of-state origins, and in the volume (21,732 tons) of whole milk exported to out-of-state destinations.³⁵ Crop Reporting District 3 imported a total of 10,740 tons of whole milk during 1969, while Crop Reporting District 9 was an important exporter of whole milk (14,121 tons).

Due to location of processing plants, Highways 2, 52, 81, 83, 85, 94, and 281 are the improved roads in North Dakota most extensively traveled by haulers of unprocessed dairy products.

CRD 1

A total of 16,811 tons of bulk milk and cream was purchased for processing in Crop Reporting District 1 during 1969. These purchases were valued at \$1,963,181, and the value added by motor carrier transportation was \$108,745.

Improved roads most extensively traveled by haulers of unprocessed dairy products in Crop Reporting District 1 include Highways 2, 52, 83, and 85.

CRD 2

A total of 34,827 tons of bulk milk and cream was purchased for processing in Crop Reporting District 2 during 1969. These purchases were valued at \$3,732,419, and the value added by motor carrier transportation was \$237,048.

Improved roads most extensively traveled by haulers of unprocessed dairy products in Crop Reporting District 2 include Highways 2, 3, 5, and 52.

CRD 3

A total of 42,960 tons of bulk milk and cream was purchased for processing in Crop Reporting District 3 during 1969. These purchases were valued at \$4,798,131, and the value added by motor carrier transportation was \$273,770. Total purchases included 10,740 tons of whole milk imported from outside North Dakota. Whole milk imported into North Dakota was valued at \$1,082,545, and the value added by transportation was \$61,924.

Improved roads most extensively traveled by haulers of unprocessed dairy products in Crop Reporting District 3 include Highways 2, 81, and 281.

³⁵ See Statistical Appendix Tables 15 and 16.

CRD 4

A total of 9,094 tons of bulk milk and cream was purchased for processing in Crop Reporting District 4 during 1969. These purchases were valued at \$1,045,206, and the value added by motor carrier transportation was \$68,272.

Improved roads most extensively traveled by haulers of unprocessed dairy products in Crop Reporting District 4 include Highways 7, 23, and 85.

CRD 5

A total of 39,993 tons of bulk milk and cream was purchased for processing in Crop Reporting District 5 during 1969. These purchases were valued at \$3,512,471, and the value added by motor carrier transportation was \$256,452.

Improved roads most extensively traveled by haulers of unprocessed dairy products in Crop Reporting District 5 include Highways 52, 94, and 281.

CRD 6

A total of 152,432 tons of bulk milk and cream was purchased for processing in Crop Reporting District 6 during 1969. These purchases were valued at \$14,416,517, and the value added by motor carrier transportation was \$902,810. Total purchases included 52,327 tons of whole milk imported from outside North Dakota. Whole milk imported into North Dakota was valued at \$4,793,191, and the value added by transportation was \$301,720.

An additional 21,732 tons of whole milk were exported from Crop Reporting District 6 to out-of-state destinations during 1969. These motor carrier shipments were valued at \$1,990,662, and the value added by transportation was \$125,307.

Improved roads most extensively traveled by haulers of unprocessed dairy products in Crop Reporting District 6 include Highways 81 and 94.

CRD 7

A total of 33,680 tons of bulk milk and cream was purchased for processing in Crop Reporting District 7 during 1969. These purchases were valued at \$3,357,088, and the value added by motor carrier transportation was \$214,547. Total purchases included 1,336 tons of whole milk imported from outside North Dakota. Whole milk imported into

North Dakota was valued at \$117,603, and the value added by transportation was \$7,706.

Improved roads most extensively traveled by haulers of unprocessed dairy products in Crop Reporting District 7 include Highways 8, 12, 21, 22, and 94.

CRD 8

A total of 77,733 tons of bulk milk and cream was purchased for processing in Crop Reporting District 8 during 1969. These purchases were valued at \$11,661,967, and the value added by motor carrier transportation was \$678,202. Total purchases included 3,004 tons of whole milk imported from outside North Dakota. Whole milk imported into North Dakota was valued at \$271,591, and the value added by transportation was \$17,323.

Improved roads most extensively traveled by haulers of unprocessed dairy products in Crop Reporting District 8 include Highways 6, 83, and 94.

CRD 9

A total of 53,791 tons of bulk milk and cream was purchased for processing in Crop Reporting District 9 during 1969. These purchases were valued at \$5,386,604, and the value added by motor carrier transportation was \$355,329. Total purchases included 3,861 tons of whole milk imported from outside North Dakota. Whole milk imported into North Dakota was valued at \$323,536, and the value added by transportation was \$22,261.

An additional 14,121 tons of whole milk were exported from Crop Reporting District 9 to out-of-state destinations during 1969. These motor carrier shipments were valued at \$1,183,331, and the value added by transportation was \$81,421.

Improved roads most extensively traveled by haulers of unprocessed dairy products in Crop Reporting District 9 include Highways 11, 13, 46, and 281.

MOTOR CARRIER TRANSPORTATION OF POTATOES AND SUGARBEETS

North Dakota ranks seventh among the states in the production of potatoes and eighth among the states in the production of sugarbeets.³⁶

³⁶ Price and Taylor, op. cit., p. 2.

Receipts from the sale of potatoes and sugarbeets provide about 4 percent of the total cash farm income from farm marketings in North Dakota.³⁷

Potato and sugarbeet production in North Dakota are concentrated primarily in the Red River Valley area (the Red River forms the eastern boundary of North Dakota). During 1969 about 98.9 percent (283,265 tons) of all motor carrier shipments of potatoes from North Dakota originated in State Region 4 (247,784 tons) and State Region 5 (35,481 tons).³⁸ During this same period, all motor carrier shipments of sugarbeets to processing plants originated in State Region 4 (547,250 tons) and State Region 5 (95,726 tons).³⁹ State Regions 4 and 5 include the Red River Valley of North Dakota.

A total of 1,074,790 tons of potatoes and sugarbeets was transported by motor carrier to first market destinations over North Dakota highways during 1969.⁴⁰ These motor carrier shipments were valued at \$20,502,406⁴¹ and the value added by transportation was \$7,624,690.⁴²

Potatoes

A total of 286,379 tons of potatoes was shipped by motor carrier from North Dakota origins during the period January, 1969, through December, 1969 (Table 12). These motor carrier shipments were valued at \$7,674,960, and the value added by transportation was \$6,170,891.

About 15.9 percent (45,664 tons) of the total volume of potatoes shipped by motor carrier from North Dakota origins during 1969 was transported to Minnesota destinations. These shipments were transported primarily over Highways 17, 81, and 94. Potatoes shipped by motor carrier to Minnesota destinations were valued at \$1,223,796, and the value added by transportation was \$441,699.

³⁷ Ibid., p. 77.

³⁸ See Table 12.

³⁹ See Table 14.

⁴⁰ See Tables 12 and 14.

⁴¹ Income received by potato and sugarbeet producers. This income includes farm to market transportation expenses and market handling which are costs absorbed by the farm producer. These costs are not subtracted from producer income in this analysis.

⁴² The value added by transportation is the cost of transporting potatoes to first market destinations from North Dakota origins and the cost of transporting sugarbeets to processing plants over North Dakota highways.

An additional 20.5 percent (58,644 tons) of the total volume of potatoes shipped by motor carrier from North Dakota origins during 1969 was transported to destinations in Iowa, Wisconsin, Ohio, Michigan, Illinois, Indiana, Missouri, Pennsylvania, Virginia, Maryland, New York, and Washington, D. C. Motor carrier shipments of potatoes to eastern destinations were transported over Highways 81 and 94. These shipments were valued at \$1,571,661, and the value added by transportation was \$1,379,522.

TABLE 12. VOLUME, VALUE, AND VALUE ADDED BY MOTOR CARRIER TRANSPORTATION OF POTATOES FROM NORTH DAKOTA ORIGINS BY STATE REGION (SR) DURING THE PERIOD JANUARY, 1969, THROUGH DECEMBER, 1969

State Region	Volume ^a (tons)	Value ^b	Value Added by Transportation ^c
3	1,525	\$ 40,870	\$ 32,519
4	247,784	6,640,612	5,683,166
5	35,481	950,892	436,055
6	774	20,744	8,892
7	244	6,539	1,486
8	571	15,303	8,773
TOTAL	286,379	\$7,674,960	\$6,170,891

^aSee Statistical Appendix Table 17.

^bSee Statistical Appendix Table 17 and North Dakota Crop and Livestock Statistics, Ag. Statistics No. 21, Statistical Reporting Service, United States Department of Agriculture and Department of Agricultural Economics, North Dakota State University, Fargo, May, 1970, p. 71.

^cSee Statistical Appendix Table 18.

The Southeastern States of Alabama, Louisiana, Arkansas, North Carolina, Florida, Tennessee, and Mississippi received 28.9 percent (82,736 tons) of the total volume of potatoes shipped by motor carrier from North Dakota origins during 1969. Motor carrier shipments of potatoes to southeastern states were transported over Highways 17, 81, and 94. These shipments were valued at \$2,217,324, and the value added by transportation was \$2,580,292.

The Western States of Montana, Idaho, Washington, and Oregon received 4.6 percent (13,290 tons) of the total volume of potatoes shipped by motor carrier from North Dakota origins during 1969. Motor carrier shipments of potatoes to Western States were transported over Highways 2, 17, and 20. These shipments were valued at \$356,172, and the value added by transportation was \$388,788.

The Southwestern States of Arizona, Wyoming, Colorado, Utah, and California received 2 percent (5,712 tons) of the total volume of potatoes shipped by motor carrier from North Dakota origins during 1969. These shipments were transported over Highways 81, 85, 94, and 281. Motor carrier shipments of potatoes to Southwestern States were valued at \$153,082, and the value added by transportation was \$194,485.

About 16.7 percent (47,711 tons) of the total volume of potatoes shipped by motor carrier from North Dakota origins during 1969 was transported south over Highways 32 and 81 to destinations in South Dakota, Nebraska, Kansas, Oklahoma, and Texas. These motor carrier shipments were valued at \$1,278,656, and the value added by transportation was \$1,003,982.

Canada received about 0.5 percent (1,388 tons) of the total volume of potatoes shipped by motor carrier from North Dakota origins during 1969. Motor carrier shipments of potatoes to Canada were transported over Highway 81. These shipments were valued at \$37,198, and the value added by transportation was \$14,435.

In-state shipments totaled 10.9 percent (31,234 tons) of the total volume of potatoes shipped by motor carrier from North Dakota origins during 1969. In-state shipments of potatoes by motor carrier were transported over Highways 2, 17, 20, 81, 83, 94, and 281. These shipments were valued at \$837,071, and the value added by transportation was \$167,688.

Analysis of potato shipments from North Dakota origins during 1969 indicated that 43.8 percent of the total volume shipped was transported to first destinations by motor carrier.⁴³

Minnesota ranked first and Arkansas second in the volume (45,664 tons and 34,751 tons, respectively) of potatoes imported from North Dakota by motor carrier (Table 13).

SR 3

A total of 1,525 tons of potatoes was shipped by motor carrier from State Region 3 during 1969. These motor carrier shipments were valued at \$40,870, and the value added by transportation was \$32,519.

⁴³Potato production in North Dakota during 1969 was estimated at 15,400,000 hundredweight. Motor carrier shipments of potatoes during 1969 totaled 5,727,572 hundredweight. Potato disposition during 1968 revealed that 84.87 percent of all potatoes produced were sold. Assuming the same disposition in 1969 and applying this percentage to 1969 production, it was determined that 13,070,000 hundredweight were sold. $5,727,572 \div 13,070,000 = .4382$ (43.8 percent)

About 276 tons of potatoes were shipped east over Highways 17, 81, and 94 to Minnesota destinations. These shipments were valued at \$7,397, and the value added by transportation was \$4,526.

An additional 221 tons of potatoes valued at \$5,923 were shipped over Highways 17, 81, and 94 to destinations in Alabama. The value added by transportation was \$7,602.

TABLE 13. MOTOR CARRIER SHIPMENTS OF POTATOES FROM NORTH DAKOTA TO OUT-OF-STATE DESTINATIONS DURING THE PERIOD JANUARY, 1969, THROUGH DECEMBER, 1969

Destination	Volume (cwt.)	Volume (tons)	Destination	Volume (cwt.)	Volume (tons)
Arizona	8,182	409	Nebraska	298,864	14,944
Alabama	164,813	8,240	New York	1,600	80
Arkansas	695,019	34,751	North Carolina	1,600	80
California	57,680	2,884	North Dakota	624,681	31,234
Canada	27,750	1,388	Ohio	292,274	14,613
Colorado	33,344	1,667	Oklahoma	77,218	3,861
Florida	315,371	15,769	Oregon	25,680	1,284
Idaho	72,310	3,616	Pennsylvania	65,566	3,278
Illinois	308,667	15,433	Rhode Island	22,113	1,106
Indiana	16,500	825	South Dakota	87,245	4,362
Iowa	198,233	9,912	Tennessee	163,986	8,199
Kansas	266,890	13,345	Texas	223,987	11,199
Louisiana	195,963	9,798	Utah	13,234	662
Maryland	3,200	160	Virginia	9,880	494
Michigan	63,427	3,171	Washington	86,280	4,314
Minnesota	913,289	45,664	Washington, D. C.	3,020	151
Missouri	100,367	5,019	Wisconsin	88,040	4,402
Mississippi	117,984	5,899	Wyoming	1,795	90
Montana	81,520	4,076	TOTAL	5,727,572	286,379

Source: Statistical Appendix Table 17.

Arizona received 409 tons of potatoes valued at \$10,961. These shipments were transported over Highways 281, 94, and 85. The value added by transportation was \$15,297.

In-state shipments totaled 619 tons of potatoes valued at \$16,589. These shipments were transported primarily over Highways 2, 17, 81, and 281. The value added by transportation was \$5,094.

SR 4

A total of 247,784 tons of potatoes was shipped by motor carrier from State Region 4 during 1969. These motor carrier shipments were valued at \$6,640,612, and the value added by transportation was \$5,683,166.

About 20,191 tons of potatoes were shipped east over Highways 81 and 94 to Minnesota destinations. These shipments were valued at \$541,119, and the value added by transportation was \$209,986.

An additional 56,693 tons of potatoes were transported over Highways 81 and 94 to destinations in Iowa, Wisconsin, Ohio, Michigan, Illinois, Indiana, Missouri, Pennsylvania, Virginia, Rhode Island, Washington, D. C., Maryland, and New York. These shipments were valued at \$1,519,374, and the value added by transportation was \$1,335,501.

The Southeastern States of Alabama, Louisiana, Arkansas, North Carolina, Florida, Tennessee, and Mississippi received 80,889 tons of potatoes valued at \$2,167,824. These shipments were transported over Highways 81 and 94. The value added by transportation was \$2,530,414.

Montana, Idaho, Washington, and Oregon received 13,290 tons of potatoes valued at \$356,172. These shipments were transported over Highways 2, 17, and 20. The value added by transportation was \$388,788.

The Southwestern States of Wyoming, Utah, California, and Colorado received 4,287 tons of potatoes valued at \$114,892. These shipments were transported over Highways 81, 94, and 85. The value added by transportation was \$154,374.

About 41,771 tons of potatoes were shipped south over Highway 81 to destinations in South Dakota, Nebraska, Kansas, Oklahoma, and Texas. These shipments were valued at \$1,119,463, and the value added by transportation was \$899,853.

Canada received 1,388 tons of potatoes valued at \$37,198. These shipments were transported over Highway 81, and the value added by transportation was \$14,435.

In-state shipments totaled 29,275 tons of potatoes valued at \$784,570. These shipments were transported over Highways 2, 17, 20, 81, and 94. The value added by transportation was \$149,815.

SR 5

A total of 35,481 tons of potatoes was shipped by motor carrier from State Region 5 during 1969. These motor carrier shipments were valued at \$950,892, and the value added by transportation was \$436,055.

About 25,151 tons of potatoes were shipped east over Highway 94 to Minnesota destinations. These shipments were valued at \$674,047, and the value added by transportation was \$226,359.

An additional 1,672 tons of potatoes were shipped east over Highway 94 to destinations in Michigan, Indiana, Illinois, and Ohio. These shipments were valued at \$44,810, and the value added by transportation was \$38,162.

Missouri received 279 tons of potatoes valued at \$7,477. These shipments were transported over Highway 94, and the value added by transportation was \$5,859.

About 1,626 tons of potatoes valued at \$43,577 were shipped to destinations in Arkansas. These shipments were transported over Highway 94, and the value added by transportation was \$42,276.

The Southwestern States of Utah and Colorado received 966 tons of potatoes valued at \$25,899. These shipments were transported over Highways 94 and 85. The value added by transportation was \$23,994.

About 5,387 tons of potatoes were shipped over Highway 81 to destinations in South Dakota, Nebraska, Kansas, and Texas. These shipments were valued at \$144,372, and the value added by transportation was \$97,005.

In-state shipments totaled 400 tons of potatoes valued at \$10,720. These shipments were transported over Highway 81, and the value added by transportation was \$2,400.

SR 6

A total of 774 tons of potatoes was shipped by motor carrier from State Region 6 during 1969. These motor carrier shipments were valued at \$20,744, and the value added by transportation was \$8,892.

About 553 tons of potatoes were shipped south over Highway 32 to destinations in South Dakota and Nebraska. These shipments were valued at \$14,821, and the value added by transportation was \$7,124.

In-state shipments totaled 221 tons of potatoes valued at \$5,923. These shipments were transported over Highway 94, and the value added by transportation was \$1,768.

SR 7

A total of 244 tons of potatoes was shipped by motor carrier from State Region 7 during 1969. All destinations were within North Dakota,

and these shipments were transported primarily over Highway 83. These motor carrier shipments were valued at \$6,539, and the value added by transportation was \$1,486.

SR 8

A total of 571 tons of potatoes was shipped by motor carrier from State Region 8 during 1969. These motor carrier shipments were valued at \$15,303, and the value added by transportation was \$8,773.

About 46 tons of potatoes were shipped east over Highway 94 to Minnesota destinations. These shipments were valued at \$1,233, and the value added by transportation was \$828.

Wyoming received 50 tons of potatoes valued at \$1,340. These shipments were transported over Highways 94 and 85. The value added by transportation was \$820.

In-state shipments totaled 475 tons of potatoes valued at \$12,730. These shipments were transported over Highways 94 and 81. The value added by transportation was \$7,125.

Sugarbeets

A total of 788,411 tons of sugarbeets was shipped to processing plants by motor carrier over North Dakota highways during 1969 (Table 14).⁴⁴ These motor carrier shipments were valued at \$12,827,446, and the value added by transportation was \$1,453,799.

Exports to Minnesota totaled 241,294 tons of sugarbeets valued at \$3,925,853. These shipments were transported over Highways 2, 81, and 94. The value added by motor carrier transportation was \$417,259.

Imports from Minnesota totaled 145,435 tons of sugarbeets valued at \$2,366,227. These shipments were transported over Highways 44 and 66. The value added by transportation was \$296,687.

An additional 401,682 tons of sugarbeets were shipped over Highways 17, 44, 66, and 81 for processing within North Dakota. These shipments were valued at \$6,535,366. The value added by transportation was \$739,853.

⁴⁴Includes motor carrier shipments of sugarbeets to processing plants by contract haulers and farm producers. Shipments by farm producers that terminate at sugarbeet piling sites are not included in this analysis.

About 47.2 percent of all North Dakota sugarbeets shipped to processing plants during 1969 was transported by motor carrier.⁴⁵

SR 4

About 692,685 tons of sugarbeets were transported by motor carrier over highways in State Region 4 during 1969. These shipments were valued at \$11,269,984, and the value added by motor carrier transportation was \$1,333,499.

TABLE 14. SHIPMENTS OF SUGARBEETS BY MOTOR CARRIER FROM NORTH DAKOTA AND MINNESOTA ORIGINS TO NORTH DAKOTA AND MINNESOTA DESTINATIONS, 1969^a

Origin and Destination	Volume (tons)	Value	Value Added by Transportation
North Dakota to Minnesota	642,976	\$10,461,219	\$1,157,112
Minnesota to North Dakota	145,435	2,366,227	296,687
TOTAL	788,411	\$12,827,446	\$1,453,799

^aSource: Statistical Appendix Table 19.

Contract haulers transported 99,472 tons of sugarbeets to the processing plant in Drayton, North Dakota. These motor carrier shipments were valued at \$1,618,409, and the value added by transportation was \$123,345. These shipments were transported over Highways 66 and 81.

Farm producers transported 302,210 tons of sugarbeets valued at \$4,916,957 to the Drayton plant. These shipments were transported over Highways 17, 44, 66, and 81. The value added by transportation was \$616,508.

⁴⁵Sugarbeet production in North Dakota during 1969 totaled 1,363,000 tons (Source: North Dakota Crop and Livestock Statistics, Ag. Statistics No. 21, Statistical Reporting Service, United States Department of Agriculture and Department of Agricultural Economics, North Dakota State University, Fargo, May, 1970, p. 52.) A total of 642,976 tons of North Dakota sugarbeets was shipped to processing plants by motor carrier during 1969 ($642,976 \div 1,363,000 = .472$).

Exports to the processing plant in East Grand Forks, Minnesota, totaled 145,568 tons of sugarbeets valued at \$2,368,391. The value added by motor carrier transportation was \$296,959.

Imports from Minnesota to the Drayton plant totaled 145,435 tons of sugarbeets valued at \$2,366,227. These shipments were transported over Highways 44 and 66. The value added by transportation was \$296,687.

SR 5

About 95,726 tons of sugarbeets were transported by motor carrier over highways in State Region 5 during 1969. These motor carrier shipments were valued at \$1,557,462, and the value added by transportation was \$120,300.

Contract haulers transported 93,726 tons of sugarbeets valued at \$1,524,922 to the processing plant in Moorhead, Minnesota. These shipments were transported over Highway 94 and the value added by transportation was \$116,220.

Farm producers transported 2,000 tons of sugarbeets valued at \$32,540 to the Moorhead plant. These shipments were transported over Highways 81 and 94. The value added by transportation was \$4,080.

MOTOR CARRIER TRANSPORTATION OF AGRICULTURAL PRODUCTS, COMPARISONS, PRIMARY ROUTES

Analysis of the transportation of agricultural products out of, into, and within North Dakota during 1969 indicated that about 35 percent of the total volume shipped was transported by motor carrier to first market destinations.⁴⁶

A total of 3,936,733 tons of agricultural products was transported by motor carrier out of, into, and within North Dakota during 1969 (Table 15). These motor carrier shipments were valued at \$345,750,992,⁴⁷ and the value added by transportation was \$30,590,511.⁴⁸

⁴⁶See Tables 15 and 16. Motor carrier shipments of agricultural products (3,936,733 tons) divided by total shipments of agricultural products (11,061,774 tons) equals .355 (35.5 percent).

⁴⁷Income received by agricultural producers. This income includes farm to market transportation expenses and market handling costs which are costs absorbed by the farm producer. (Income received by small grain producers did not include market handling costs.)

⁴⁸The value added by transportation is the cost of transporting agricultural products by motor carrier to first market destinations from North Dakota (exports and intrastate movement) and out-of-state origins (imports).

Results of this analysis indicated that the motor carriers' share of the transportation of agricultural products out of, into, and within North Dakota during 1969 included:⁴⁹ (1) 35.5 percent of the volume, (2) 54.5 percent of the value, and (3) 35 percent of the value added by transportation (revenue received by transporters of agricultural products).

TABLE 15. VOLUME, VALUE, AND VALUE ADDED BY MOTOR CARRIER TRANSPORTATION OF AGRICULTURAL PRODUCTS TO FIRST MARKET DESTINATIONS BY COMMODITY DURING THE PERIOD JANUARY, 1969 THROUGH DECEMBER, 1969^a

Commodity	Volume (tons)	Value	Value Added by Transportation
Wheat	996,698	\$ 44,089,319	\$ 6,896,143
Durum	470,693	23,176,295	3,416,773
Barley	147,193	5,139,975	1,138,755
Oats	169,208	5,328,499	1,438,272
Flaxseed	187,316	18,565,720	1,198,123
Rye	59,693	1,807,299	447,505
Sub-Total	2,030,801	\$ 98,107,107	\$14,535,571
Livestock Exports	316,840	\$164,183,037	\$ 4,926,923
Livestock Imports	17,128	9,910,865	201,424
Sub-Total	333,968	\$174,093,902	\$ 5,128,347
Unprocessed Dairy Products	497,174	\$ 53,047,577	\$ 3,301,903
Potatoes	286,379	7,674,960	6,170,891
Sugarbeets	788,411	12,827,446	1,453,799
TOTAL	3,936,733	\$345,750,992	\$30,590,511

Source: Tables 1, 5, 8, 11, 12, and 14.

^aData pertaining to elevator shipments of small grains correspond to the time period August, 1968, through July, 1969.

Primary Routes

Motor carrier shipments of agricultural products in North Dakota during 1969 were transported primarily over Highways 2, 11, 13, 17, 44,

⁴⁹See Tables 15 and 16.

TABLE 16. ESTIMATED VOLUME, VALUE, AND VALUE ADDED BY MOTOR CARRIER AND RAIL TRANSPORTATION OF AGRICULTURAL PRODUCTS TO FIRST MARKET DESTINATIONS BY COMMODITY DURING THE PERIOD JANUARY, 1969, THROUGH DECEMBER, 1969^a

Commodity	Volume ^b (tons)	Value ^b	Value Added by Transportation ^c
Wheat	3,401,741	\$150,476,013	\$25,198,520
Durum	2,093,741	103,091,619	16,384,927
Barley	1,464,730	51,146,907	12,350,995
Oats	469,089	14,771,612	4,242,159
Flaxseed	330,073	32,714,855	2,203,132
Rye	136,637	4,136,822	1,082,293
Sub-Total	7,896,011	\$356,337,828	\$61,462,026
Livestock Exports	327,256	\$169,585,284	\$ 5,088,986
Livestock Imports	17,128	9,910,865	201,424
Sub-Total	344,394	\$179,496,149	\$ 5,290,410
Unprocessed Dairy Products	497,174	\$ 53,047,577	\$ 3,301,903
Potatoes	653,833	17,522,740	14,088,792
Sugarbeets	1,670,362	27,176,792	3,080,083
TOTAL	11,061,774	\$633,581,086	\$87,223,214

^aData pertaining to elevator shipments of small grains correspond to the time period August, 1968, through July, 1969.

^bEstimates based on information listed in Table 15 and percentages of each commodity transported by motor carrier out of, into, and within North Dakota during 1969.

^cValue added per ton by rail transportation of small grains is based on 110 percent of the value added per ton by motor carrier transportation of each of the various small grains. The 10 percent differential is based on the fact that rail rates are approximately \$2.00 per ton higher than motor carrier rates.

66, 81, 94, and 281.⁵⁰ Exports of agricultural products by motor carrier moved primarily east and south to destinations in Minnesota and states east and south of North Dakota.

⁵⁰Routes or direction of movement are based on origin and destination of shipments of agricultural products by motor carrier in North Dakota during 1969. The statistics illustrated in Figures 4, 5, and 6 are a summary of the volume, value, and value added by transportation associated with primary routes listed in Table 15 and the Statistical Appendix Tables. These statistics include all motor carrier shipments of agricultural products discussed in this study except motor carrier shipments of small grains to in-state and unknown destinations; and motor carrier shipments of unprocessed dairy products.

The largest proportion of the total volume of agricultural products shipped by motor carrier in North Dakota during 1969 was transported over Highways 2 and 94 (Figure 4). About 738,406 tons were transported over the extreme eastern section of Highway 2, and about 1,005,493 tons were transported over the extreme eastern section of Highway 94. The summation of these two volumes (1,743,899 tons) comprises about 44 percent of the entire volume (3,936,733 tons) of agricultural products transported by motor carrier in North Dakota during 1969. Highways 2 and 94 are the most important east-west routes in North Dakota.

The volume of agricultural traffic becomes increasingly larger as one traces a route from west to east over North Dakota highways. This additive effect is due to the fact that a large part of North Dakota's agricultural production moves to destinations in states east and southeast of North Dakota. Those sections of Highways 2 and 94 located in the extreme western part of North Dakota carry a much smaller volume of agricultural production than those sections located in extreme eastern North Dakota.

Highways 11 and 13 in southeastern North Dakota are important east-west routes. A large part of the volume transported over these highways consists of small grain shipments to Minnesota destinations.

A large volume of agricultural production (488,930 tons) was transported over Highways 17 and 66 in northeastern North Dakota. Shipments of potatoes and sugarbeets comprised much of the agricultural production transported over these highways. The large volume transported over Highway 66 is primarily due to shipments of sugarbeets to the processing plant located in Drayton, North Dakota.

Highways 44, 81, 85, and that section of Highway 281 south of Highway 94 were north-south routes that carried an important share of the agricultural traffic (volumes transported over various sections of these highways included: 506,112 tons over the northern section of Highway 81; 110,524 tons over the central section of Highway 85; 99,065 tons over the southern section of Highway 281; and 323,295 tons over Highway 44).

A large part of the volume shipped over Highways 85 and 281 consists of livestock shipments to states south and southeast of North Dakota.

Agricultural traffic over Highways 44 and 81 consists primarily of potato and sugarbeet shipments, although a large part of the volume shipped over that section of Highway 81 south of Highway 94 consists of livestock shipments to destinations in states south and southeast of North Dakota.

The largest proportion of the total value of agricultural products was transported over Highway 94 in North Dakota during 1969 (Figure 5).

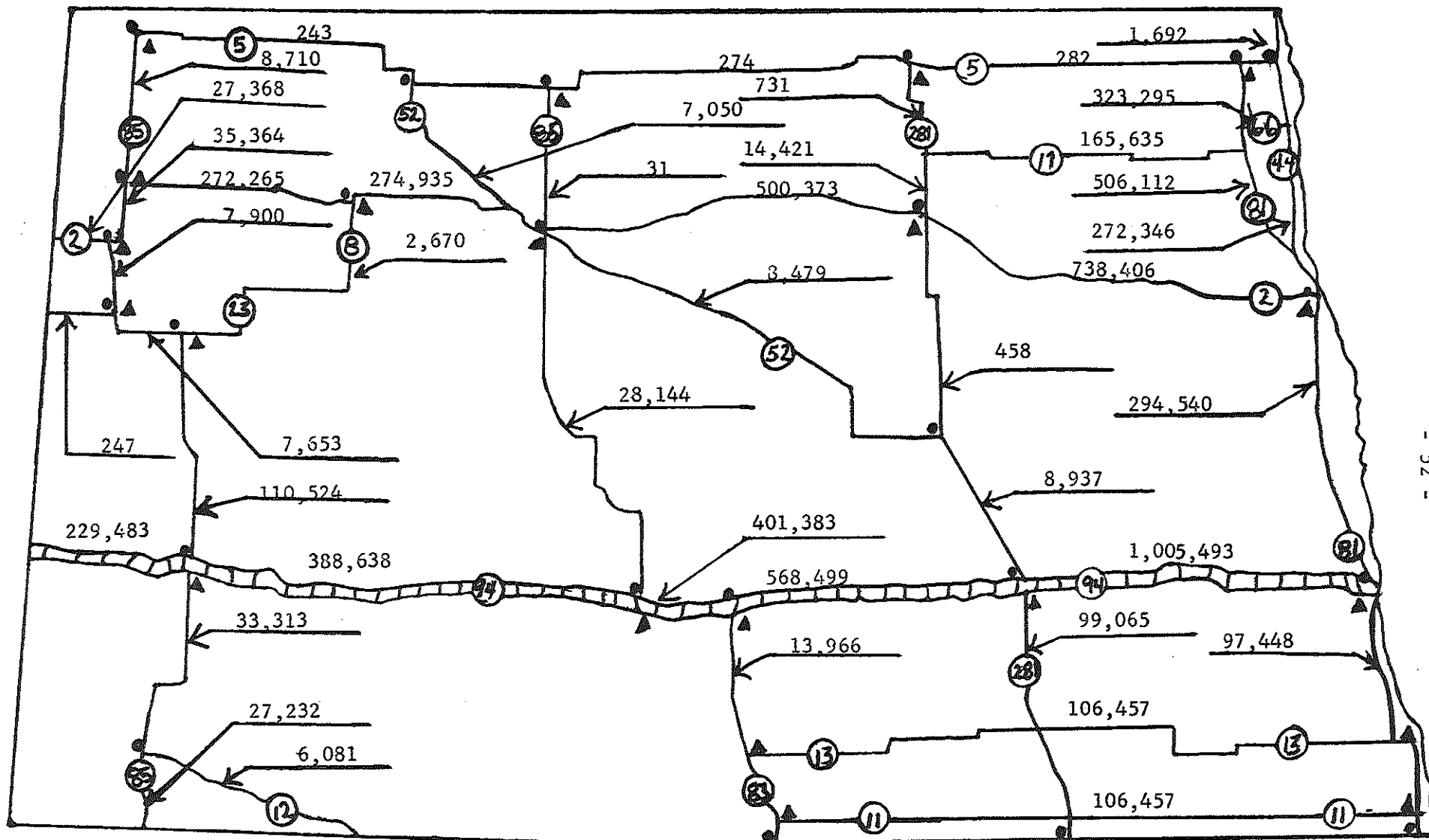


Figure 4. Volume (tons) of Agricultural Products Transported over Various Sections of North Dakota Highways During 1969. Note: Triangles define section boundaries on east-west highways; dots define section boundaries on north-south highways.

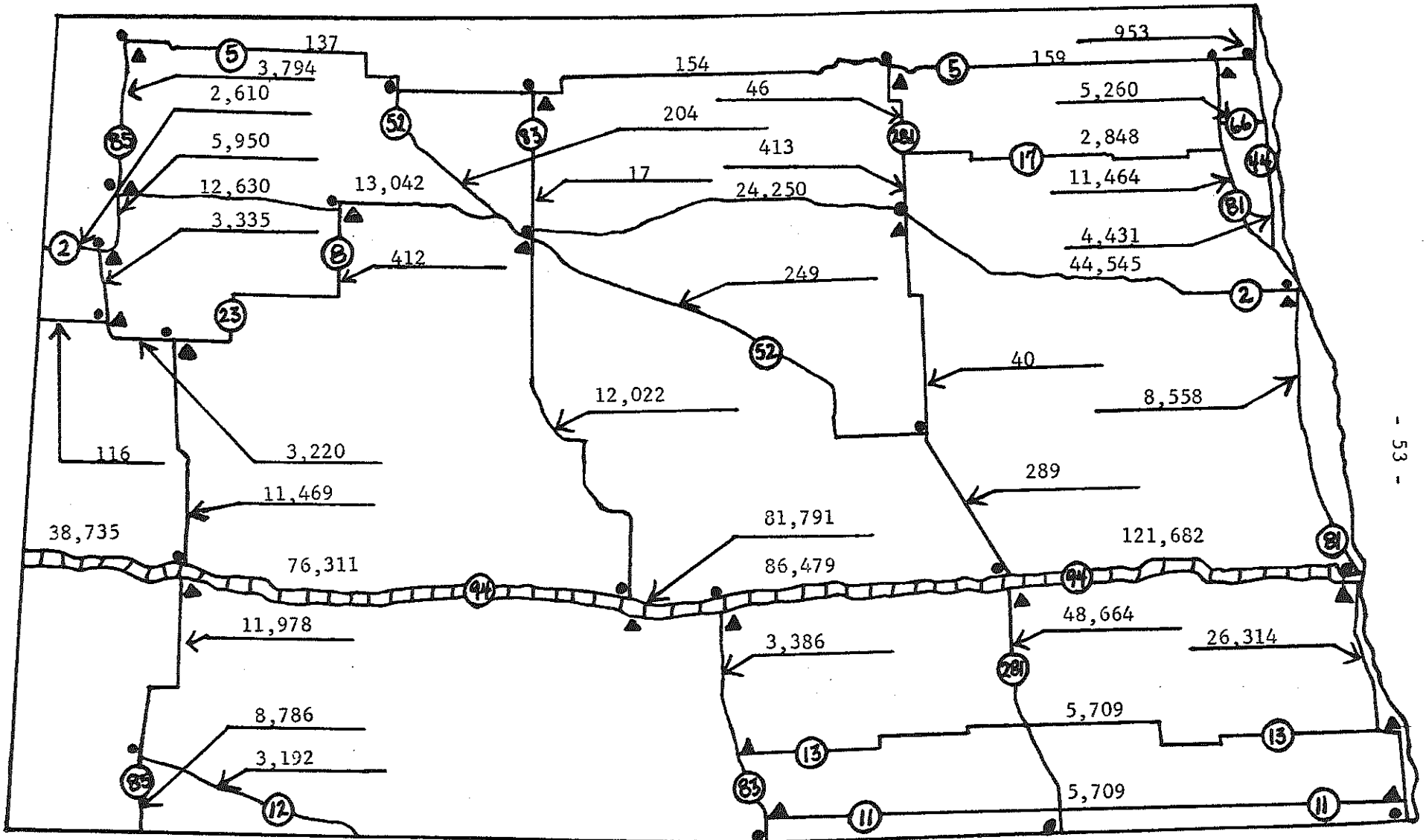


Figure 5. Value (thousand dollars) of Agricultural Products Transported Over Various Sections of North Dakota Highways During 1969. Note: Triangles define section boundaries on east-west highways; dots define section boundaries on north-south highways.

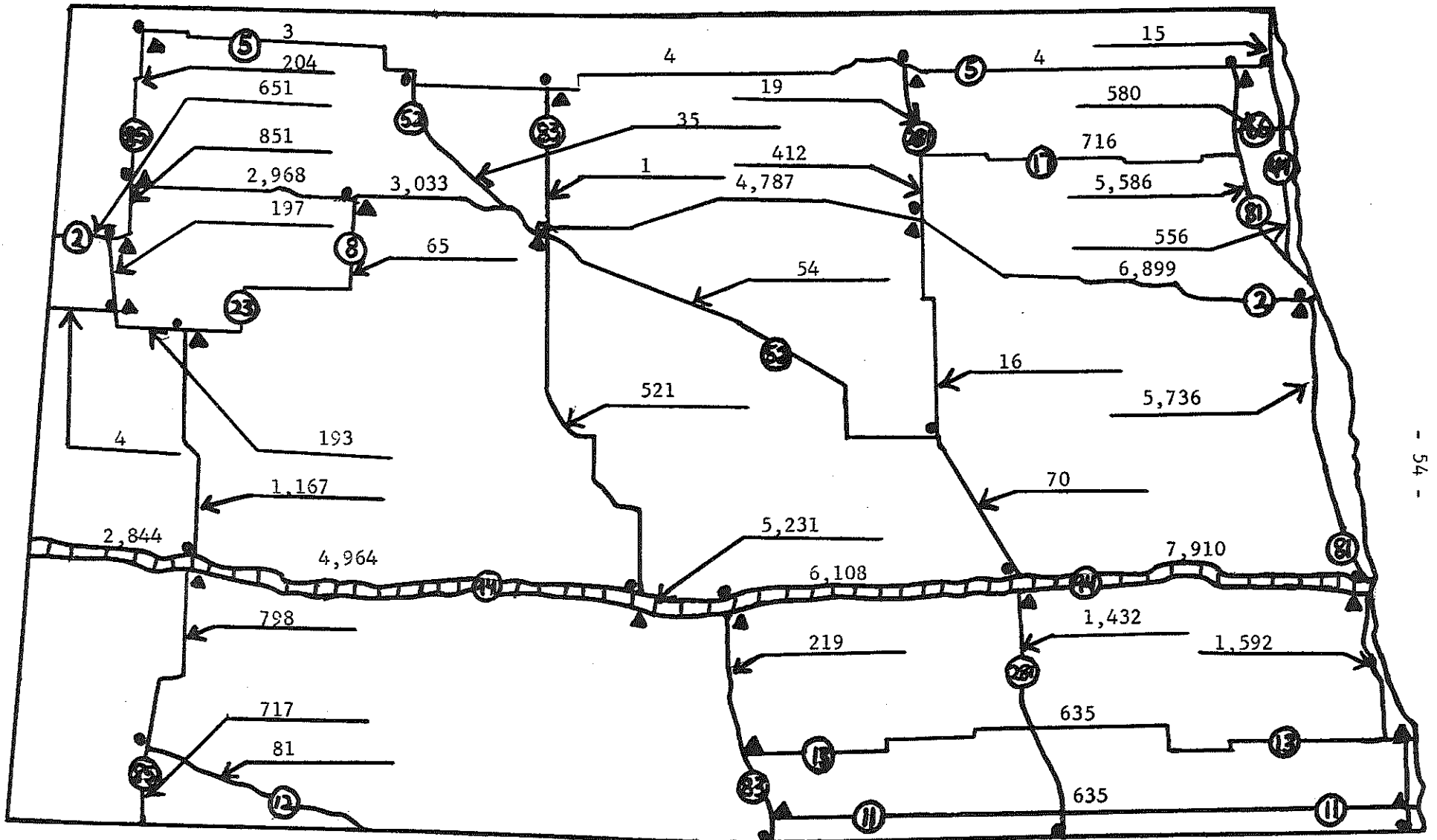


Figure 6. Value Added by Transportation (thousand dollars) of Agricultural Products Transported Over Various Sections of North Dakota Highways During 1969. Note: Triangles define section boundaries on east-west highways; dots define section boundaries on north-south highways.

Agricultural products valued at \$121,682,000 were transported over the extreme eastern section of Highway 94. This value comprises about 35 percent of the total value (\$345,750,992) of agricultural products transported by motor carrier in North Dakota during 1969.

The value of agricultural products transported over North Dakota highways varies due to the proportion of high-valued⁵¹ versus low-valued products shipped over these respective highways.

A large proportion of the total value of agricultural production was transported over those sections of Highways 81, 85, and 281 south of Highway 94 due to the large percentage of relatively high-valued livestock shipped over these routes. Agricultural products valued at \$86,956,000 were transported over those sections of Highways 81, 85, and 281 south of Highway 94. This value comprised about 25 percent of the total value (\$345,750,992) of agricultural products transported by motor carrier in North Dakota during 1969.

The proportion of the total value added by transportation of agricultural products in North Dakota during 1969 was largest over Highways 2 and 94 (Figure 6). About 48 percent (\$14,809,000) of the total value added by motor carrier transportation (\$30,590,511) consisted of the value added by transportation of those shipments which moved over the extreme eastern section of Highways 2 and 94.

The value added by transportation (revenue received by transporters of agricultural products) varies due to the proportion of relatively high-transportation-cost products versus low-transportation-cost products shipped over the various highways.

⁵¹ Livestock would be considered a high-valued product; potatoes a low-valued product.