AN ANALYSIS OF LIGHT-DENSITY RAIL LINES IN NORTH DAKOTA

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Disclaimer

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I. INTRODUCTION

North Dakota's economy is based primarily on agriculture and extractive industries. Railroads are generally the most efficient mode of transporting bulk commodities long distances to markets. In the absence of rail transport, North Dakota grains and oilseeds must move by truck. As Table 1 illustrates, truck costs per cwt-mile are typically higher than rail costs, even for branch-line origins[1]. Thus, the loss of rail transport may affect the long-run competitiveness of North Dakota shippers.

TABLE 1: Comparative Rail Branch-line and Trucking Cost per Cwt.

	Off-Branch Cost per Cwt	On-Branch Cost per Cwt	Total Cost per Cwt
BN	$0.34	$0.38	$0.72
BN/Local Railroad	$0.34	$0.29	$0.63
Soo Line	$0.43	$0.38	$0.80
Truck	--	--	$1.02

The branch-line network is an important component of the rail transportation system in North Dakota. As Table 2 depicts, 59 percent of the miles of railroad operated in North Dakota by the BN and the Soo Line consist of branch-line track. In addition, the

[1]The revenues and costs shown in Table 1 are generalized estimates that do not necessarily reflect the cost of any given branch line. The on-branch rail costs reflect single-car operations over a 43 mile branch line at 25 miles per hour at a density of roughly 20 cars per mile. Normalized maintenance and net liquidation value have been computed under representative FRA Class II operations in North Dakota, using the salvageable value of rails, ties, and other track materials typically found on light-density branch lines. For a detailed description of the rail costing process see: Tolliver (1989, Pub. 76); Tolliver, Dooley and Zink (1987, Staff Paper 85); and Tolliver and Lindamood (1989, Staff Paper 96). Rail revenues and off-branch costs are based on the average or typical commodity mix and market distribution patterns for North Dakota. Truck costs reflect the highway miles from each branch-line shipping point to final destination, including the empty return ratio. The truck unit costs are documented in Dooley, Bertram, and Wilson (1988).

branch-line network is still quite important in the transport of grains and oilseeds. During the period from 1985 to 1989, approximately 50 percent of the state's grain and oilseed shipments originated from branch-line stations[2].

TABLE 2: Class I Mainline and Branch-Line Track in North Dakota-1989.

	Miles of Railroad		
Railroad	**Branch**	**Main**	**Total**
BN[3]	1,223	1,126	2,349
Soo Line[4]	918	361	1,279
Total[5]	2,141	1,487	3,628

Potential Impacts of Railroad Rationalization

The state's light-density network is currently in transition. Since 1936, approximately 860 miles of track have been abandoned in North Dakota (Table 3). Another 940 miles of track have been sold or leased to regional and short-line operators[6].

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[2]Source: Unpublished North Dakota grain and oilseed shipment data.

[3]Source: BN Dakota Division.

[4]Source: Schedule SC-700, R-1 Annual Report, 1989.

[5]Total does not include track owned or operated by local or regional railroads.

[6]The BN sold approximately 660 miles of track to the Red River Valley & Western Railroad (RRV&W) in 1987. The Soo Line recently leased approximately 284 miles of track to the Dakota, Missouri Valley & Western Railroad.

TABLE 3: North Dakota Rail Line Abandonments				
CASE NO.	COMPANY	LINE	LENGTH	DATE
1045	MILW	Brampton to Cogswell	7.5	1936
A-193	GN	Walhalla to CN Border	5.3	1936
A-194	GN	St. John to CN Border	3.6	1936
----	GN	Clifford to Portland	10	1962
1449	MID-CONT	Clementsville to Edgeley	48.5	1970
1451	BN	Maxbass to Dunning	4.7	1972
1450	BN	Rutland to Ludden	30.2	1974
IRC 3	BN	Neche to Canadian Border	1	1976
IRC 8	BN	Blanchard to Mayville	10.1	1976
IRC 23	BN	Minnewauken to Brinsmade	7.5	1976
IRC 23 (SUB 1)	BN	Brinsmade to Leeds	9.9	1977
IRC 39	BN	Jamestown to Klose	5.9	1979
IRC 43	MILW	Fargo to SD Border	70.4	1980
IRC 50	MILW	Edgeley to SD Border	31.5	1980
IRC 56	MILW	Brampton to SD Border	4.5	1980
IRC 57	BN	Ellendale to Forbes	13.5	1980
IRC 62	BN	Devils Lake to Warwick	21.1	1980
IRC 63	BN	Joliette to Pembina	12.2	1980
IRC 73	BN	Fairview Jct. To Great Bend	8.8	1981
IRC 76	BN	Binford to McHenry	11.7	1981
IRC 77	BN	Newburg to Dunning	5.6	1981
IRC 82	MILW	New England to SD Border	123.8	1982
IRC 84	BN	Golva to MT border	7.4	1981
IRC 97	BN	Wolford to Dunseith	23.4	1982
IRC 100	BN	Casselton to Amenia	6.1	1982
IRC 101	BN	Rolla to St. John	7.2	1982

IRC 103	SOO	Wimbledon to Clementsville	9.3	1982
IRC 105	BN	Grand Forks to Honeyford	16.6	1983
IRC 106	BN	Edgeley to Streeter	39.4	1983
IRC 109	BN	Ludden Jct. To Ellendale	20.1	1984
IRC 110	BN	Beach to Golva	12.9	1984
IRC 111	BN	Truax to Truax Jct.	6.7	1984
IRC 113	BN	Regan to Wilton	11.5	1984
IRC 115	BN	Loraine to Sherwood	7.6	1984
IRC 116	BN	Zeeland to SD Border	6	1984
IRC 117	SOO	Egeland to Armourdale	19.6	1984
IRC 119	BN	Westhope to Antler	13	1985
IRC 120	BN	Hunter to Blanchard	10.5	1985
IRC 125	BN	Zap to Killdeer	40.9	1984
IRC 128	BN	Mandan to Mott	99.4	1986
IRC 132	SOO	Bismarck to Moffit	22.1	1986
IRC 135	SOO	Ashley to SD Border	16.3	1987
IRC 139	BN	Fargo to Horace	8.1	1988
IRC 140	BN	Rogers to Dazey	7.7	1988
		Total	859.1[7]	

Railroad rationalization is a process which affects both shippers and rural communities. The loss of rail service may generate a wide range of secondary economic, community, and highway impacts. In most instances, branch-line abandonment is not likely to cause the closure of elevators or other businesses, or result in the loss of non-rail jobs. However, because of higher average costs, truck rates are likely to be higher than

[7]Soo Line recently filed an application for abandonment for the Baker to Drake Line, which is 41 miles in length.

rail multiple-car and trainload rates in the long-run. The reduction in shippers' (consumers') surplus resulting from higher truck rates affects both the personal income of producers and the level of gross business volume. Furthermore, if rail traffic is diverted to truck as a result of abandonment, low-volume roads are typically impacted (in a negative fashion) by the incremental heavy truck traffic.

Recent studies have shown that the incremental motor fuel taxes and registration fees generated by heavy grain trucks on rural collectors and minor arterials fall well short of the incremental pavement damage occasioned by the traffic[8]. However, the problem is more complex than a simple revenue-cost comparison. There is no assurance that the incremental revenues will be returned to the impacted areas and used for the replacement of affected highways. State highway revenue allocation formulas are based on county and city populations, city size, and motor vehicle registrations[9]. These factors tend to work

[8]See: Tolliver (1989, UGPTI Pub. 75) and Tolliver and Lindamood (1989, UGPTI Paper 96).

[9]Highway funds are allocated by the state treasurer to the counties in the proportion that the number of motor vehicles registered in each county bears to the total motor vehicles registered in all counties in the state. The amount so allocated to each county is then distributed by the state treasurer 73 percent to the county for county highway purposes and 27 percent to the incorporated cities of that county for street purposes. Distribution to incorporated cities is made according to population as determined by the last regular or special United States census, or by state census for newly incorporated places. Provided, however, that in each county having a city with a population of 10,000 or more, the amount transferred each month into the county highway tax distribution fund shall be the difference between the amount allocated to that county and the total amount allocated and distributed to the incorporated cities in the county as computed according to the following formula: (1) The share to each city in the county having population of less than 1,000 shall be determined by multiplying the population of that city by the product of 1.50 times the statewide per capita average. (2) The share to each city in the county having a population of 1,000 to 4,999, inclusive, shall be determined by multiplying the population of that city by the product of 1.25 times the statewide per capita average. (3) The share to each city in the county having a population of 5,000 or more shall be determined by multiplying the population of that city by the statewide per capita average for all such cities.

against a cost-based allocation of the incremental revenues[10].

The diversion of branch-line grain traffic from rail to truck may also affect the viability of the carriers involved. As Table 2 illustrates, North Dakota's light-density branch lines comprise a substantial "feeder" network, which increases mainline traffic densities and system revenues. However, parts of the branch-line network may be marginal in nature. On some lines, the Class I carriers may not be recovering the long-run avoidable costs of operations and maintenance, or the opportunity costs of investment.

Objectives and Research Design

The last comprehensive North Dakota rail plan was developed in 1982. Since then, the characteristics and ownership of many of the state's branch lines have changed. The purpose of this study is to develop current information and trend data for North Dakota branch lines, and to discuss some of the issues and problems concerning branch-line preservation.

The design of the study and some of the major factors are highlighted below.

Research Design

The viability and future of North Dakota's light-density network (and specific rail lines) are impacted by a set of factors, including:

1. The system-wide performance, productivity, and financial position of the individual carriers serving the state,
2. State economic and production patterns and trends,
3. Total state-wide freight traffic volumes and trends,
4. Modal shares,

[10]In fact, it could be argued that in many instances, none of the incremental revenues will be returned to the impacted areas to mitigate the incremental pavement damage.

5. Individual line operating characteristics and density trends.

This set of factors is addressed in the study through three different levels of data collection and analysis: (1) carrier-wide (system), (2) state-wide, and (3) line specific. The first part of the study focuses on the system performance and productivity of the major Class I carriers serving North Dakota. The purpose of this initial portion of the analysis is to highlight trends in railroad size, density, efficiency, and financial performance over time. The trends will be used to evaluate each individual railroad's productivity and network characteristics, and to assess the efficiency of each carrier's operations. Also, as part of the carrier-wide analysis, performance factors and network characteristics of the BN and the Soo Line will be compared to western region averages.[11] The purpose of the railroad-to-region comparison is to identify positive (or negative) variances in efficiency and operating productivity.

In the second stage of the analysis, state-wide trends in grain production and freight traffic are examined. The purpose of this portion of the analysis is to highlight background factors which may affect overall branch-line viability and carrier operations in the state.

The third part of the study focuses on individual branch lines. In this section of the report, trends in overall line density, grain carloadings, and modal share are examined for each grain-dependent branch line in the state. Since these data are proprietary and confidential in nature, they are presented in a separate appendix.

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[11]The western region average is calculated from the following railroads: Atchison, Topeka and Santa Fe; Burlington Northern; Chicago and Northwestern; Denver and Rio Grand Western; Kansas City Southern; Missouri-Kansas-Texas; Soo Line; Southern Pacific; Union Pacific.

Scope

With few exceptions, North Dakota's branch-line system is grain-dependent. A grain-dependent line is one on which the predominant outbound traffic volume consists of grains and oilseeds, and the primary inbound commodities are farm implements and fertilizers.

A few branch lines in North Dakota have significant coal or other non-grain traffic which support the lines. These lines (such as the Knife River Spur) will not be analyzed in this report. Similarly, the mainlines of the BN will not be considered. The viability of the BN mainlines depends primarily on overhead traffic. Since the primary focus in rail planning and rationalization is on the light-density network, most of the resources in this project have been directed towards the branch-line network.

II. RAILROAD PERFORMANCE AND SYSTEM PRODUCTIVITY ANALYSIS

In this section of the report, a series of performance and financial indicators are graphed and analyzed for the BN and the Soo Line over time (from 1979 to 1988). The set of indicators includes: (1) network factors, (2) commodity mix, (3) maintenance and train operating variables, and (4) financial ratios.

The network factors consist of:

1. Size (miles of railroad)
2. Average length of haul
3. Revenue freight traffic density
4. Revenue per ton-mile.

Collectively, these factors describe the primary network effects which impact efficiency and financial viability.

The financial viability and system efficiency of the BN and the Soo Line can impact North Dakota rail services over time. Poor cash flow and high-cost operations may result in the need for further rationalization or downsizing of rail systems. In the case of the Soo Line, a major restructuring process is currently underway to reduce or eliminate high cost operations.

In the commodity portion of the analysis, both the present mix of the carrier's traffic base and trends in major commodities over time (such as coal and grain) are presented. After the commodity analysis, track maintenance indicators are evaluated by examining cross-tie and rail replacement factors for each carrier. Train operating efficiency is then assessed by examining trends in net ton-miles of freight traffic per train-mile of operation.

The set of financial indicators includes:

1. Operating ratio ($\frac{OE}{R}$)
2. Net Railway Operating Income (NROI)
3. Return on Investment (ROI) in Transportation Properties.

The operating ratio is the ratio of operating expenses to revenues. Lower ratios imply more efficient operations, higher profits, and increased working capital. Net railway operating income represents the margin of operating revenues over expenses, while ROI is the ratio of net income to depreciated book investment in transportation properties. This measure of ROI, it should be noted, does not necessarily relate to the ICC's revenue adequacy determinations, which involve relationships between the ICC's computed ROI and the current railroad cost of capital. However, upwards trends in transportation ROI, as computed in this study, indicate movement towards revenue adequacy. Table 4 shows the operating ratio and return on investment for all railroads in the U.S. from 1980 through 1988. These figures should give a good baseline for comparison to individual railroads.

Table 4: Operating Ratio and Return on Investment for All U.S. Railroads		
Year	**Operating Ratio**	**ROI (%)**
1980	.93	4.22
1981	.93	3.98
1982	.96	2.11
1983	.90	4.29
1984	.88	5.70
1985	.91	4.58
1986	.95	1.30
1987	.90	4.75
1988	.89	6.73

In the following sections of the report, the carrier-wide performance measures are presented for the BN, followed by similar indices for the Soo Line. The primary sources of the data are the carriers' R-1 reports and MOODY'S TRANSPORTATION MANUAL.

Trends in BN Network Factors and Characteristics

As Figure 1 depicts, the average miles of railroad operated by the BN increased from 22,711 in 1979 to an all-time high of 28,937 in 1982 (subsequent to the St. Louis-San Francisco merger). However, due to line abandonments and branch-line sales, BN's system has been shrinking ever since. In 1988, the Burlington Northern operated 23,392 miles of railroad, only 681 more than in 1979.

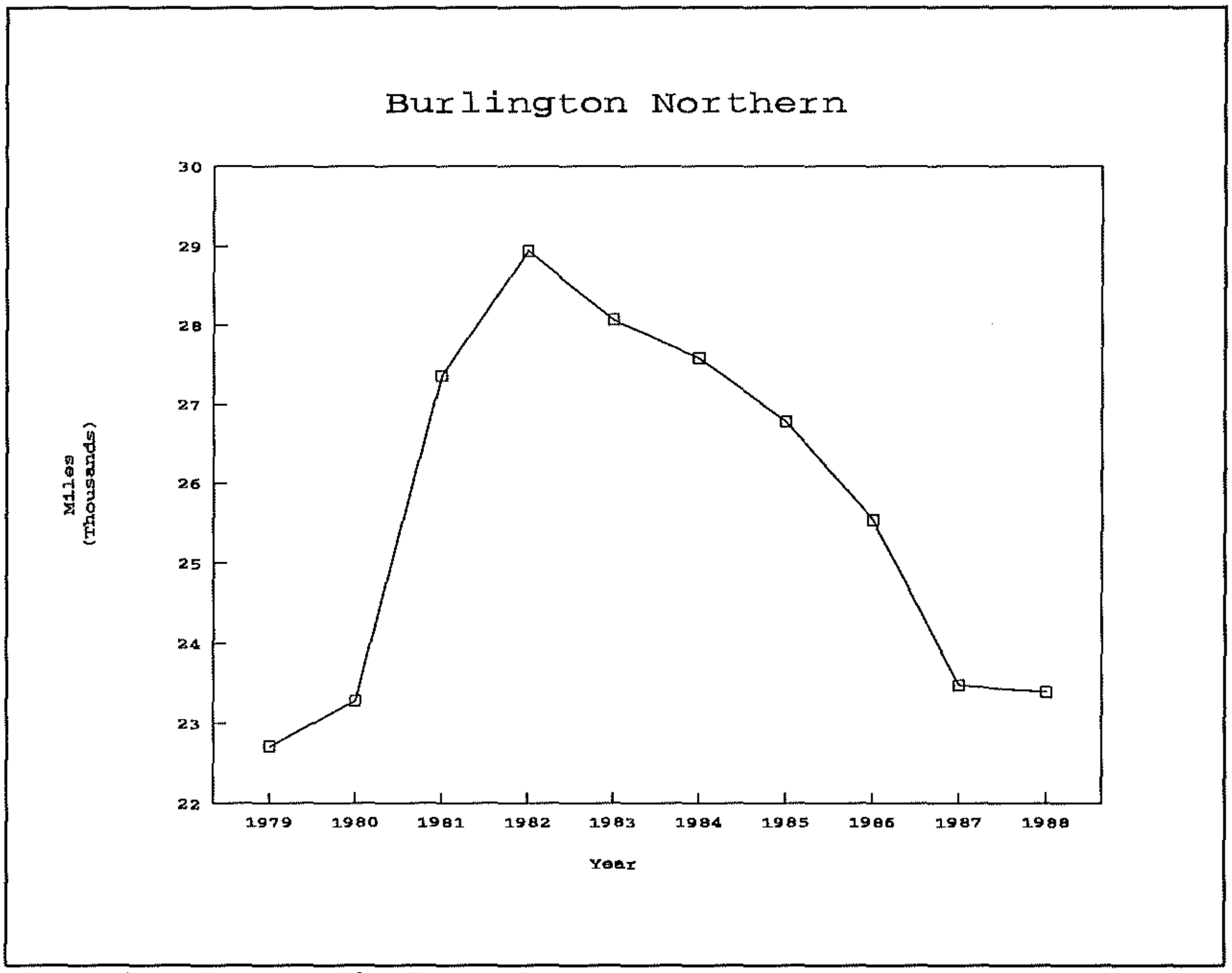

Figure 1: Average Miles Operated

While the BN has been downsizing its network, the average length of haul has been increasing. As Figure 2 shows, in 1979 the Burlington Northern's average length of haul (ALH) was 641 miles. BN's ALH peaked in 1987 (at 770 miles), and declined slightly to 761 miles in 1988. But nevertheless, this represents a positive trend in operating efficiency.

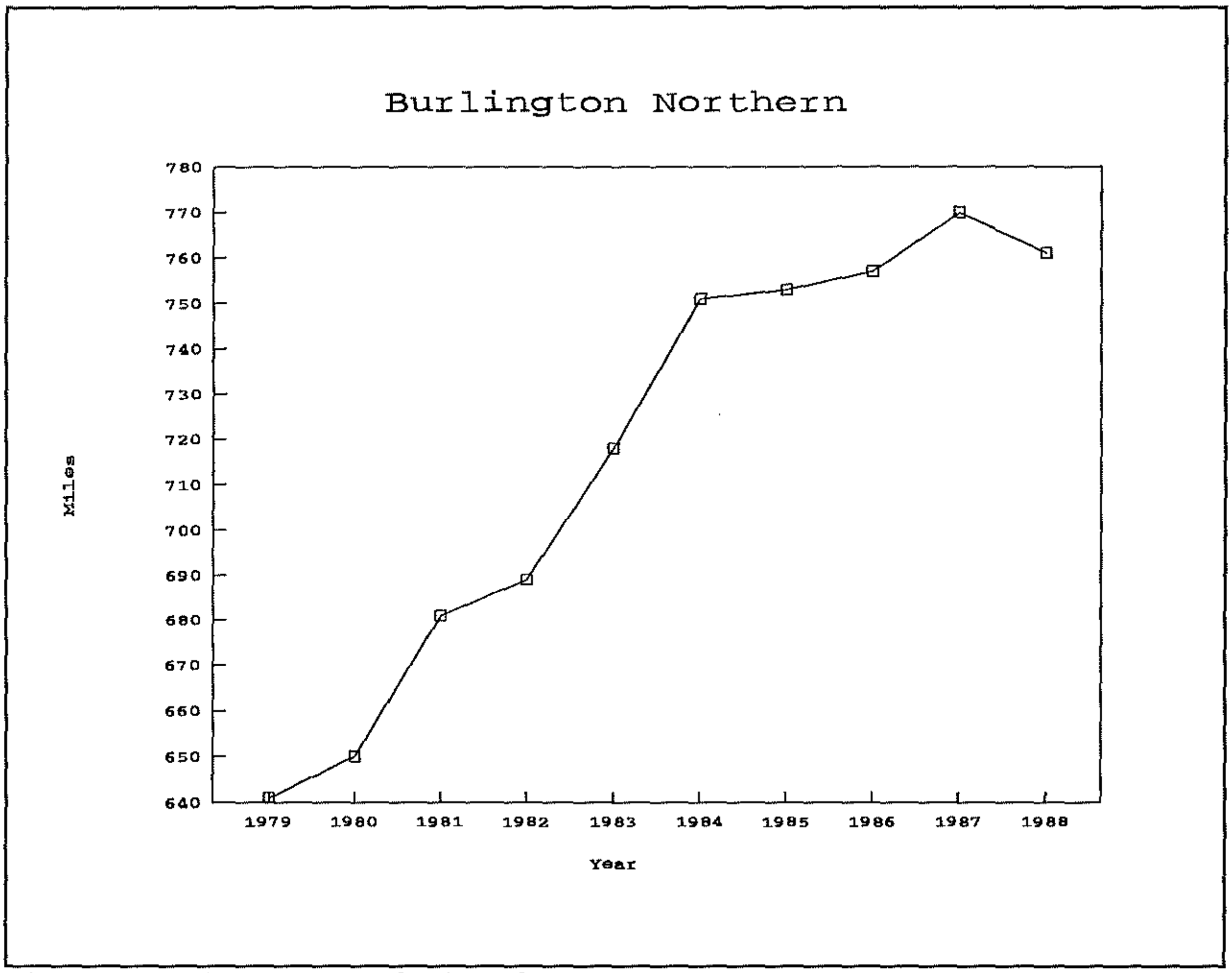

Figure 2: Average Length of Haul

ALH is important for two reasons. First, longer hauls generally result in lower costs per ton-mile. On longer hauls, fixed terminal costs at origin and destination become relatively less important, as they are spread over more revenue-generating ton-miles. Also, longer hauls generally result in longer, more efficient through and unit train operations. Second, ALH is important from a revenue-division perspective. Longer hauls generally imply a greater share of the line-haul revenues generated from joint or through rates.

Revenue freight traffic density (net ton-miles per mile of railroad) is perhaps the most important network effect in the short-run when the size of the carrier's network is relatively fixed. Increasing traffic on a fixed network typically results in economies of utilization in high fixed-cost assets, and therefore, in lower average costs per carload[12]. Marginal costs per carload decrease in many instances, as well[13].

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[12] Whether short-run average costs are decreasing or rising depends primarily on the relationships between network capacity and traffic levels. As output increases for a fixed network, capacity constraints, congestions, delays, lack of maintenance windows, and other factors will eventually result in increasing average cost per carload.

[13]Marginal costs per carload may decrease due to efficiencies resulting from repetition and increased traffic. As rail volume increases, rail workers, rail management, and rail maintenance workers become more proficient at their jobs. As a result, the cost of an extra carload decreases. This occurs until congestion, delays, and other factors cause marginal costs per carload to increase.

As Figure 3 shows, the Burlington Northern's revenue freight traffic density increased substantially during the last decade. In 1979, the BN generated 5.518 million revenue freight ton miles per mile of railroad. In contrast, subsequent to the Frisco merger and several branch-line sales, BN's revenue density reached an all-time high of 8.748 million in 1988.

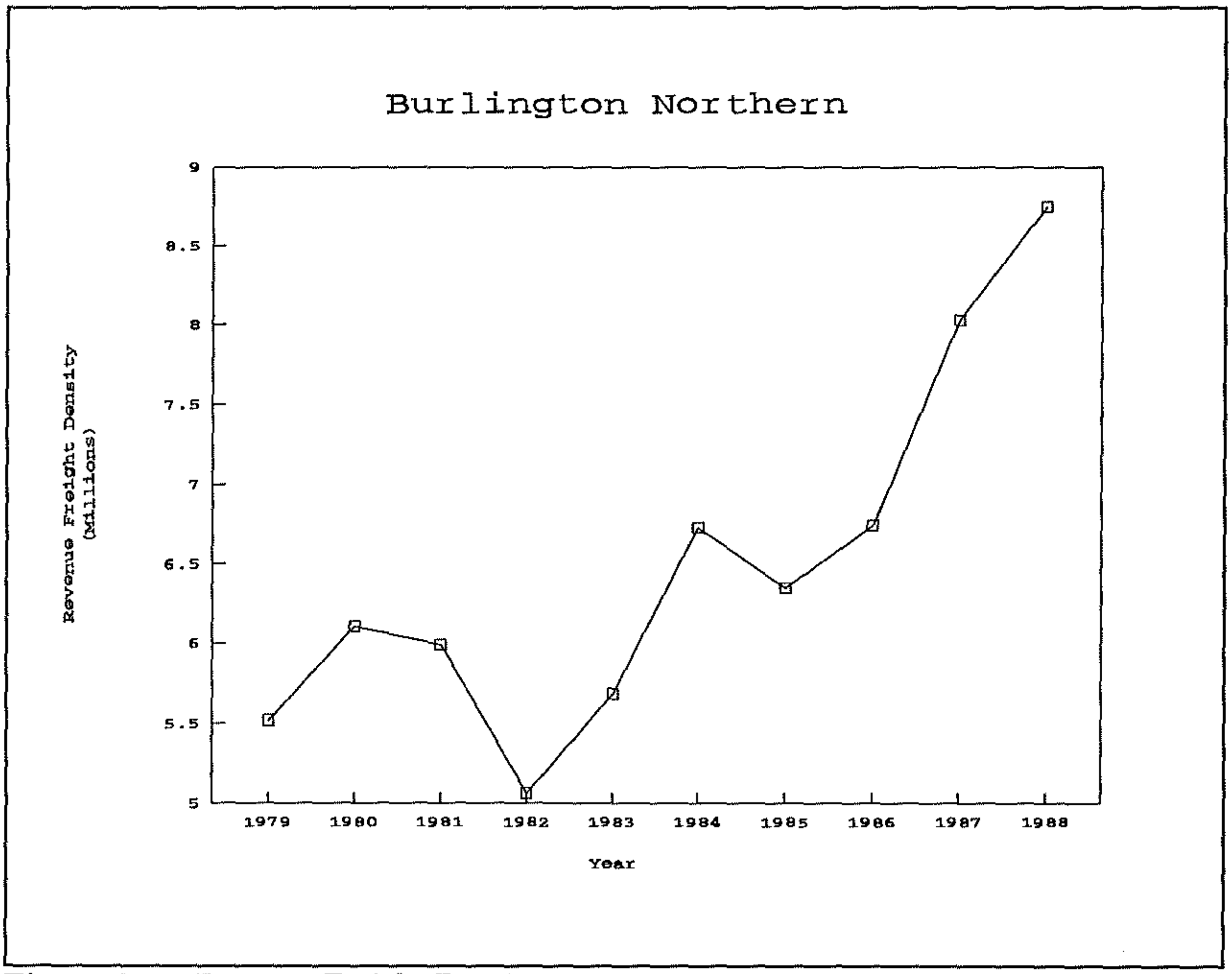

Figure 3: Revenue Freight Density

Revenue per ton-mile (RTM) is partly a function of the ALH. But it is also a function of the commodity mix, which will be discussed later. As Figure 4 shows, whereas the BN's traffic density and length of haul have been increasing, the average revenue per ton-mile has been decreasing. BN's real average revenue per ton-mile[14] was 2.7 cents in 1979, prior to the passage of the Staggers Rail Act. Since then, BN's RTM has steadily decreased to a level of 1.7 cents in 1988. This decline is partly a function of market competition, partly a function of increased length of haul, and partly a reflection of productivity gains which have lead to rate reductions.

[14] The railroad cost recovery index (1982 dollars) is used to adjust average revenue per ton per mile for inflation.

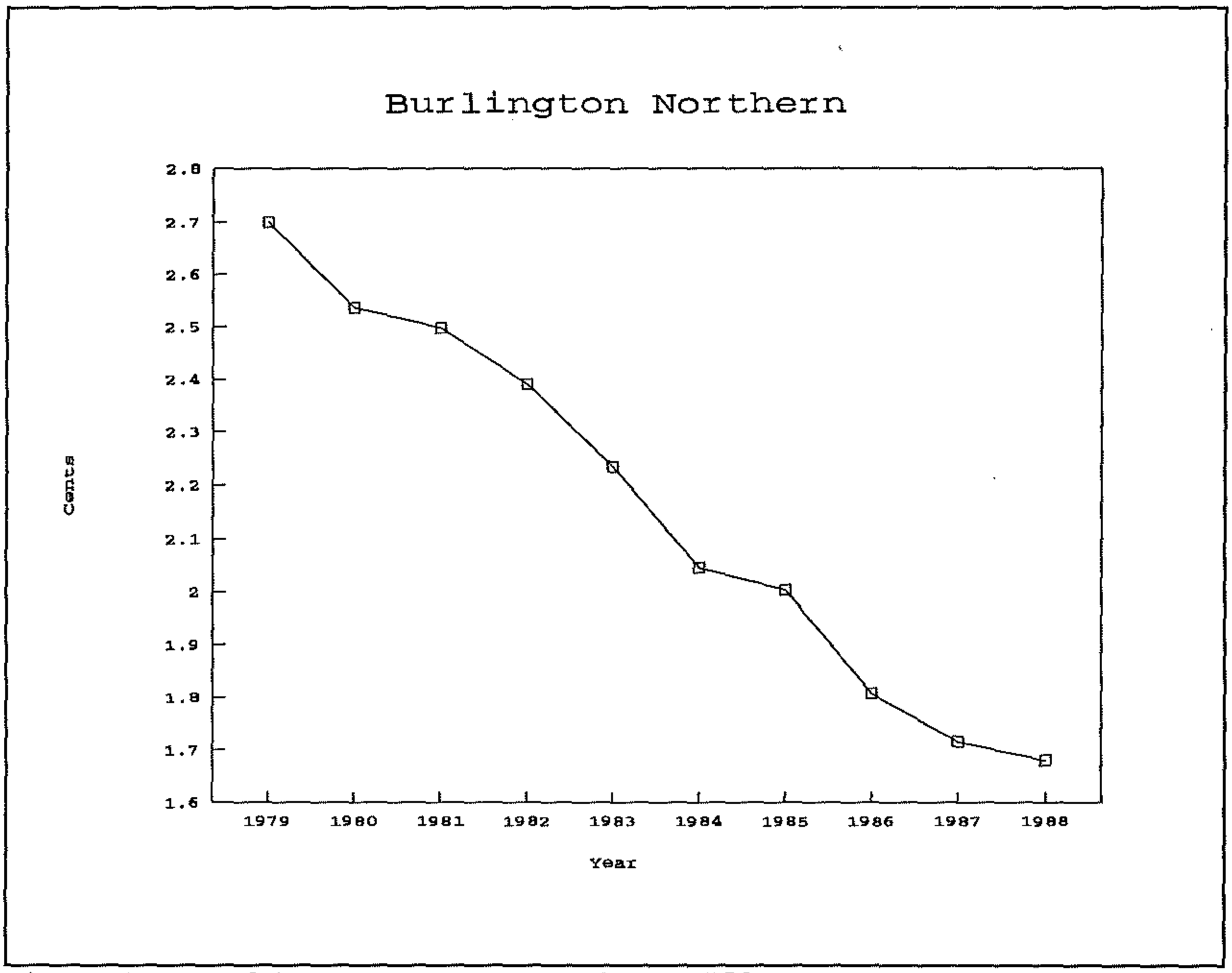

Figure 4: Real Average Revenues Per Ton Per Mile

BN's Commodity Mix

The commodity mix of a carrier can impact its operating cost, length of haul, and revenues. Because of volume and length of haul, coal traffic is of particular importance to western carriers. Like many railroads, the Burlington Northern relies heavily on coal transport. Approximately 48.9 percent of BN's total tonnage in 1988 was attributable to coal (Figure 5). Farm products, which consist mostly of grains and oilseeds, also comprise a significant portion of BN's tonnage (14.3%, the largest in the country). Containerized traffic, metallic ores, food and kindred products, lumber and wood products, and non-metallic materials constitute much of the remainder of BN's traffic base.

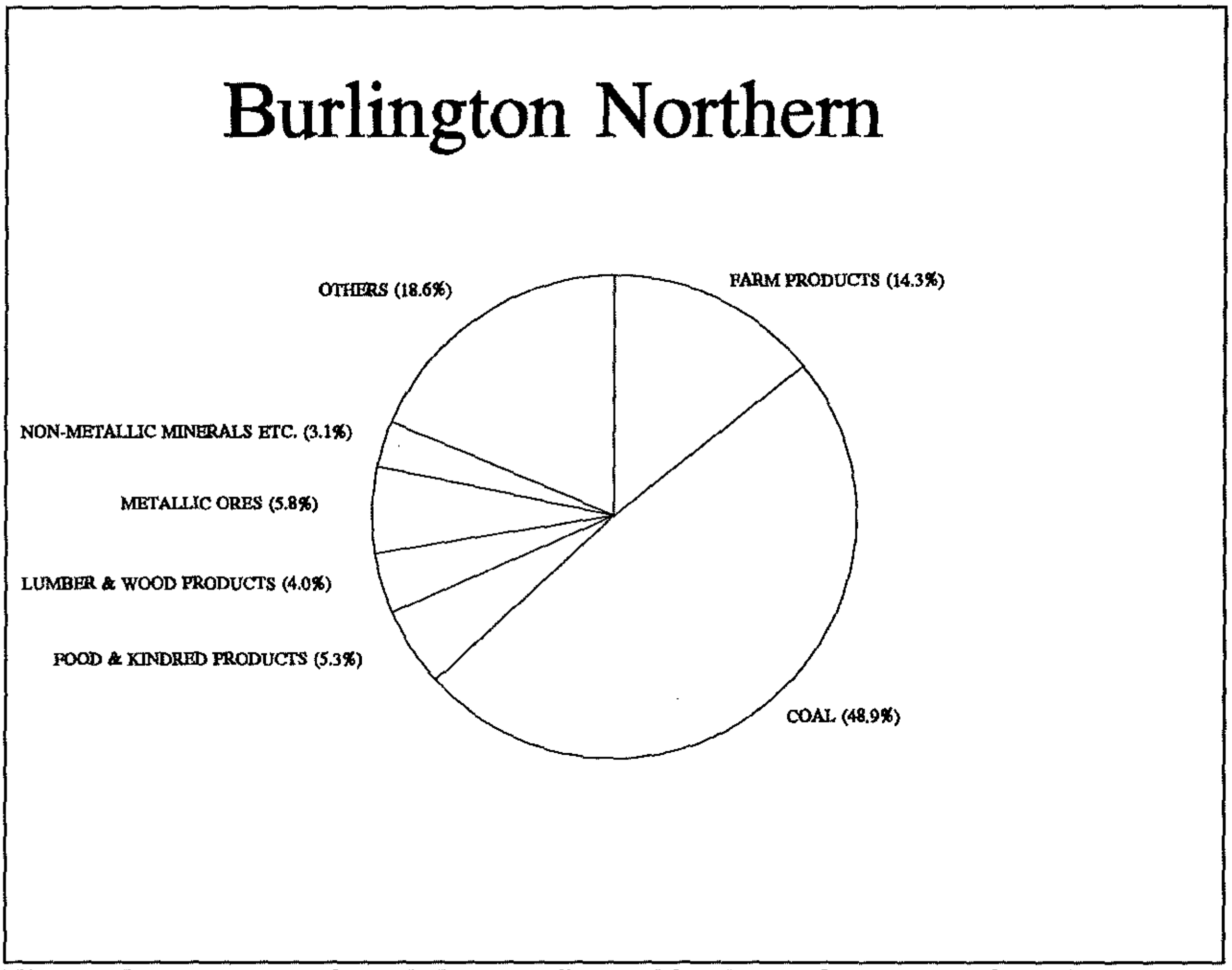

Figure 5: Percent of Total Tonnage Shipped by the Burlington Northern in 1988

Trends in bulk commodity tonnage (particularly coal and farm products) can be important indicators of shifts in a railroad's future traffic base. The importance of farm products to the BN (as a percentage of total tons shipped) has risen during the 1980's (Figure 6). In 1979, 11.7 percent of total BN tonnage was due to movements of farm products. However, by 1983 the percentage had risen to 14.2, and (with the exception of 1985) has remained relatively constant since then.

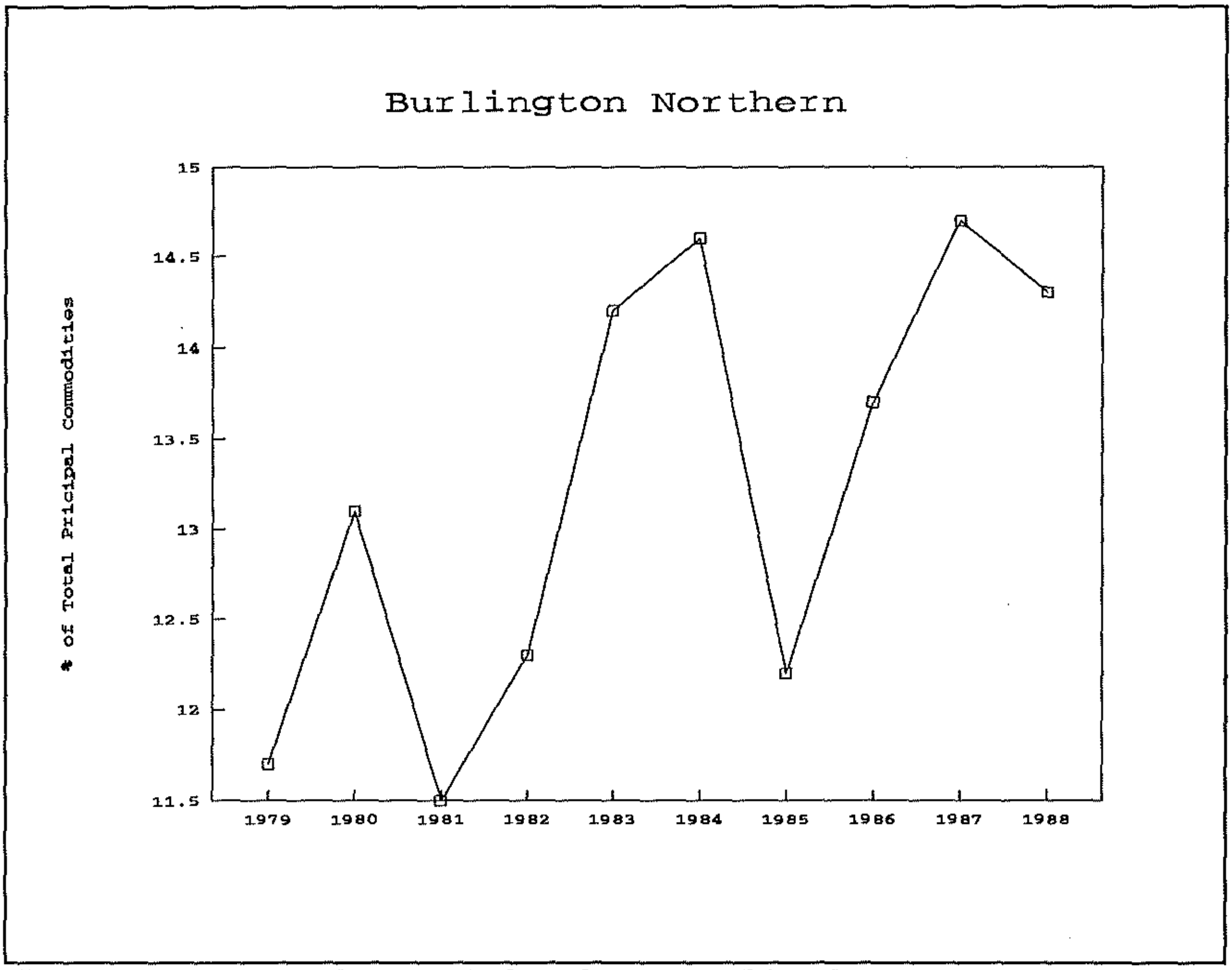

Figure 6: Farm Products as % of Total Tonnage Shipped

Despite fluctuations in export and domestic demand, coal continues to dominate total tonnage shipped by the Burlington Northern (Figure 7). The percent of total BN tonnage that consists of coal traffic rose from 43.2 percent in 1979 to a high of 55.0 percent in 1985. Although coal traffic has since declined to less than 50 percent of BN's traffic base, it still remains the dominant commodity handled by the BN.

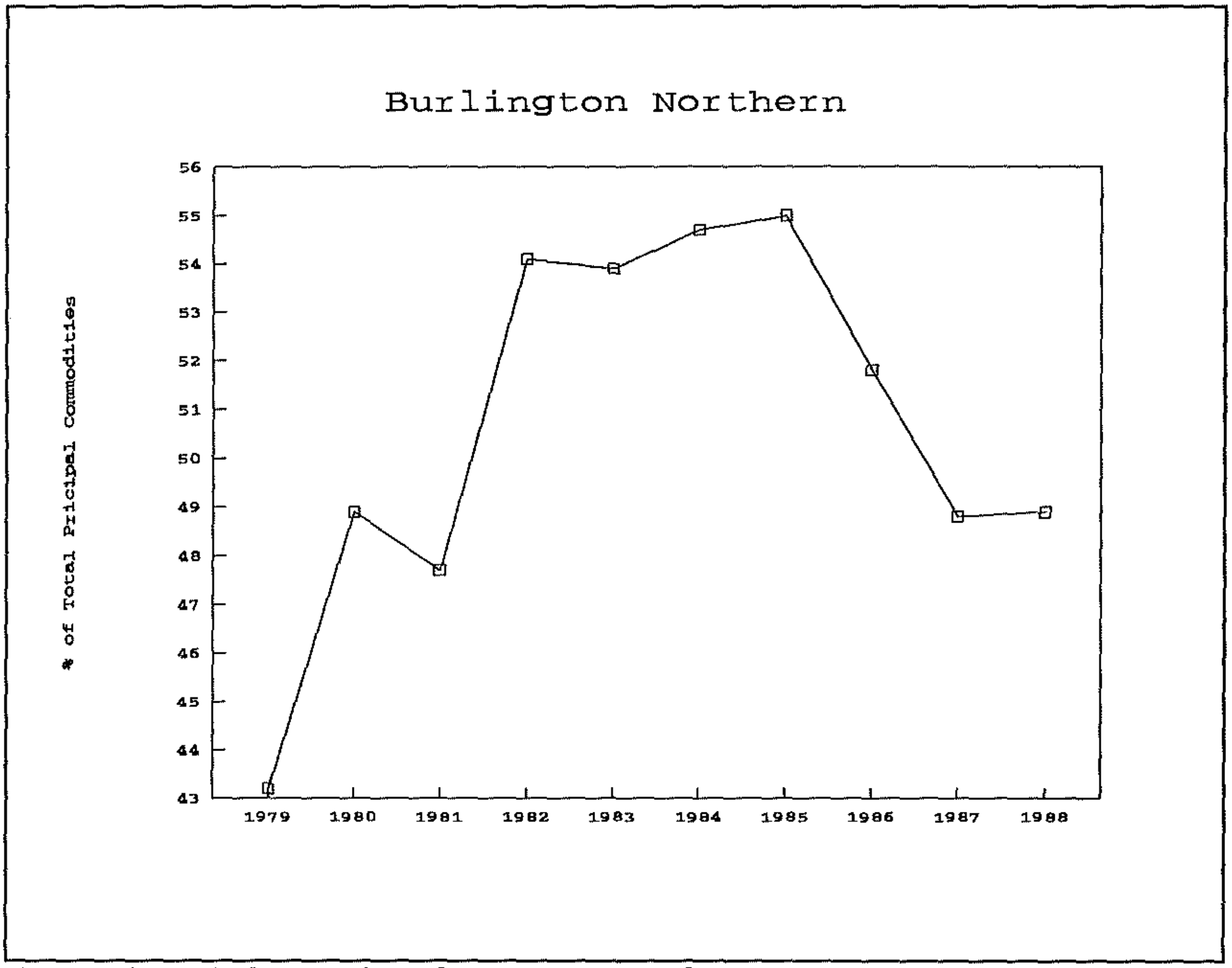

Figure 7: Coal as % of Total Tonnage Shipped

While coal and farm products have been increasing as components of BN's commodity mix, food and kindred products, lumber, and metallic ores have been decreasing in significance. As Figure 8 shows, the percentage of the BN's total tonnage which is due to food and kindred products has declined in recent years. In 1979, 6.7 percent of total tonnage was attributable to food and kindred products. However, this percentage declined to a low of 4.4 in 1984 before rebounding slightly to 5.3 percent in 1988.

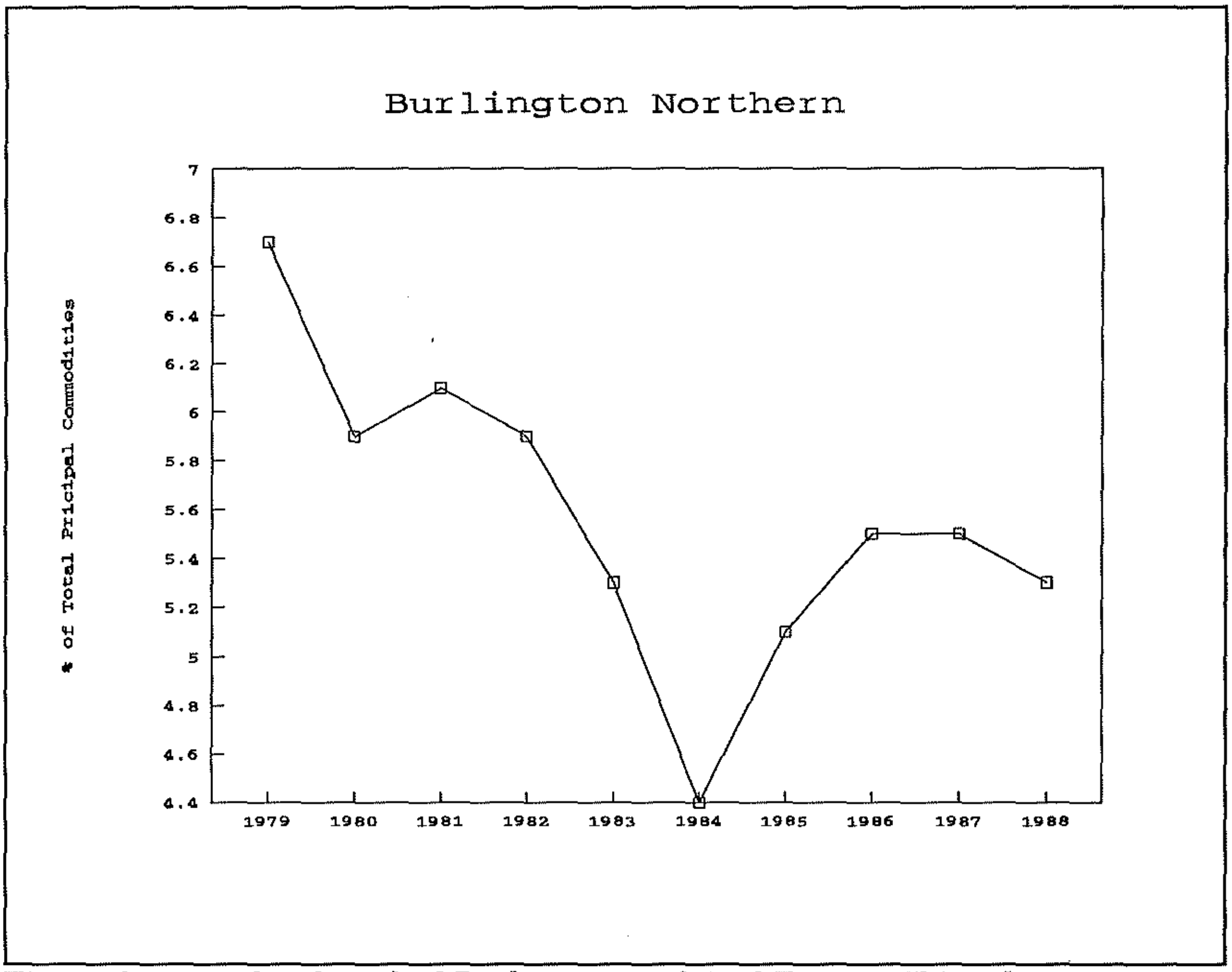

Figure 8: Food and Kindred Products as % of Total Tonnage Shipped

The decline in lumber and wood products has followed a pattern similar to that of food and kindred products (Figure 9). Shipments of lumber and wood fell from a high of 6.6 percent of total tonnage in 1979 to a low of 3.6 percent in 1984. Although lumber and wood products have rebounded slightly, they still constitute less than 4.0 percent of BN's tonnage.

In summary, BN's traffic mix appears to be shifting even more in the direction of coal and farm products, and away from lumber and traditional metallic ores. This is partly a function of broader changes in the economy. The significance of these shifts is that they underscore the importance of coal and grain traffic to viability of the Burlington

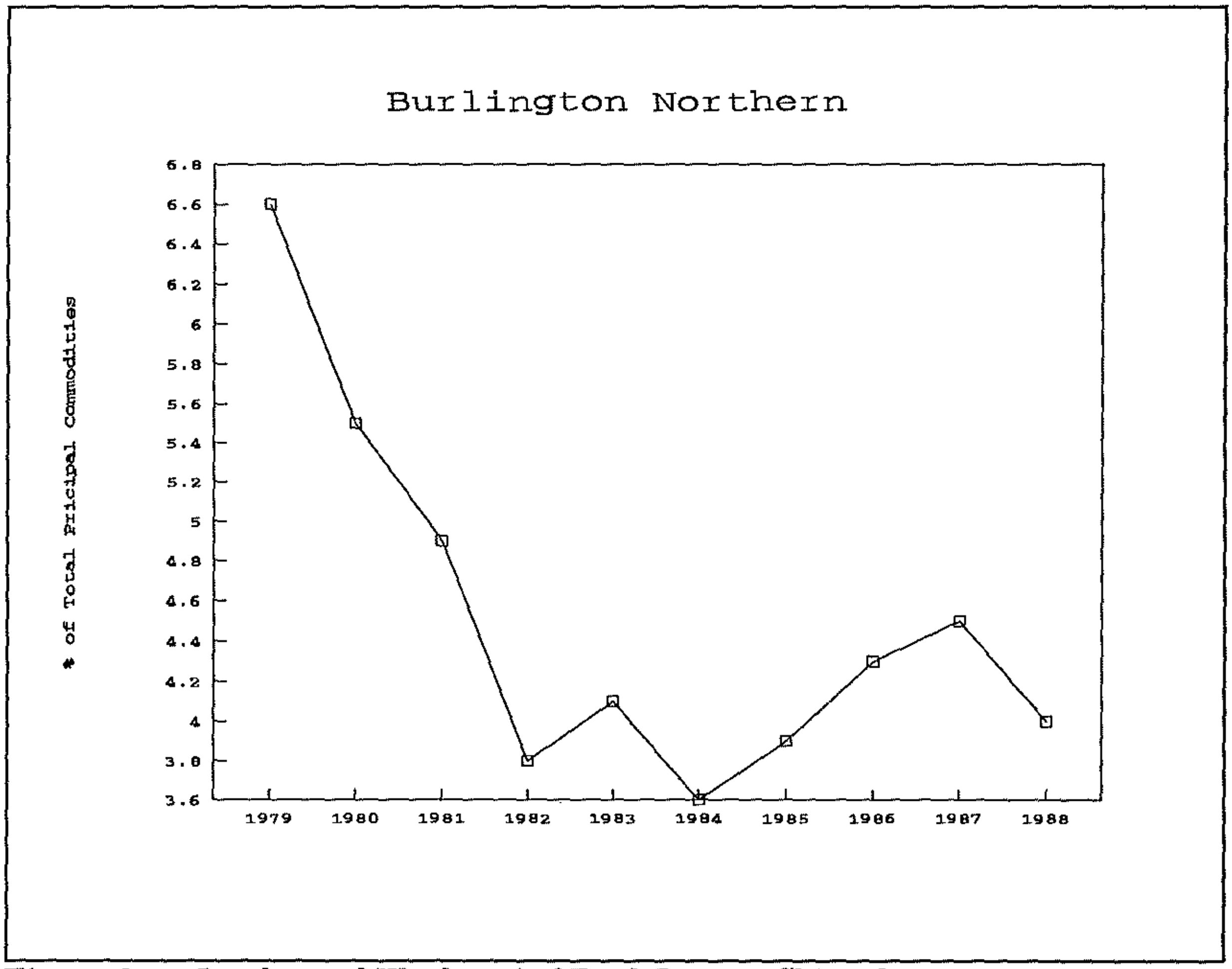

Figure 9: Lumber and Wood as % of Total Tonnage Shipped

Northern Railroad. Significant shifts in domestic or global markets that affect grain or coal flows could indirectly impact the financial viability of the BN.

Trends in BN Track Maintenance

Track maintenance is an important indicator of the performance and future viability of a carrier's network. Normalized maintenance implies economical and safe operations. Deferred maintenance may imply the opposite[15].

[15]This analysis is not aimed at finding specific periods deferred maintenance by any carrier. It merely looks at trends in track maintenance, and possible explanations for these trends, including deferred maintenance.

Trends in two indicators of track maintenance are reviewed in this report: (1) cross ties replaced per equated track mile, and (2) miles of rail laid in replacement or line extensions per equated track mile.

As Figure 10 depicts, cross-tie maintenance by the Burlington Northern has fluctuated considerably through time, but has decreased overall in recent years. In 1979, the BN replaced 105 cross ties per equated track mile. Tie replacement reached a high for the period of 156 cross ties per equated track mile in 1983, but subsequently declined to a period low of 55 cross ties per mile in 1987. This may reflect deferred maintenance on branch lines.[16]

As Figure 10 shows, the number of cross ties replaced per equated track mile has increased marginally in 1988. However, the 1988 level of 74 cross ties per mile is still the second lowest level of maintenance performed during the 1979-88 time period.

Whether programmatic BN cross-tie replacement will return track maintenance to its pre-1980 level is unclear from the trend lines. The trend from 1982 to 1987 is especially disturbing, but may be due in part to depressed earnings and modern tie life extension methods. Thus, with increased earnings track maintenance may or may not be accelerated.

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[16]Extreme caution must be taken in interpreting this trend, because it could reflect extended tie life due to modern tie life extension methods. These include the use of plugging compounds and decay preventatives. Also, the statistics are not separated out for concrete and wood ties.

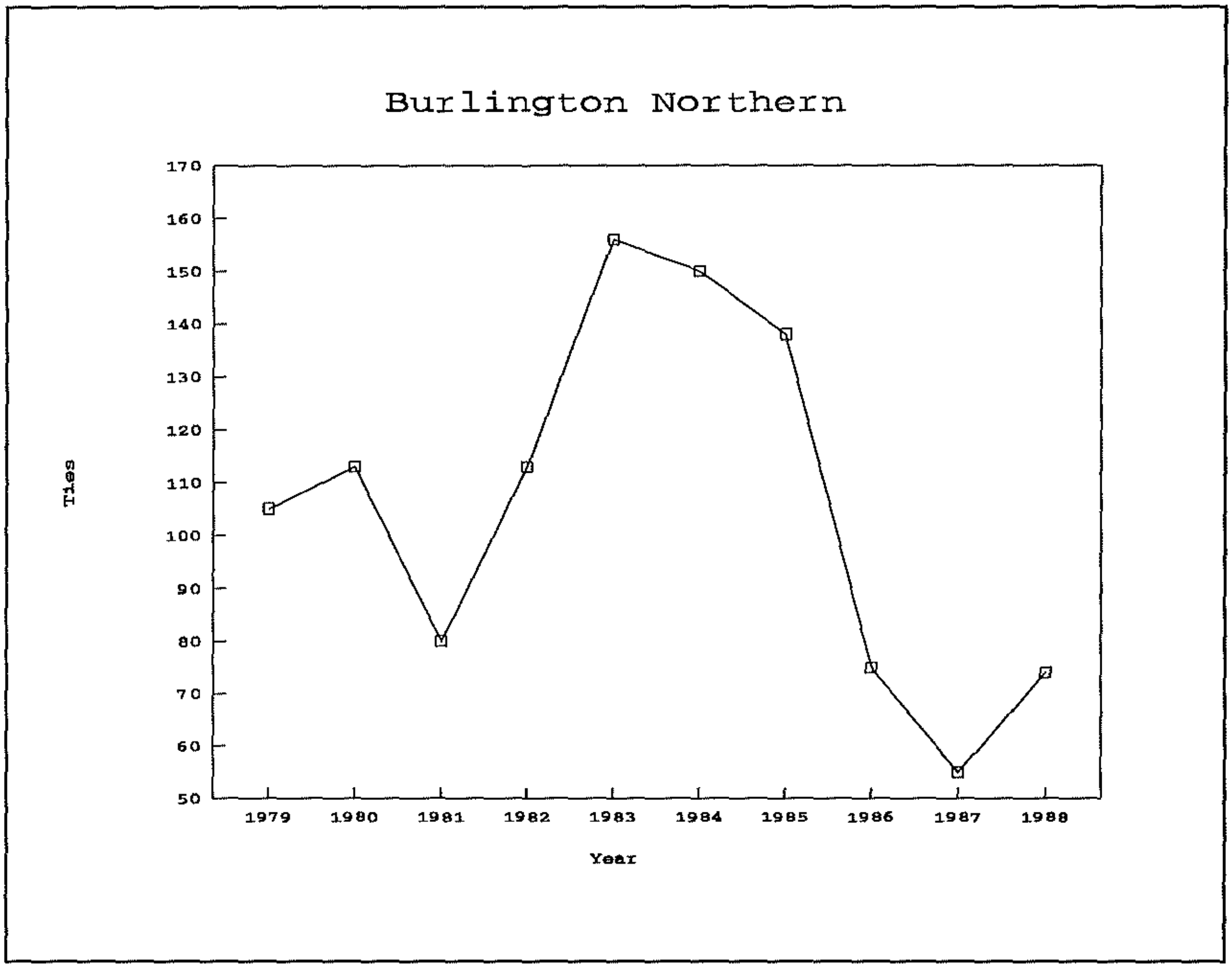

Figure 10: Cross Ties Replaced Per Equated Track Mile

The pattern of rail replacement by the Burlington Northern also shows rail maintenance to be declining in recent years (Figure 11). In 1979, the ratio of miles of rail replaced to equated track miles was .095. However, this factor decreased to a period low of .028 in 1987. In 1988, the track replacement ratio rebounded to .04. However, the 1988 level is still much lower than the pre-1980 level.[17]

[17]However, this may represent improvements in rail preservation methods since 1980. Extensive rail grinding is now used, extending the rail life from pre-1980 levels of 700 million gross ton-miles to current levels of 1.5 billion gross ton-miles (Burlington Northern).

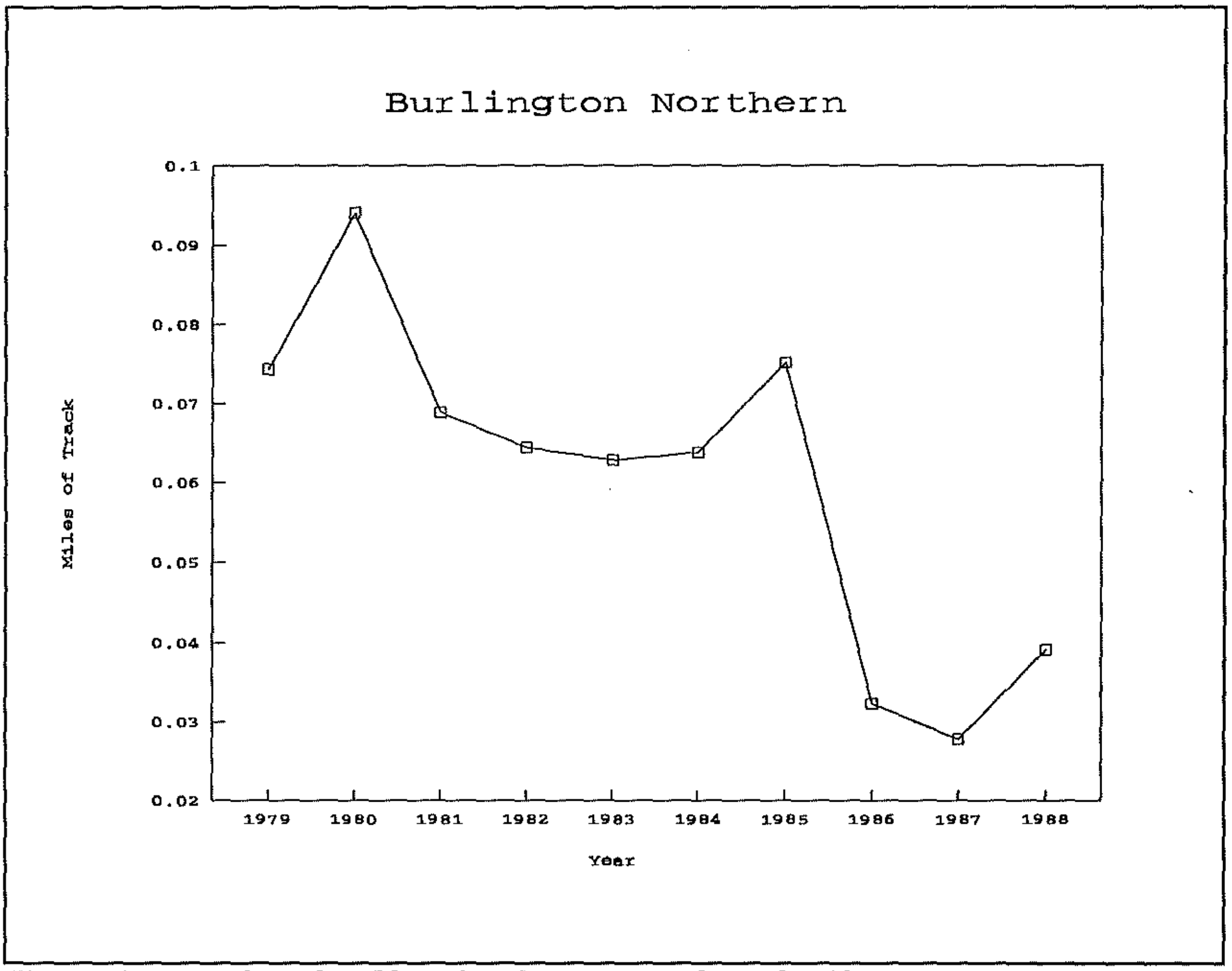

Figure 11: Rail Laid - Miles of Rail per Equated Track Mile

BN Trends in Train Operating Efficiency[18]

Revenue net ton-miles are the basic revenue-generating output measure in the railroad industry. The number of train-miles required to handle the revenue traffic is one measure of the efficiency of train operations. Generally, higher ratios of net ton-miles to train-miles imply longer freight trains and better utilization of fixed train capacity in

[18]These trends are analyzed for all train operations. Because there are three different types of train shipments (unit, way, and through), caution should be used in interpreting these trends.

mainline corridors. Conversely, lower ratios and downward trends imply poorer utilization of mainline corridor train capacity and/or shorter trains.

As Figure 12 shows, train operating efficiency has increased on the BN from 2,558 net ton-miles per train-mile (NTMTM) in 1979 to 3,159 in 1988, indicating improving train utilization and efficiency. After reaching a high of 3,213 NTMTM in 1984, and decreasing to a level of 2,967 in 1986, BN train efficiency has exhibited a relatively constant upward trend. It is likely that part of this increase in utilization and efficiency is the result of the increased use of unit trains since 1980.

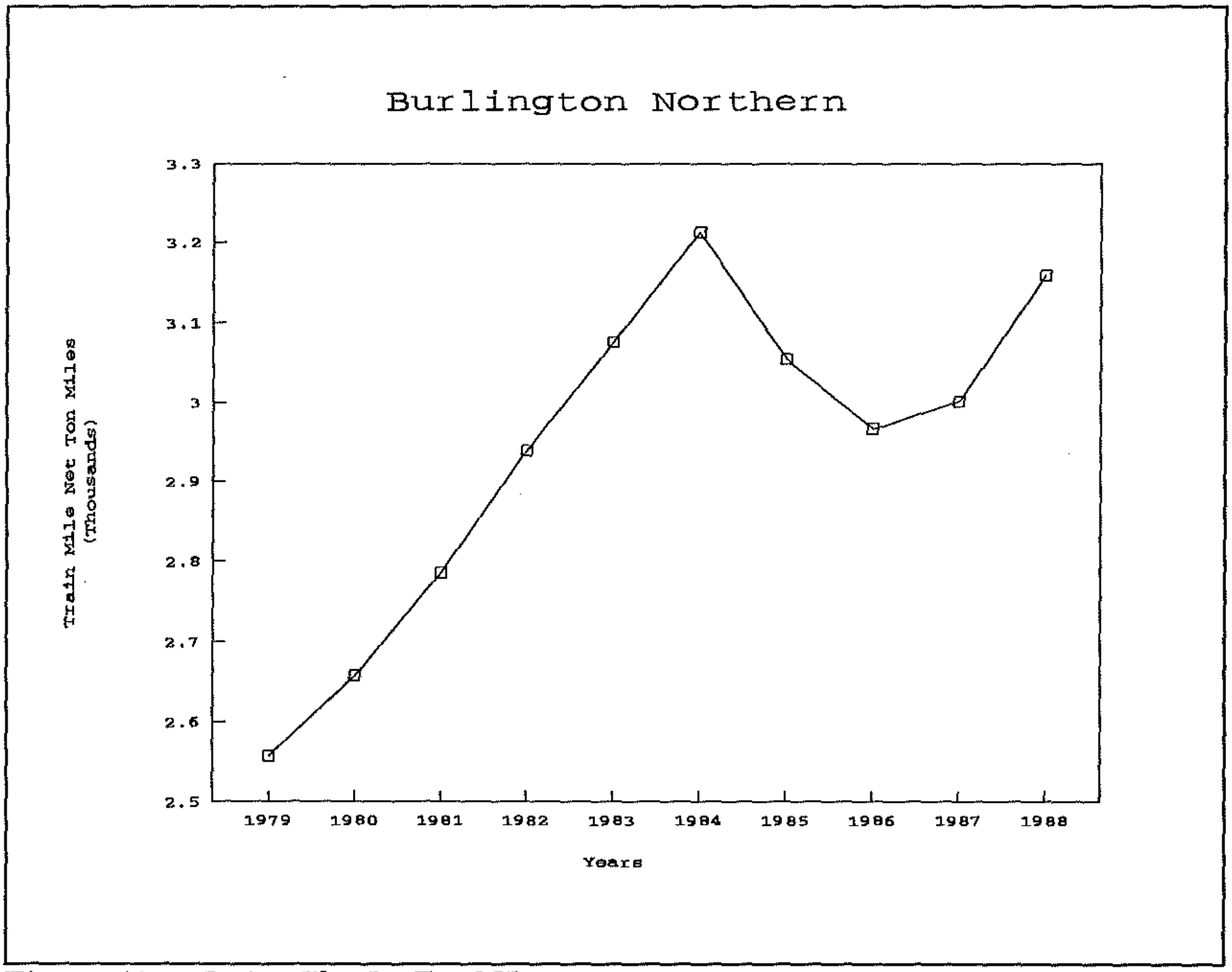

Figure 12: Train Mile Net Ton Miles

The increase in train operating performance between 1979 and 1983 may be explained in part by the BN-Frisco and the BN-Colorado Southern (CS) mergers. However, subsequent line sales and abandonments may also be responsible. In the aggregate, the BN has gained some high-density routes while losing some low-density ones.

Trends in BN Financial Indicators

The significance of the railroad operating ratio and ROI were discussed previously. Figure 13 shows how BN's freight operating ratio has changed since 1979. In 1979, the

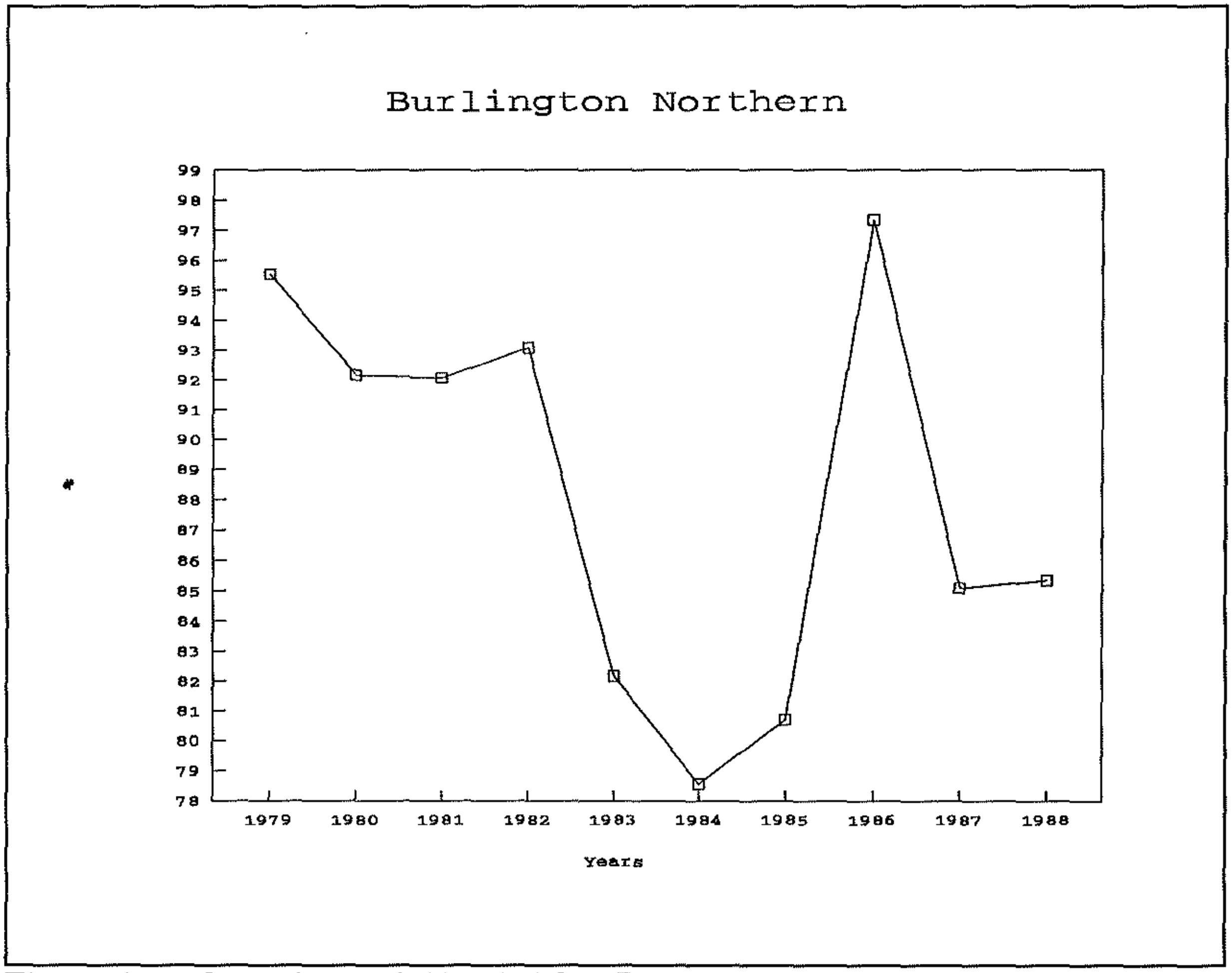

Figure 13: Operating Ratio For Freight - Percent

Burlington Northern had an operating ratio of 95.53 percent, which was clearly out of the desirable range. In fact, BN's 1979 operating ratio was as high if not higher than many efficient motor carriers. Subsequent to the Frisco and CS mergers and rail deregulation, BN's operating ratio dropped to a low of 78.58 in 1984. However, the operating ratio then jumped to a period high of 97.33 in 1986. Subsequently, in a positive trend, BN's ratio dropped to 85.09 in 1988.

The operating ratio is rarely in and of itself an insightful measure of financial viability or performance of a railroad company. Instead, the ratio needs to be interpreted in concert with other measures such as ROI. This is particularly true in the above example. Because of the considerable fluctuation which occurred during the period, it is very difficult to derive a trend line for the operating ratio.

Figure 14 plots real total operating revenues against real total operating expenses

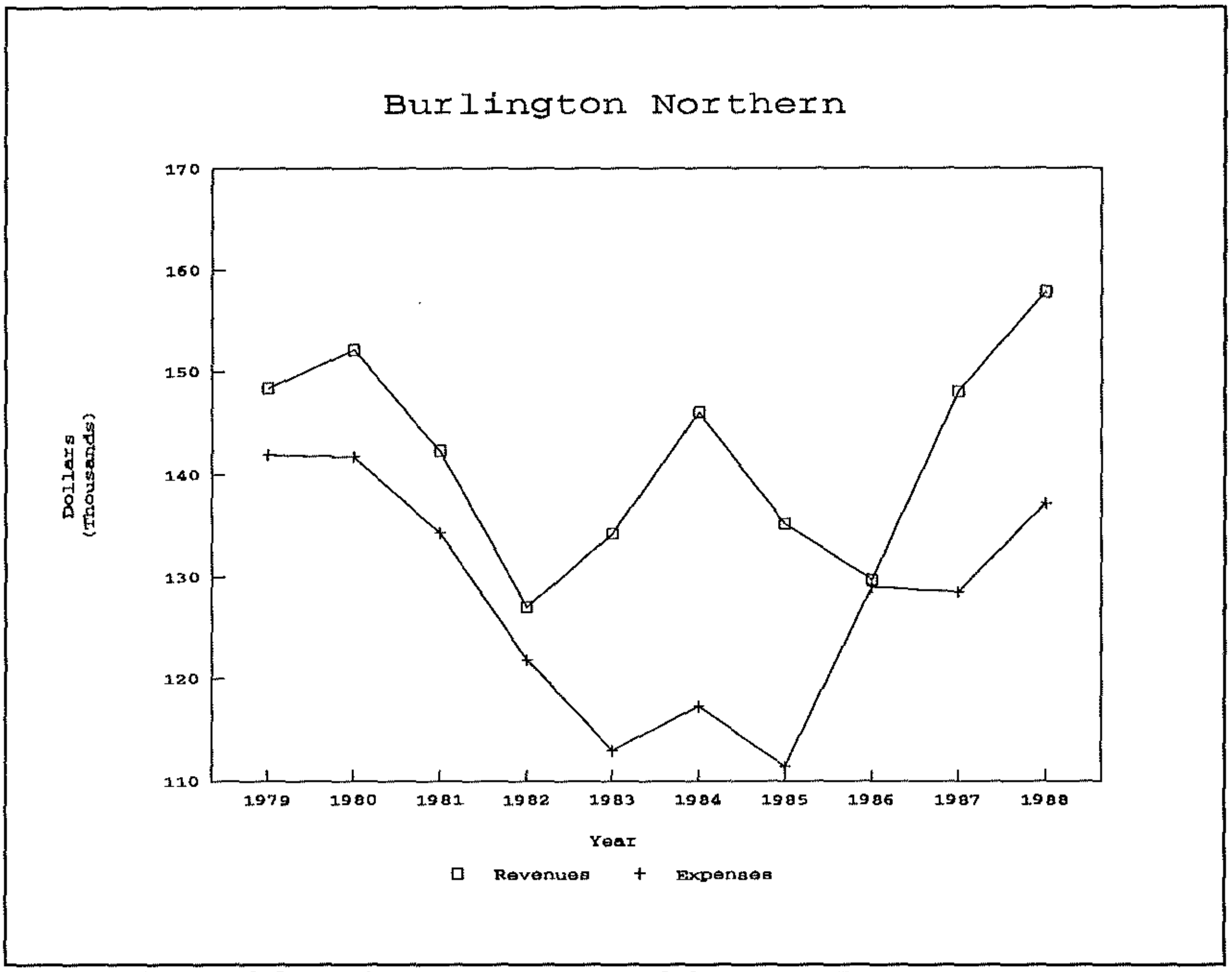

Figure 14: Real Operating Revenues Vs. Real Operating Expenses

for the BN.[19] The plot shows similar trends to those found in the previous graph of the freight operating ratio. From 1982 to 1984, the difference between real operating revenues and real operating expenses broadened but narrowed again between 1984 and 1986. However (as Figure 14 depicts), the overall trend lines from 1982 to 1988, if smoothed, show operating revenues increasing at a greater rate than operating costs. The trend is even more striking during the 1986 to 1988 period. In short, the trend in net

[19]Operating revenues and expenses are shown in real terms by adjusting each into 1982 dollars by the railroad cost recovery index.

railway operating income (the difference between the two trend lines in Figure 14) is upward for the BN, a positive sign.

As Figure 15 shows, BN's return on investment in transportation property has also

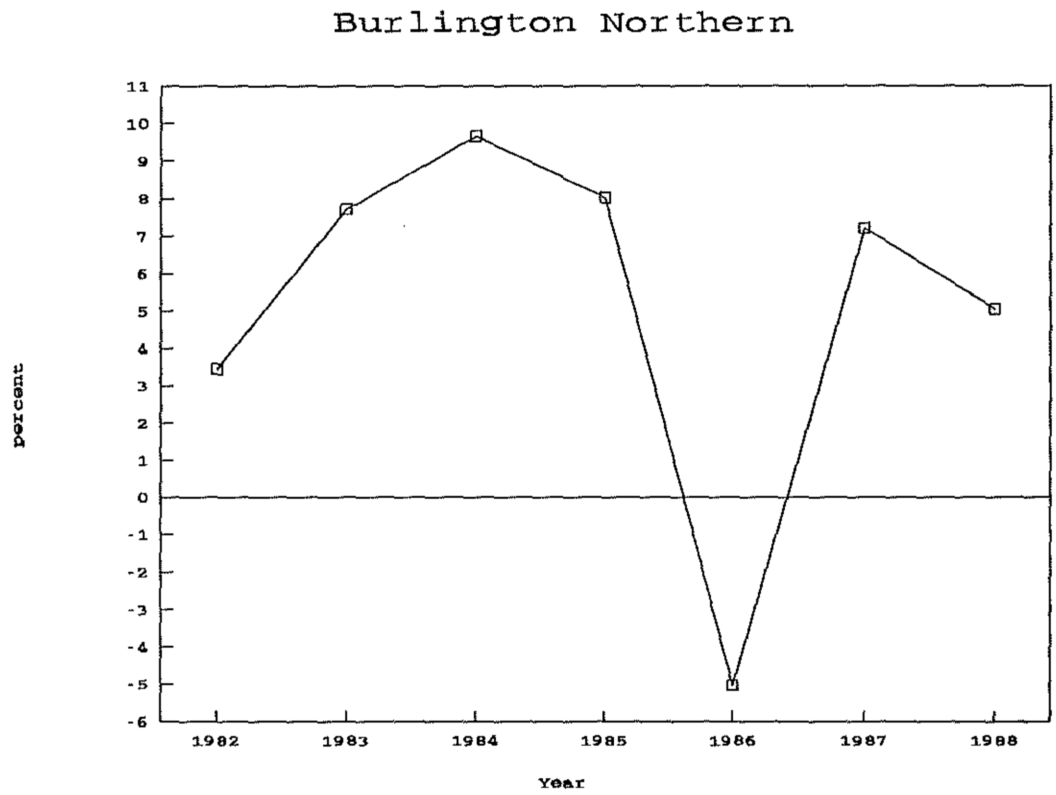

Figure 15: Return on Investment (Net Income/Transp. Prop.)

fluctuated considerably during the period[20]. Transportation ROI was at 3.47 percent in 1982, but rose to a period high of 9.67 percent in 1984. BN's ROI was actually negative in 1986, but has since risen to a level of 5.05 percent in 1988.

[20]As noted earlier, ROI, as computed in this study, reflects only the ratio of net income to investment in transportation property. This should not be confused with the ICC's annual calculations.

In summary, trends in NROI and transportation ROI are generally positive for the BN. However, the BN's operating ratio remains relatively high, and a more consistent return on transportation property would be desirable.

Trends in Soo Line Network Effects

The average miles of railroad operated by the Soo Line increased from 4,562 in 1978 to a high of 7,975 in 1985 (Figure 16). The sudden jump in the graph is the result of

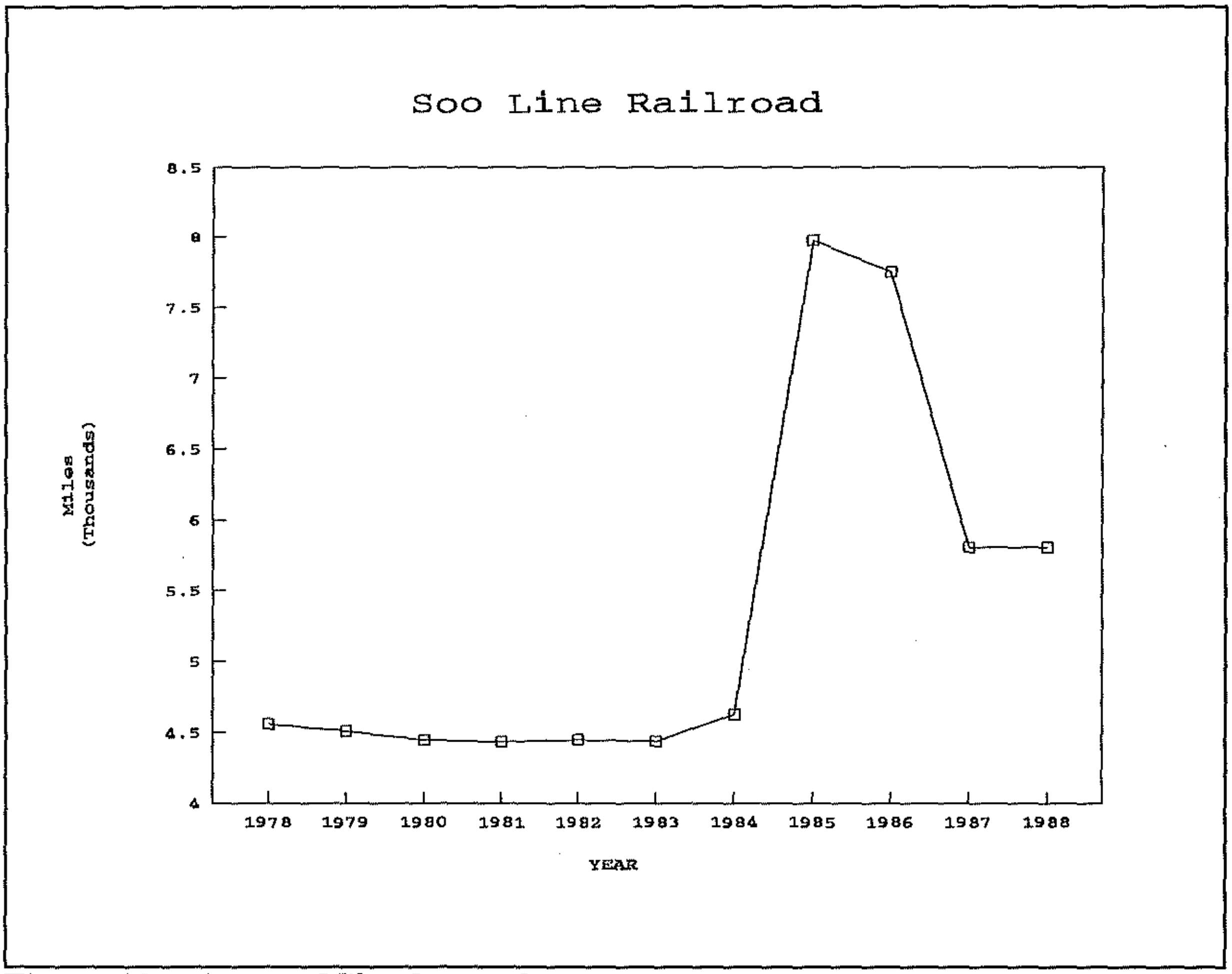

Figure 16: Average Miles Operated

the Soo Line acquisition of the Chicago, Milwaukee, St. Paul and Pacific Railroad Company in February of 1985, through its parent company, Soo Line Corporation. The average miles of road then dropped to 5,807 in 1988 as the company sold its Lake States Division to The Wisconsin Central Railroad in April of 1987.

While the average miles of railroad operated by the Soo Line have increased since 1978, the average length of haul has been decreasing (Figure 17). The average length of haul in 1978 was 412 miles. Soo Line ALH peaked in 1983 (at 434 miles), but subsequently declined to 393 miles in 1988.

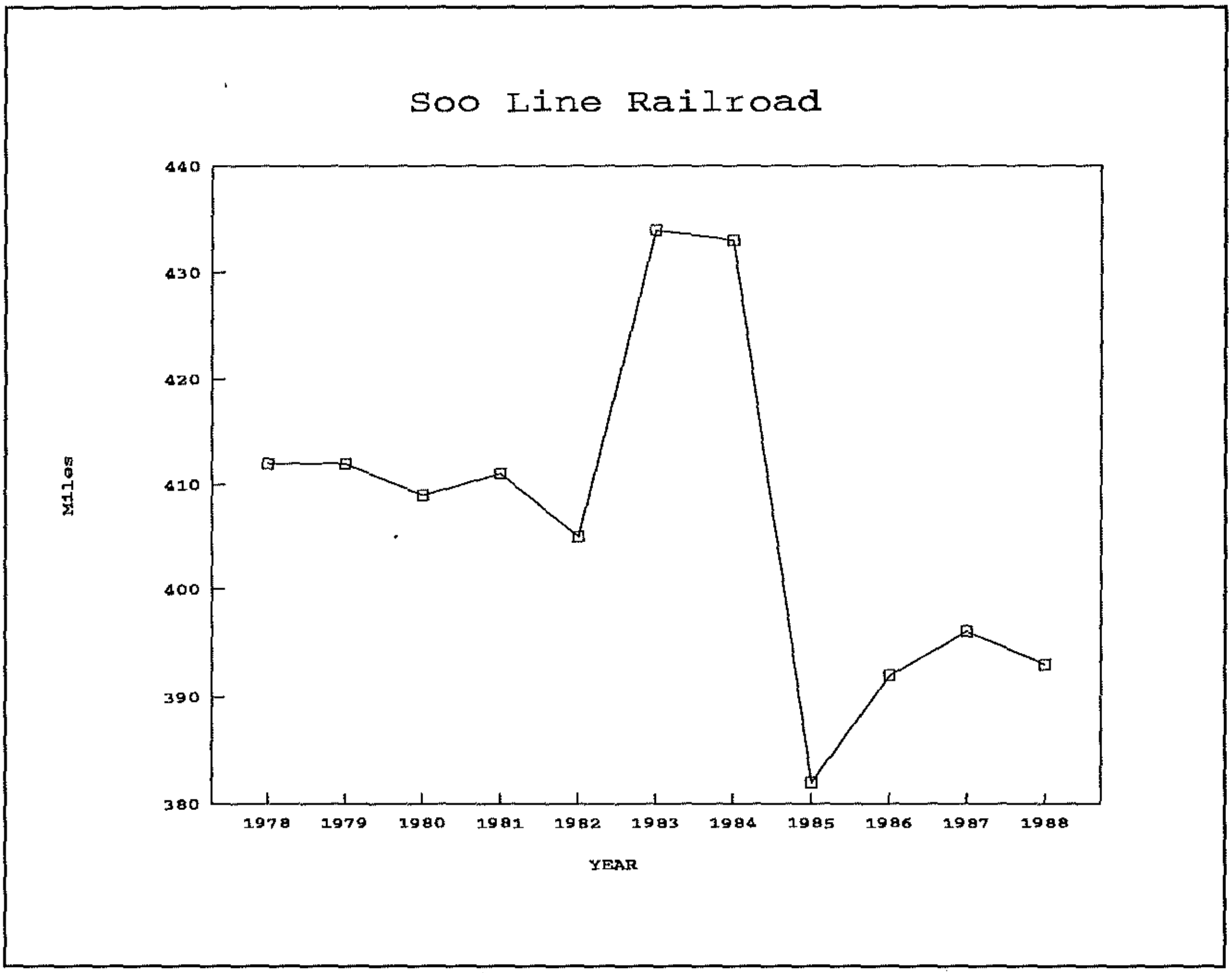

Figure 17: Average Length of Haul

In 1978, the Soo Line generated 2.398 million revenue freight ton-miles per mile of road (Figure 18). From 1979 to 1982, the Soo Line's revenue freight traffic density declined to a period low of 1.782 million revenue freight ton-miles per mile. However, from 1982 onward, the Soo Line's revenue traffic density increased dramatically reaching a level of 3.549 million revenue freight ton-miles per mile in 1988. As will be illustrated later, much of this dramatic increase can be explained by growth in coal traffic.

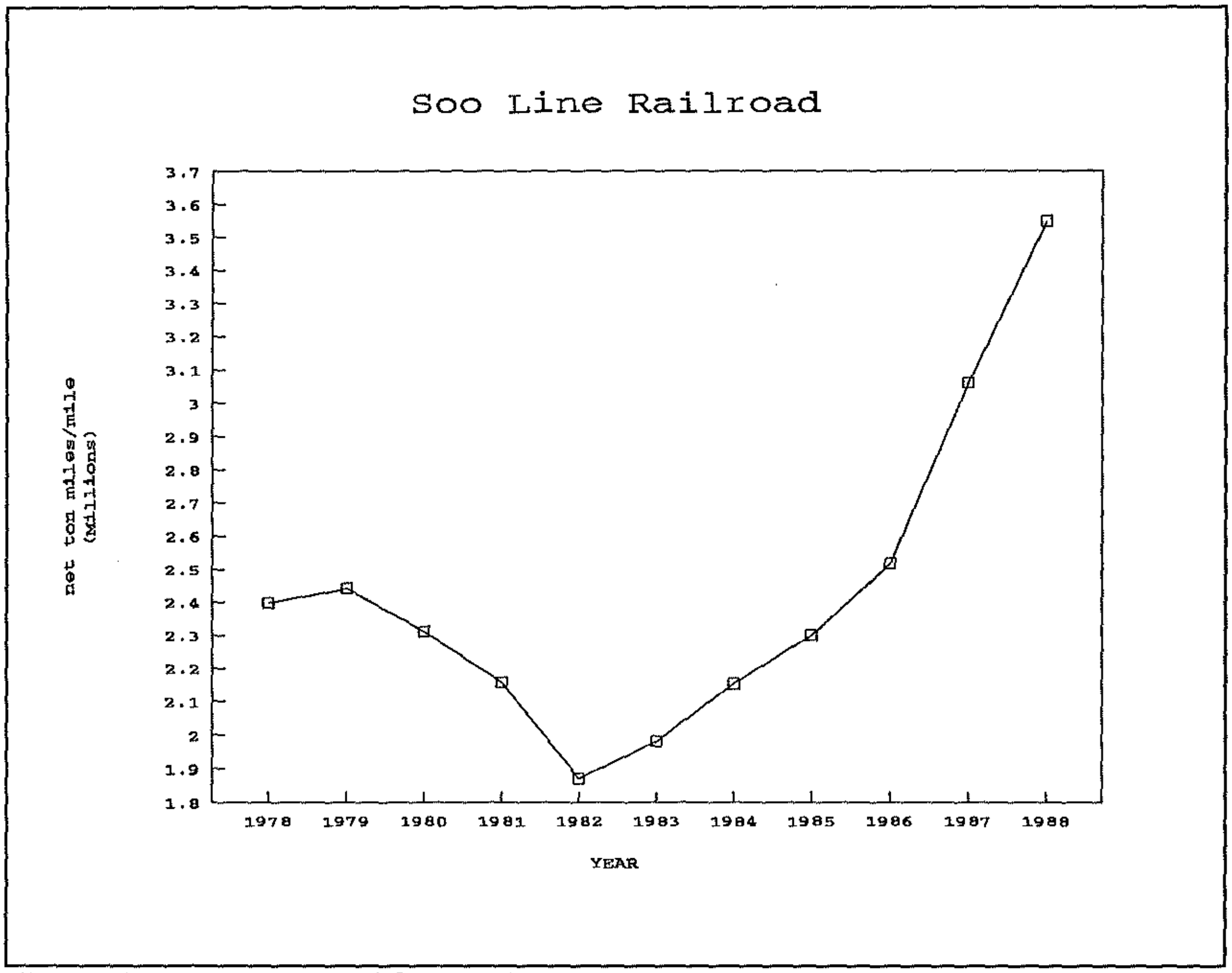

Figure 18: Revenue Freight Density

As Figure 19 shows, real average revenue per ton-mile[21] for the Soo Line has decreased substantially since 1978. In 1978, real average revenue per ton-mile was 3.47 cents. After reaching a high of 3.62 cents in 1981, the Soo's real average revenue per ton-mile dropped to a level of 2.23 cents in 1988.

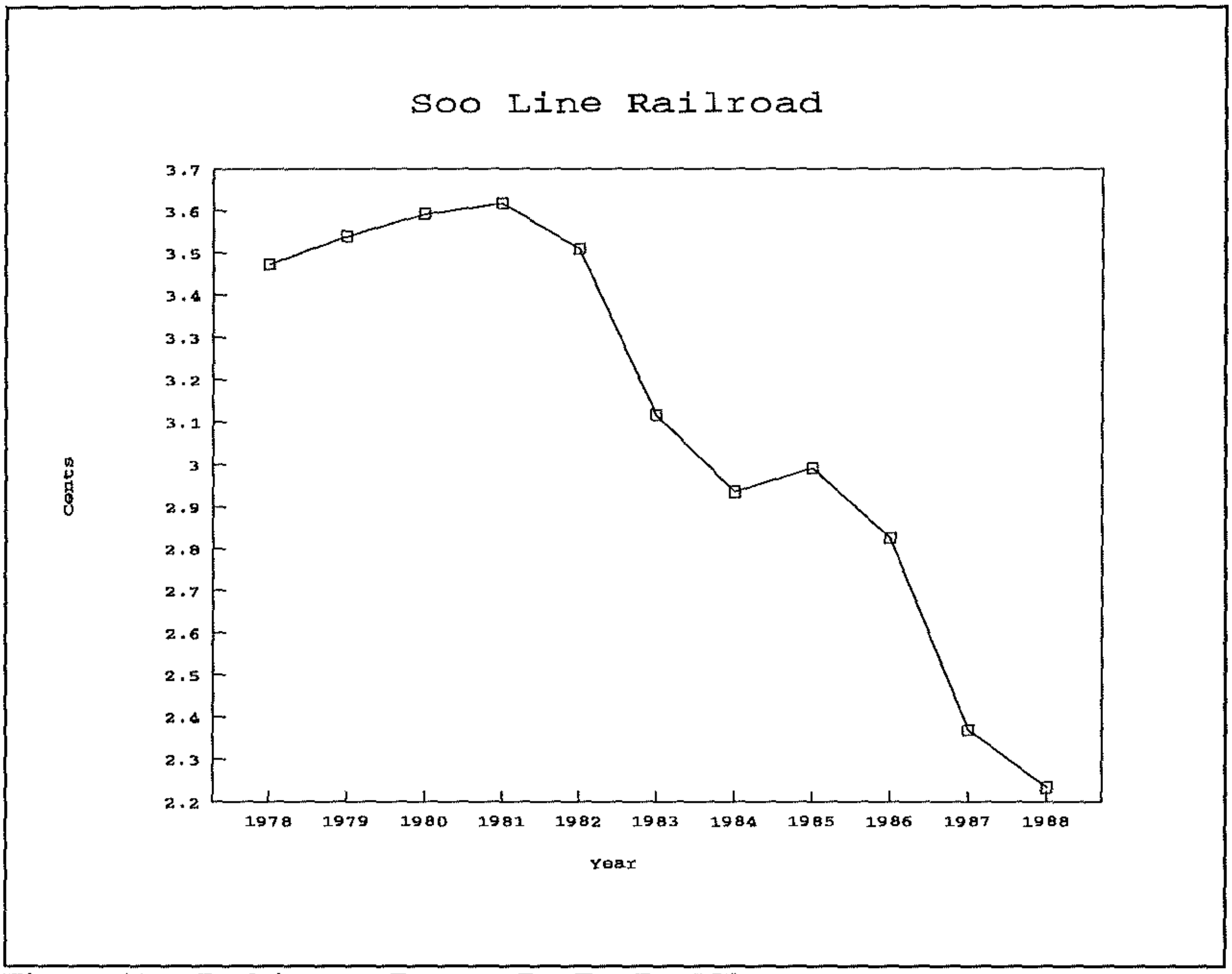

Figure 19: Real Average Revenue Per Ton Per Mile

[21]Adjusted for inflation by the railroad cost recovery index (1982 dollars).

Soo's Commodity Mix

Farm products, coal, and chemicals account for the majority of tonnage shipped on the Soo Line (Figure 20). Other products such as food and kindred products, lumber and wood, and pulp and paper also represent significant portions of total tonnage.

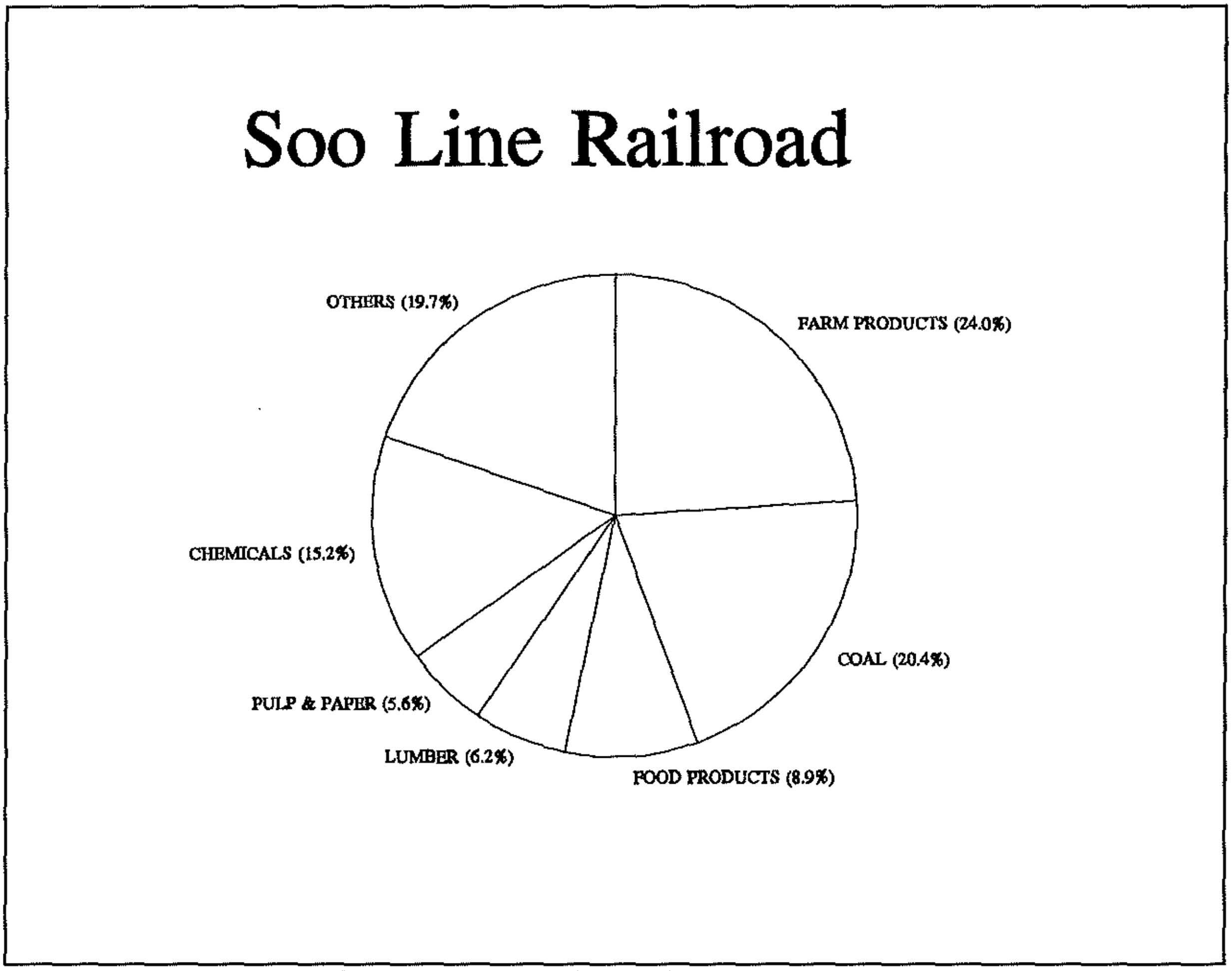

Figure 20: Percent Of Total Tonnage Shipped By Soo Line In 1988

The relative importance of farm product shipments on the Soo Line has grown since 1978 (Figure 21). Farm product shipments comprised 18.1 percent of total tonnage shipped on the Soo Line in 1978, but increased to 24.4 percent in 1984. After a drop to 16.4 percent of total tonnage in 1985 (the year the Soo Line acquired the Milwaukee Road), farm products now represent 24.0 percent of the total Soo Line tonnage.

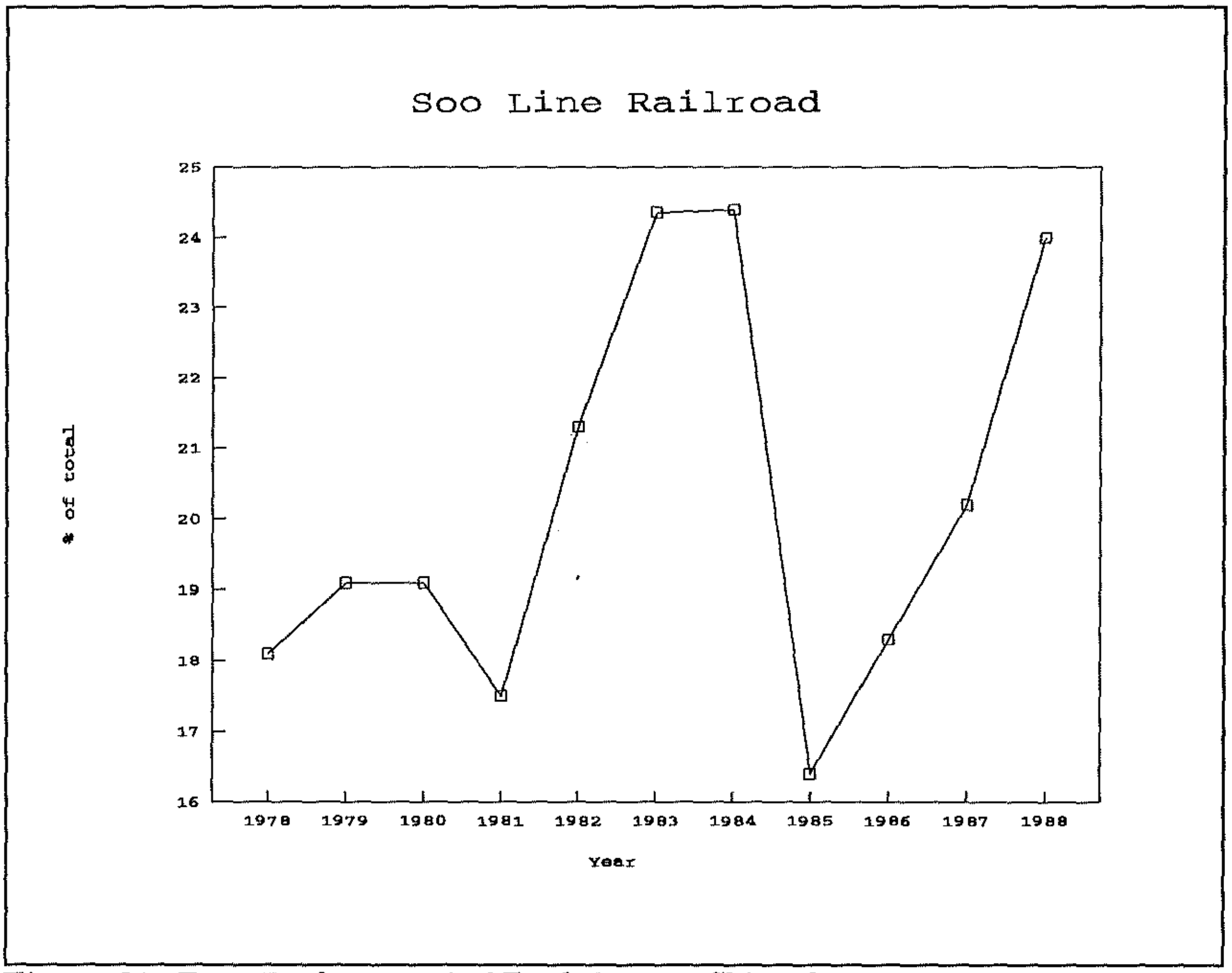

Figure 21: Farm Products as % of Total Tonnage Shipped

In 1978, coal represented only 1.7 percent of the total tonnage shipped on the Soo Line (Figure 22). This percentage increased only marginally between 1978 and 1984. However, coal's percentage of total tonnage increased dramatically in 1985 to 17.6 percent. Today, coal shipments account for 20.4 percent of total tonnage on the Soo Line.

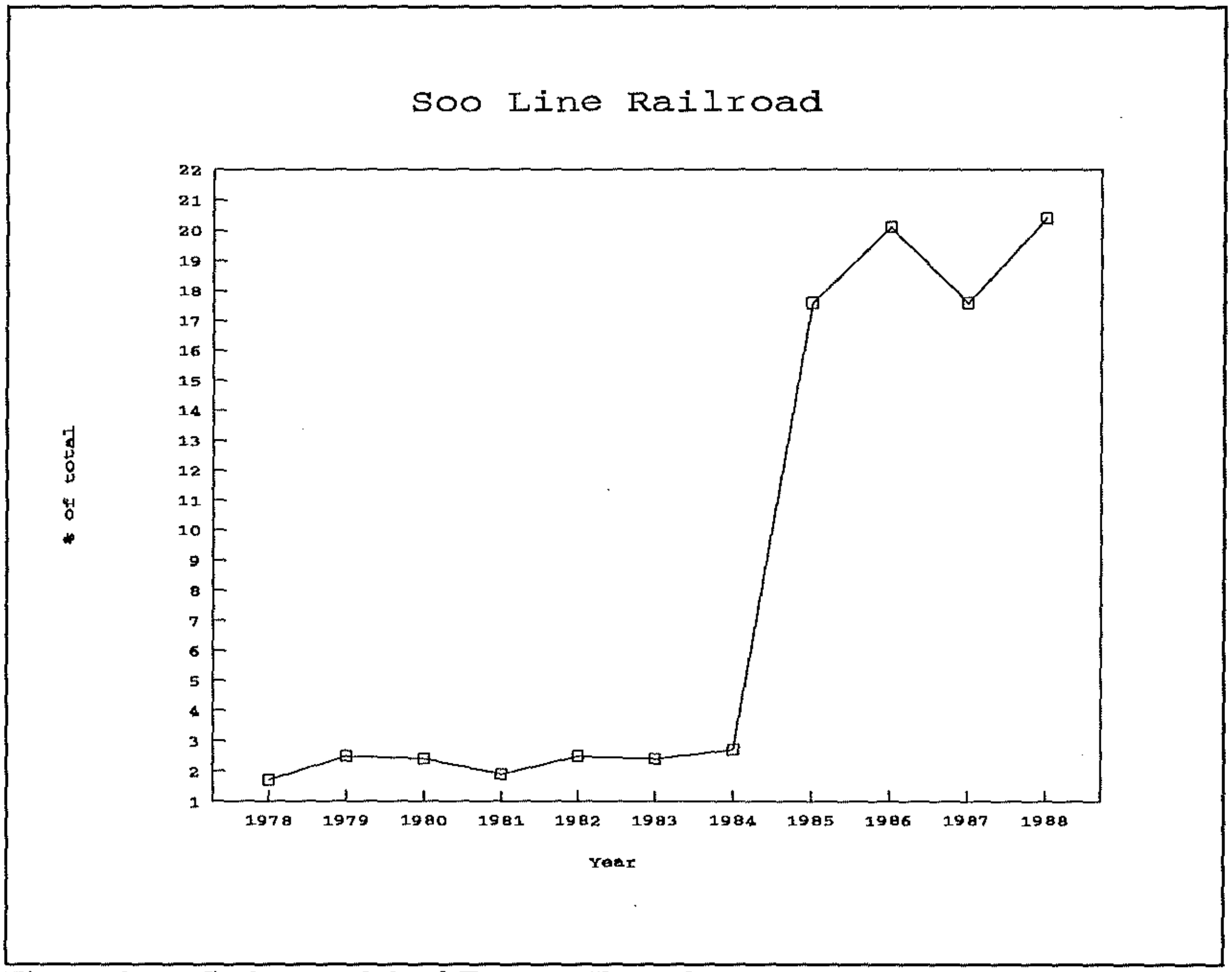

Figure 22: Coal as % of Total Tonnage Shipped

Figure 23 illustrates the importance of lumber shipments, which have decreased substantially over the 1978-88 time period. In 1978, lumber represented 16.0 percent of the total tonnage transported by the Soo Line. This percentage has decreased to a level of 6.2 percent in 1988.

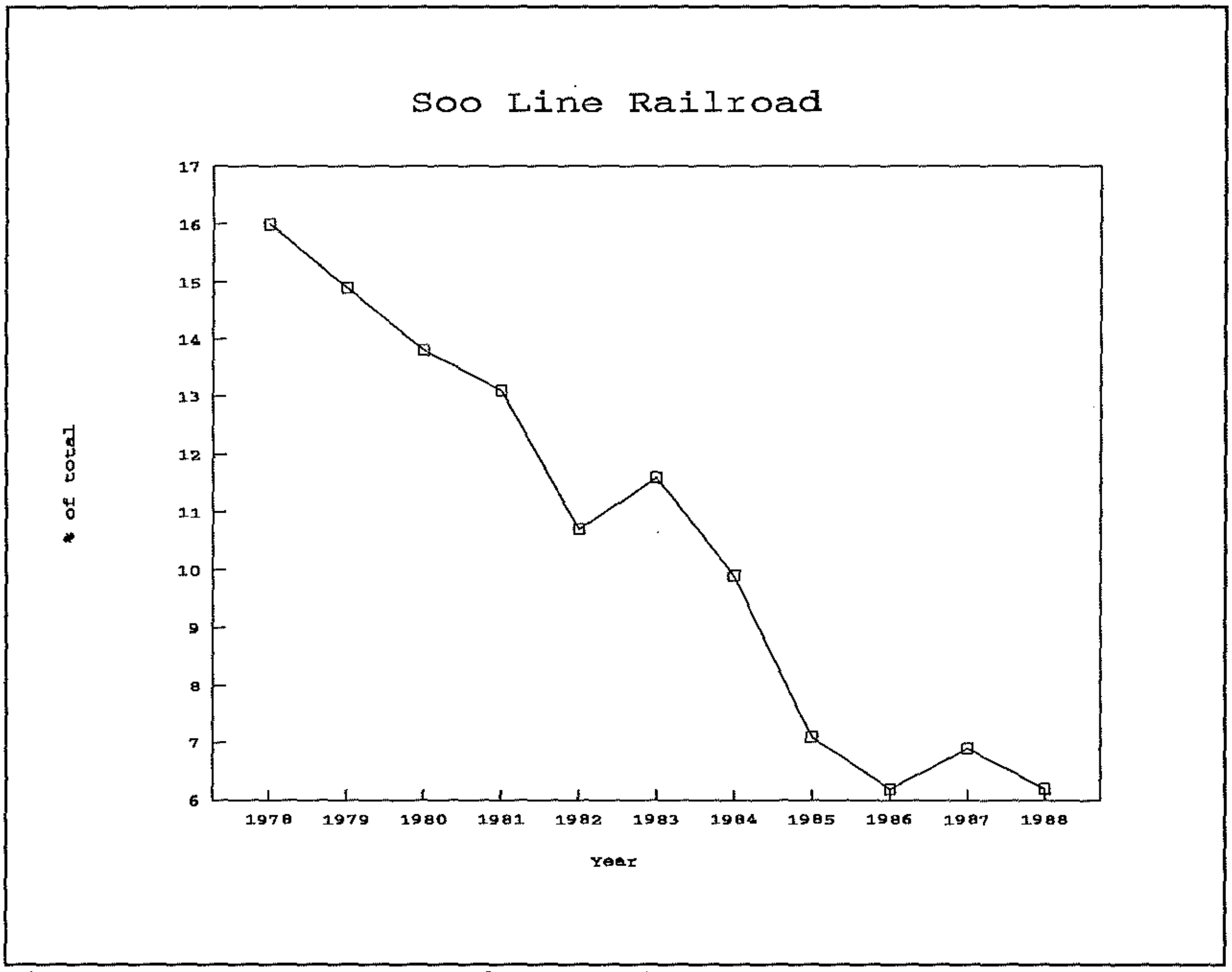

Figure 23: Lumber as % of Total Tonnage Shipped

The percentage of Soo Line's total tonnage due to pulp and paper shipments was 11.9 percent in 1978 (Figure 24). This percentage rose to a period high of 18.0 percent in 1983, but has since fallen to 5.6 percent in 1988.

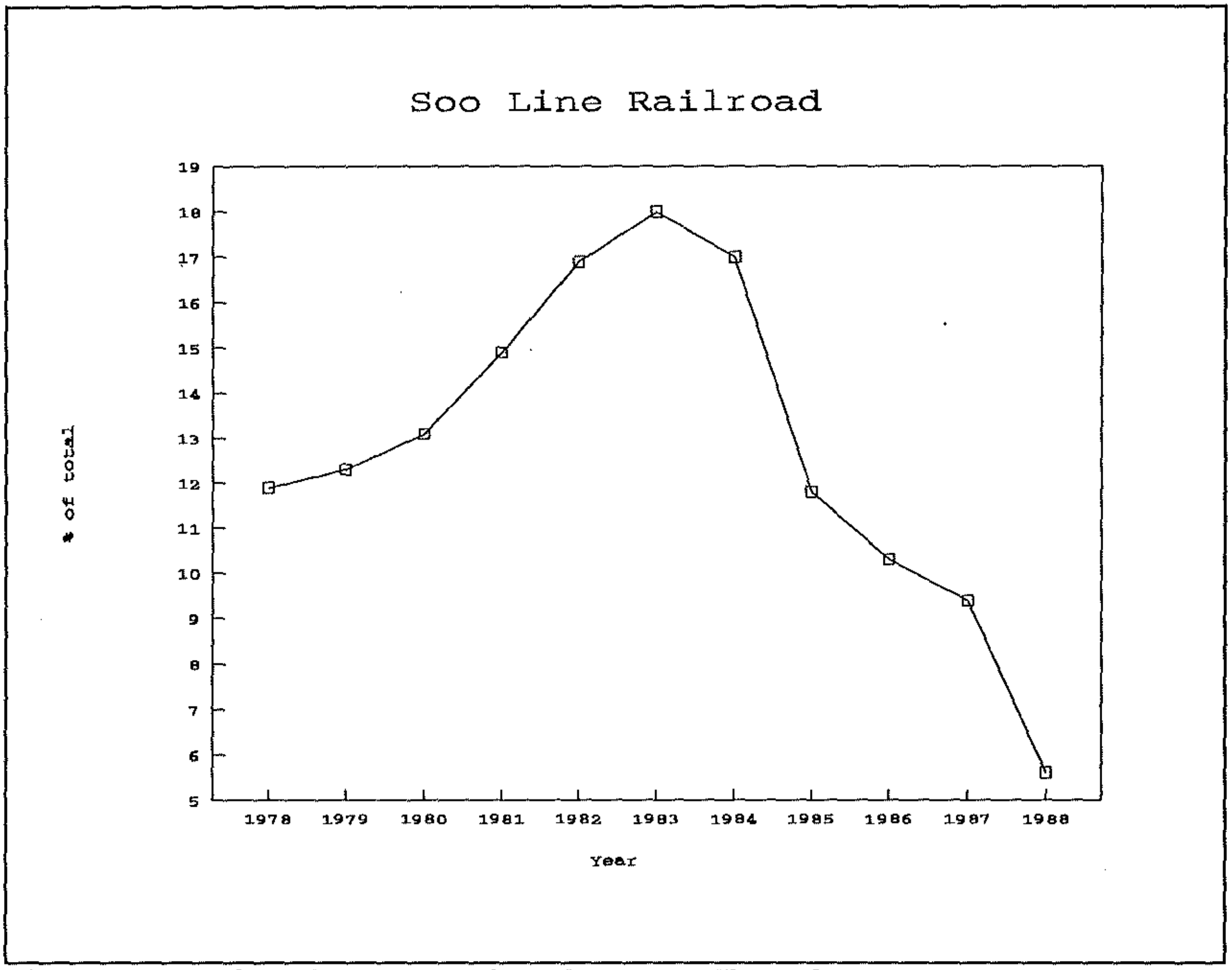

Figure 24: Pulp & Paper as % of Total Tonnage Shipped

While chemicals represent a significant portion of total tonnage shipped on the Soo Line, the percentage they comprise has dropped significantly since 1978 (Figure 25). In 1978, chemicals represented 21.7 percent of total tonnage on the Soo Line. This share rose to a period high of 24.7 percent in 1981. However, chemical shipments have since declined in relative importance, comprising only 15.2 percent of traffic in 1988.

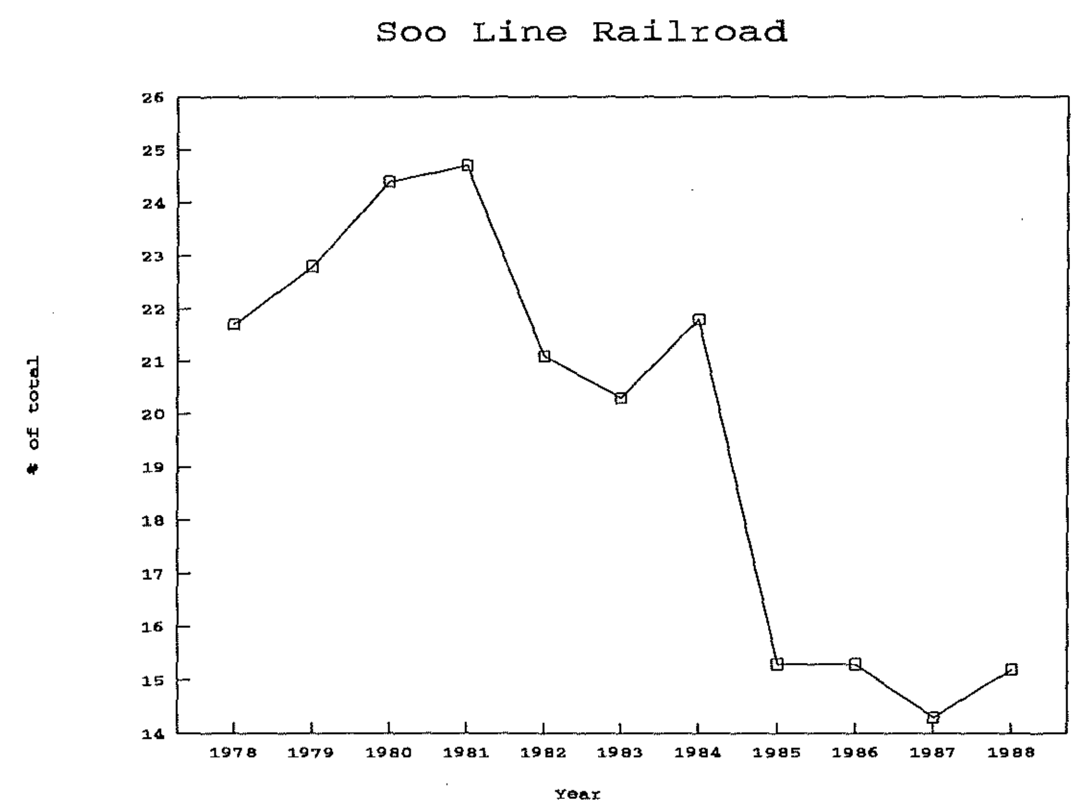

Figure 25: Chemicals as % of Total Tonnage Shipped

As was the case with the BN, the Soo Line's traffic mix has been shifting towards even greater dependence upon coal and farm products. At the same time, the significance of chemicals, lumber, and other traditional bulk commodities has been declining. Although not shown in the graphs, the movement of Canadian commodities, particularly manufactured goods and intermodal traffic bound for the Twin Cities and Chicago, is also an important element of the Soo Line's business. The increase in coal traffic and Canadian overhead traffic are both positive signs for the Soo Line. However, the Soo's traffic base remains relatively specialized and lacks broad diversity. This is particularly true in North Dakota, as will be discussed later.

Trends in Soo Line Track Maintenance

As shown in Figure 26, the amount of cross ties replaced per track mile by the Soo Line has declined in recent years. In 1978, 69 cross ties were replaced per equated track mile. After declining to 38 cross ties per mile in 1982, tie replacement jumped precipitously, reaching a period high of 82 per equated track mile in 1984. From 1985 through 1988, the numbers of cross ties replaced per mile were 42, 34, 30, and 41 respectively.[22]

The lower level of track maintenance in recent years by the Soo Line may be the result of net losses realized from 1985 through 1987. Whether this trend constitutes long-term deferred maintenance is unclear from the data. However, it should be noted that the Soo Line's 1988 ratio of 41 cross ties per mile is considerably less than the 74 ties per mile replaced by the BN in 1988.[23]

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[22]This may again be the result of advances in tie preservation, and may not imply deferred maintenance.

[23]Since concrete and wood cross ties are not separated, this could be the result of more Soo Line mileage with concrete ties.

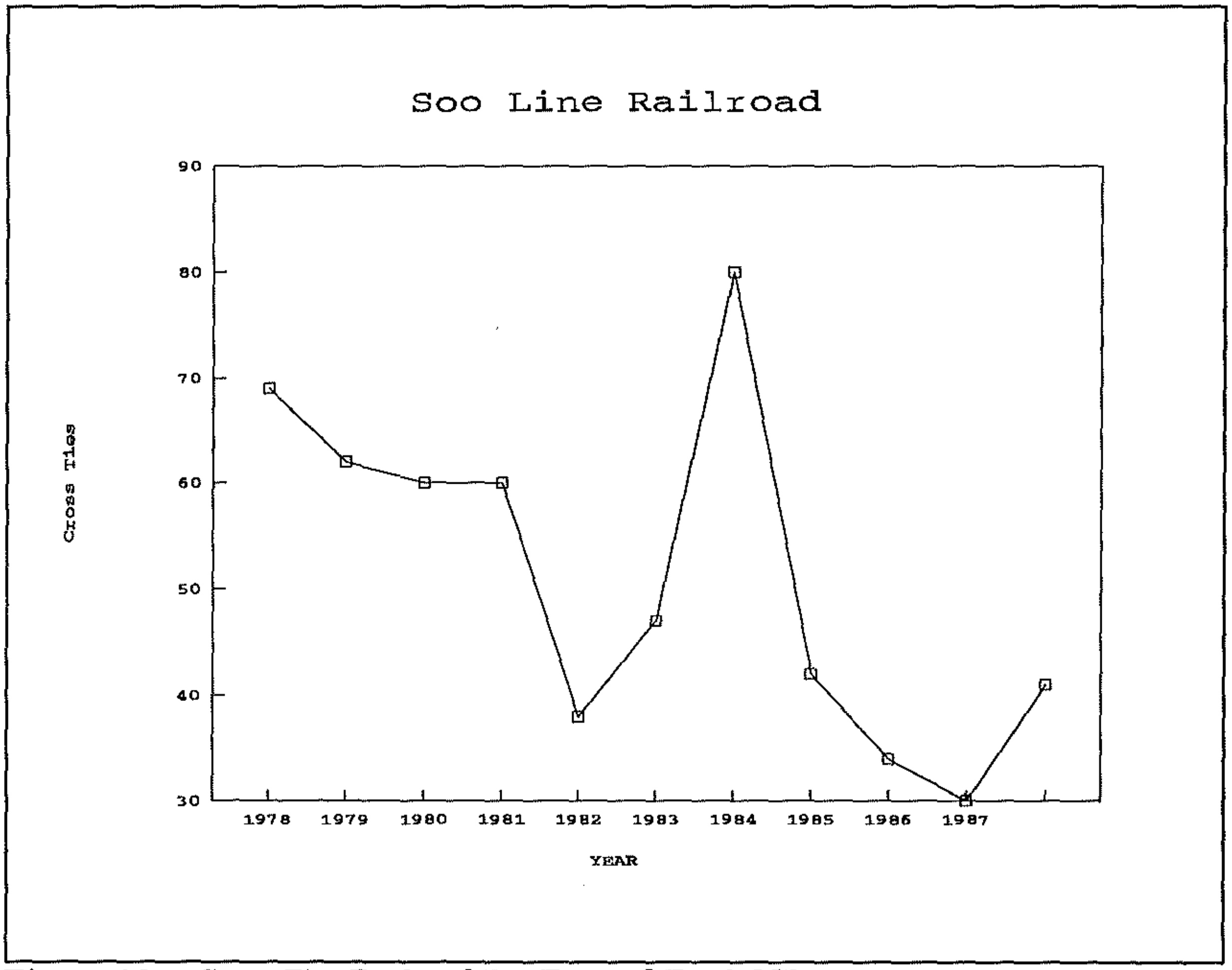

Figure 26: Cross Ties Replaced Per Equated Track Mile

The amount of rail replaced per track mile (Figure 27) exhibits a similar trend to cross-tie maintenance (Figure 26). The ratio of rail replaced to track miles was .06 in 1978. In contrast, the 1987 and 1988 totals were the lowest for the entire period at .01 and .013 respectively. As was the case with cross ties, the trend in rail replacement may be explained in part by the net losses realized by the Soo Line in 1985, 1986, and 1987.[24]

[24]This may also be explained in part by longer track life since 1980.

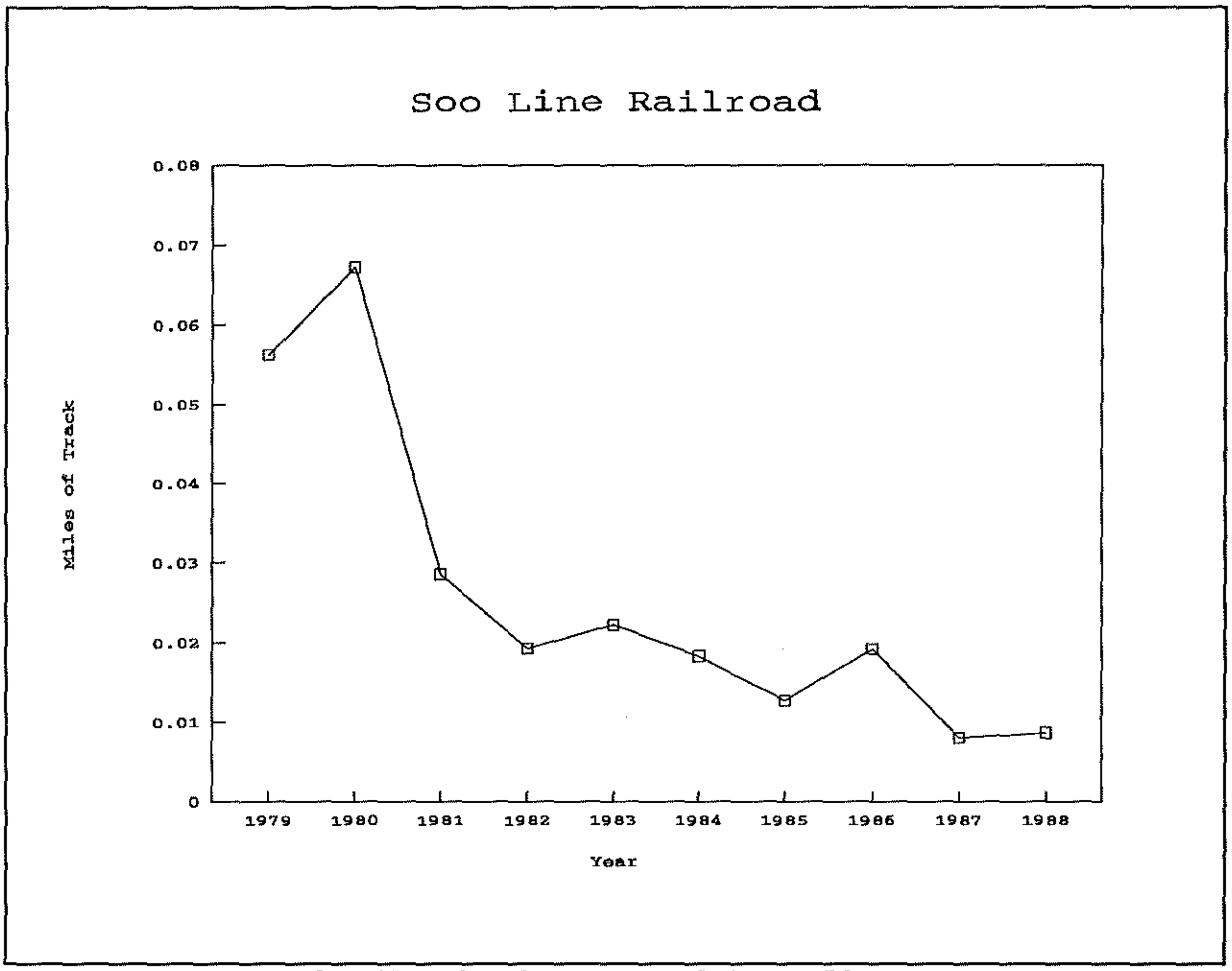

Figure 27: Rail Laid - Miles of Rail per Equated Track Mile

Trends in Soo Line Train Operating Efficiency

Net ton miles per train mile have increased substantially for the Soo Line since 1978 (Figure 28). In 1978, net ton-miles per train mile were at a level of 2,344 and remained within a range of 2,377 to 2,582 between 1979 and 1987. After the Soo Line sold its Lake States Division in 1987, net-ton miles per train-mile rose dramatically, reaching a period high of 3,008 in 1988. The increase in train utilization is partly a function of the sale of light-density track. However, there is an overall upward trend during the period, indicating some gains in train operating productivity.

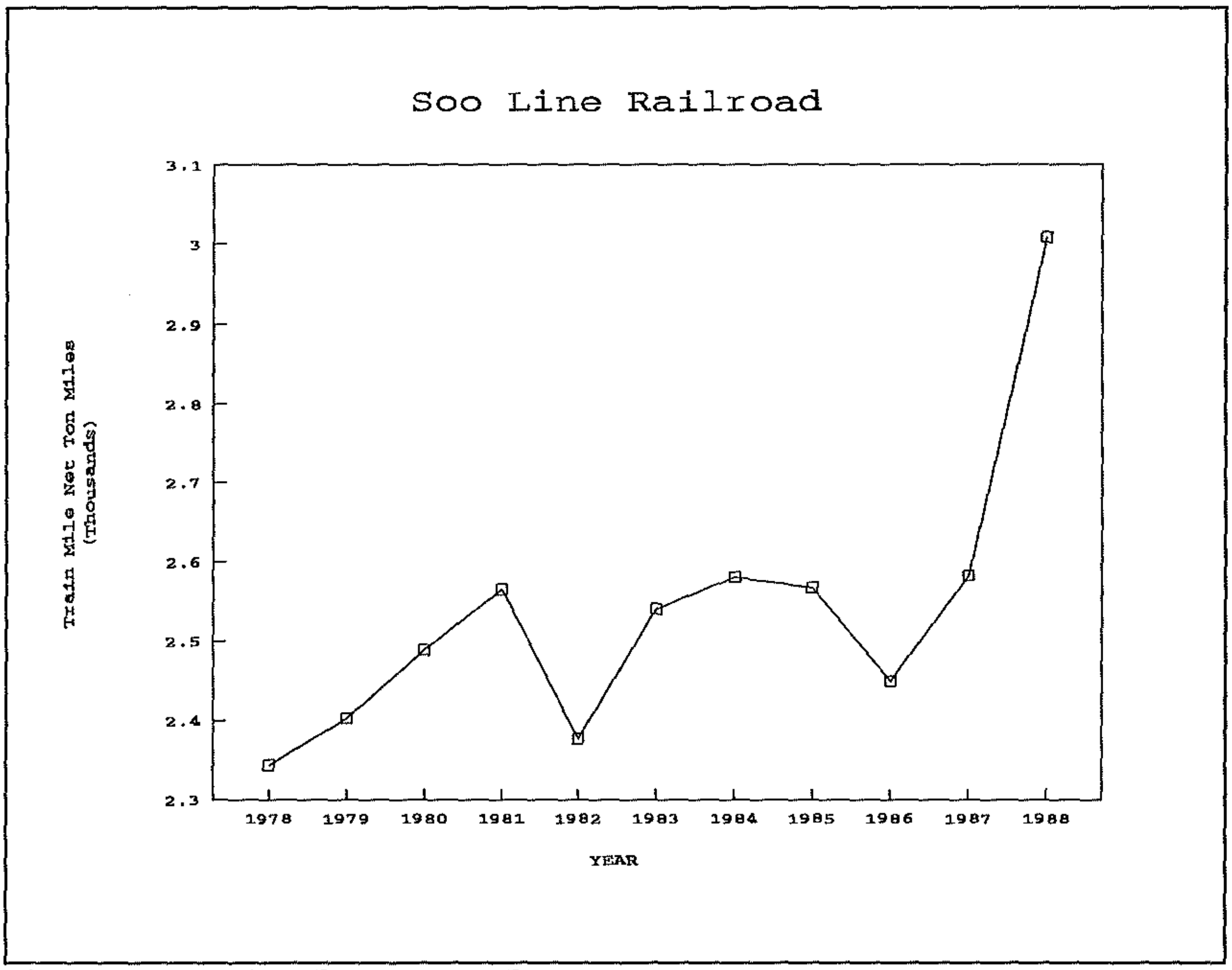

Figure 28: Train Mile Net Ton Miles

Trends in Soo Line Financial Indicators

Soo Line's freight operating ratio stood at 84.8 in 1978 (Figure 29). However, the operating ratio rose to very high levels in 1985, 1986, and 1987 of 99.6, 111.24, and 99.0 respectively. These percentages indicate that operating expenses were nearly the same as (or greater than) operating revenues. Subsequently, the operating ratio dropped to 92.9 percent in 1988.

The high operating ratios from 1985 through 1987 may be indicative of the fact that the Soo Line was operating some very high-cost light-density lines which were increasing operating expenses greatly, but contributing only marginally to operating

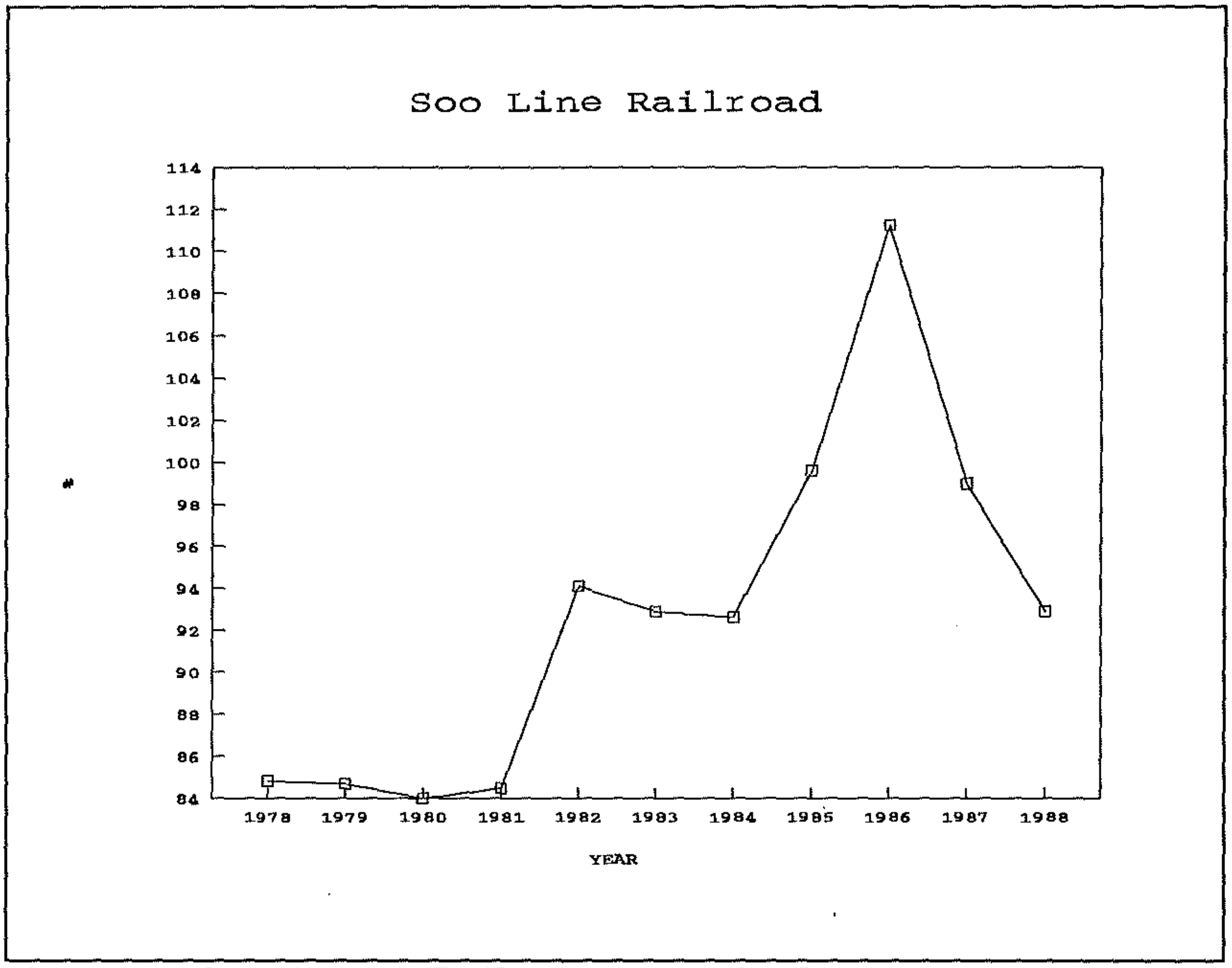

Figure 29: Operating Ratio For Freight - Percent Per Year

revenues. Again, the sale of the Lake States Division appears to have had a positive effect on operating margin.

The rise in Soo Line's operating ratios in the 1985 through 1987 period can be readily seen when looking at real operating revenues and real operating expenses over time (Figure 30)[25]. In 1985 and 1986, real operating expenses rose by much greater amounts than real operating revenues. Soo Line's net railway operating income was $3,636 in 1988. Again, the reversal of the trend in NROI begins in 1987, coinciding with

[25]Operating revenues and expenses are adjusted by the railroad cost recovery index (1982 dollars).

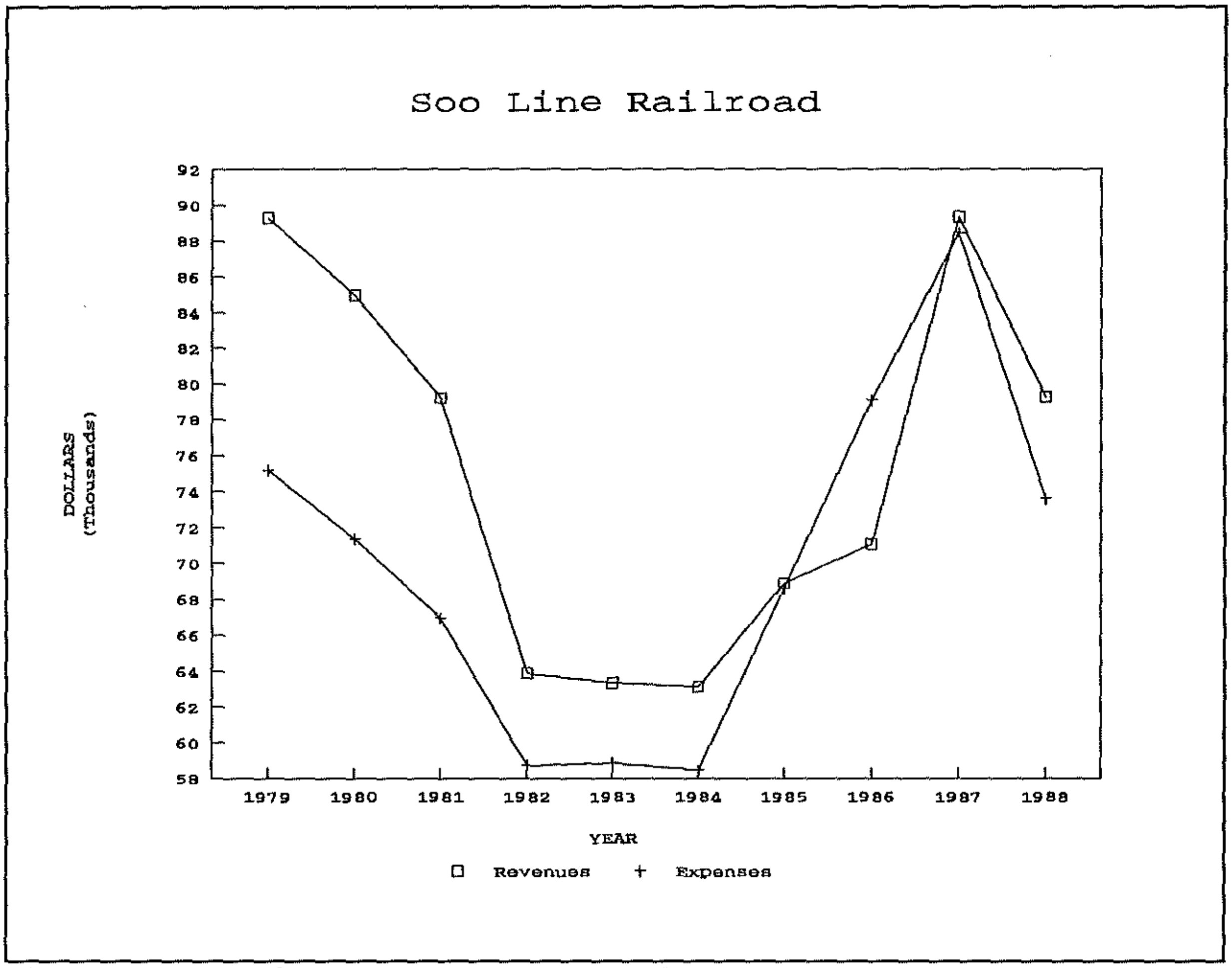

Figure 30: Real Operating Revenues Vs. Real Operating Expenses

the sale of the Lake States Division.

The return on investment in transportation property realized by the Soo Line grew from 3.9 percent in 1982 to 4.2 percent in 1984 (Figure 31). However, from 1985 through 1987 return on transportation investment was negative for the Soo line. In a positive trend, the Soo Line's ROI rebounded to a level of 3.6 percent in 1988. However, this level is still far below the opportunity cost of capital for Class I carriers.

In summary, the financial performance of the Soo Line fluctuated dramatically during the 1979-88 period. In 1986, the carrier's transportation ROI was negative. However, the Soo Line exhibited a modest recovery towards the end of the period,

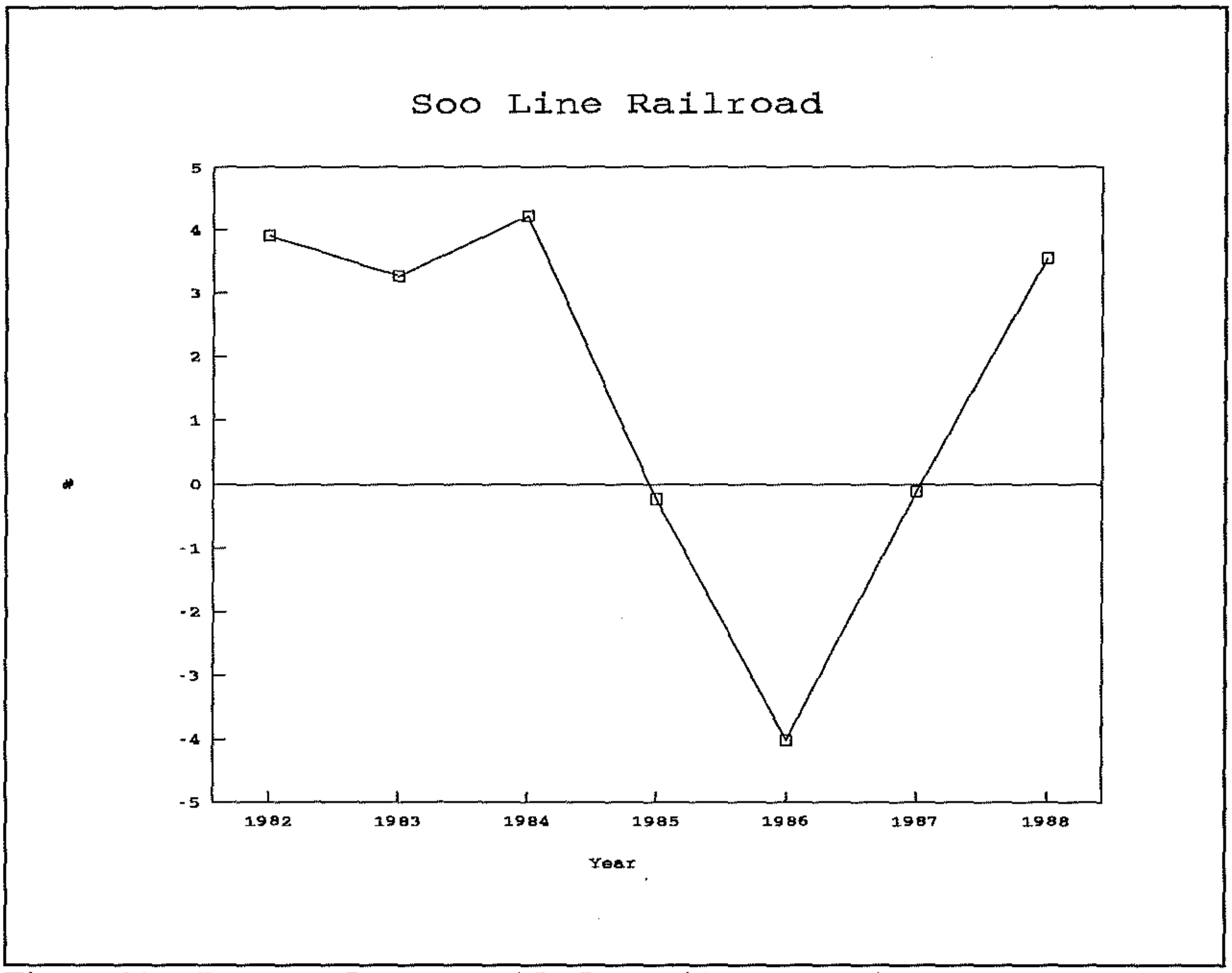

Figure 31: Return on Investment (Net Income/Transp. Prop.)

generating a positive ROI. This is a hopeful sign. However, no long-term trend can be extrapolated from the carrier's 1988 experience.

Comparison to Regional Performance Factors

In the previous sections of the report, railroad financial and performance factors were evaluated in a stand-alone fashion. Each carrier's data were considered individually and in isolation. A second method of evaluating the performance and efficiency of North Dakota carriers is to compare them to the western region of the United States.

Table 5 displays a series of traffic and operating indices which were extracted from the 1988 Rail Data File, or from Worktable E of the Uniform Rail Costing System

(URCS). The first item, traffic density in gross ton miles (GTM) per mile, is a similar concept to the net freight traffic density introduced earlier in the report. The difference between the two measures is that the weight of the freight cars and locomotives is reflected in the latter. As Table 5 shows, the BN had a traffic density of 18 million GTM per mile in 1988, compared to an average of 15.5 million GTM for all western railroads. The Soo Line, in contrast, averaged roughly 6.9 million GTM per mile of railroad in 1988. This comparison illustrates the differences between the two carriers' networks and commodity mixes. As noted earlier, economies of traffic density is probably the most significant factor affecting railroad viability and financial performance in the short-run.

TABLE 5: Comparison of BN and SOO Line Performance Factors to Western Region Averages			
Item	Soo	BN	Western Region
Traffic Density (Gross Ton Miles per Mile of Railroad)	6,863,386	17,976,640	15,522,565
Ratio: Carloads Interchanged to O/T	0.704044	0.348078	0.540414
Train Hours per Car Mile	0.001315	0.000836	0.000967
Yard Switching Minutes per Car Mile	0.042	0.018	0.023
Ratio: Train switching Hours - to - Total Train Hours	0.695112	0.415982	0.50282
SEM per Industry Switch	10.55177	5.7746	7.42506
SEM per Interchange Switch	5.80346	3.17603	4.08377
SEM per Intra & Inter Train Switch	2.63793	1.44365	1.85626
Average Distance per Car in Way Trains	133.3606	21.07088	37.51361

The second item in Table 5 is the ratio of carloads interchanged to carloads originated and terminated (O/T). A low ratio means that most of the carrier's traffic is local -- that is, originated and terminated on its own lines. A high ratio implies the opposite, that most of the carrier's traffic is interlined. The interchange of traffic requires additional switching, information transference, and related activities. In addition, interline movements require a division of the revenue among carriers.

As Table 5 depicts, the ratio for the BN (.348) is below the average for western carriers (.54). However, the Soo Line ratio is much higher. This variance underscores the differences in size between the two carrier's networks and their physical configurations.

The next item -- train-hours per car-mile -- is an indicator of the effectiveness of road train operations. The higher the ratio, the higher the carrier's road train cost structure, and vice versa. As the data show, the BN requires fewer than average train-hours of operation to move a freight car one mile. Again, the Soo Line's ratio lies above the regional average.

The fourth item in Table 5 -- yard switching minutes per car-mile -- is a measure of the yard classification and switching time required to move a freight car one mile. As the data depict, the Soo Line requires 0.042 minutes for each car-mile of line-haul movement, as opposed to 0.018 minutes for the BN.

Yard switching is an expensive component of railroad operations, increasing locomotive and car ownership cost, fuel, crew wages, and overhead expenses. So typically, the lower the ratio, the lower the carrier's cost structure, and vice versa.

The ratio of train switching-hours to total train-hours (item 5 of Table 5) is another road train efficiency measure. Ratios above .5 imply that a carrier is spending more time switching at industrial sidings or yards during road train operations than in line-haul or running activities. Thus, lower ratios tend to reflect more efficient road train operations.

Part of the explanation for the Soo Line's higher train-switching ratio can be found in the next item of Table 5, the average switch engine minutes (SEM) per industry switch. The Soo Line's average of 10.55 SEM per car is considerably higher than either the regional average (7.42) or the BN's (5.77). Furthermore, the next two items in Table 5 -- average SEM per interchange and intertrain switches -- partially explain the Soo Line's higher yard switching-minutes per car-mile.

The last line of Table 5 shows the average distance each car is hauled in way train service. Way train costs are significantly higher than through or unit train costs on a gross ton-mile basis. Average western region unit costs per gross ton-mile in way, through, and unit trains are shown in Table 6 for 1988. These data clearly illustrate the diseconomies of way train operations.

TABLE 6: Western Region Gross Ton-Mile Cost, by Type of Train - 1988

	Item	Way Train	Through Train	Unit Train
1	Raw Gross Ton-Mile Unit Cost	$0.000247	$0.002468	$0.002468
2	Average Gross Tons	1982.6	4708	6735.2
3 (L1 x L2)	GTM Cost per Train-Mile	$0.489326	$11.61981	$16.62315
4	Unit Cost per Locomotive Mile	$2.5821	$2.5821	$2.5821
5	Average Locomotive Units per Train	2.37315	3.4563	3.138
6 (L4 x L5)	Locomotive Cost per Train-Mile	$6.127711	$8.924512	$8.10263
7	Crew Wages per Train-Mile	$7.4348	$7.4348	$7.4348
8 (L3+L6+L7)	Total Expense per Train-Mile	$14.05184	$27.97913	$32.16058
9	Average Empty-Loaded Car-Mile Ratio	1.7797	1.7797	1.7797
10 (L8 x L9)	Total Expense per Loaded Train-Mile	$25.00805	$49.79445	$57.23618
11 (L10 ÷ L2)	Adjusted Cost per GTM	$0.012614	$0.010577	$0.008498

Source: Worktable E, Uniform Rail Costing System.

In essence, when compared to average values for western railroads, the Soo Line realizes relative diseconomies due to lower traffic density, higher train and yard switching times, and longer way train hauls. All of these factors contribute to a higher cost structure and higher operating ratios. Furthermore, these conclusions are supported and underscored by the Soo Line's own business assessment which emphasizes the need to achieve greater economies through increases in traffic density and freight train productivity, and to reduce multiple terminal handling of cars[26].

In a recent interview, Edwin Dodge, President and CEO of the Soo Line, noted the extent and consequences of the lower traffic density facing the Soo.

> Soo's traffic volume for each mile of railroad is well under the level of the largest, or "mega" railroad systems. The mega carriers transport anywhere from 50 to 100 million gross tons per mile (GTM) each year on their mainlines. Soo [Line] carries only 25 to 40 million GTM. On branchlines, Class I Railroads carry three to six million GTM compared to the one million GTM Soo carries. This is why Soo [Line] is at a cost disadvantage compared to large carriers. Competing regional and shortline carriers have low density, but they also have lower costs to balance their low volumes[27].

Furthermore, Mr. Dodge went on to state:

> Soo [Line] cannot operate as a traditional Class I carrier. We have Class I costs, but not a Class I density, hence reductions in our overhead costs were necessary.

As the data in Table 5 show, the BN typically exhibits relatively good or average scores on each performance and cost factor. In particular, the BN realizes substantial economies due to high traffic density, exceeding the western region average by roughly 2.5 million GTMM.

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[26]See: Soo in the 1990's, Soo Line Railroad Company, 1989.

[27]See: Soo News, March 1990.

III. STATE-WIDE TRAFFIC ANALYSIS

In the previous section of the report, a series of system-wide railroad performance, commodity, and financial factors were analyzed. The objectives were to identify trends in efficiency, productivity, and return on investment for each railroad.

North Dakota traffic and commodity factors contributed in part to the trends and indicators presented previously. Although the overall viability of the carriers is important from a rail planning perspective, trends in state-wide traffic and agricultural production are more directly relevant to branch-line viability in North Dakota. So, in this section of the report, specific trends in North Dakota rail traffic are highlighted. The primary sources of the data are the railroad's annual R-1 reports to the North Dakota Public Service Commission (PSC) and North Dakota grain and oilseed shipment statistics collected by the PSC and processed by the UGPTI.

Trends in BN North Dakota Traffic

Grain and oilseed shipments dominate freight revenue traffic originating on the Burlington Northern in North Dakota (Figure 32). In 1988, they accounted for 73.4 percent of total statewide carloads originated on the BN. Lignite coal also represents a large portion of BN carloadings (20.4 percent in 1988). Wheat flour and potatoes comprise substantially smaller portions of BN's North Dakota traffic base.

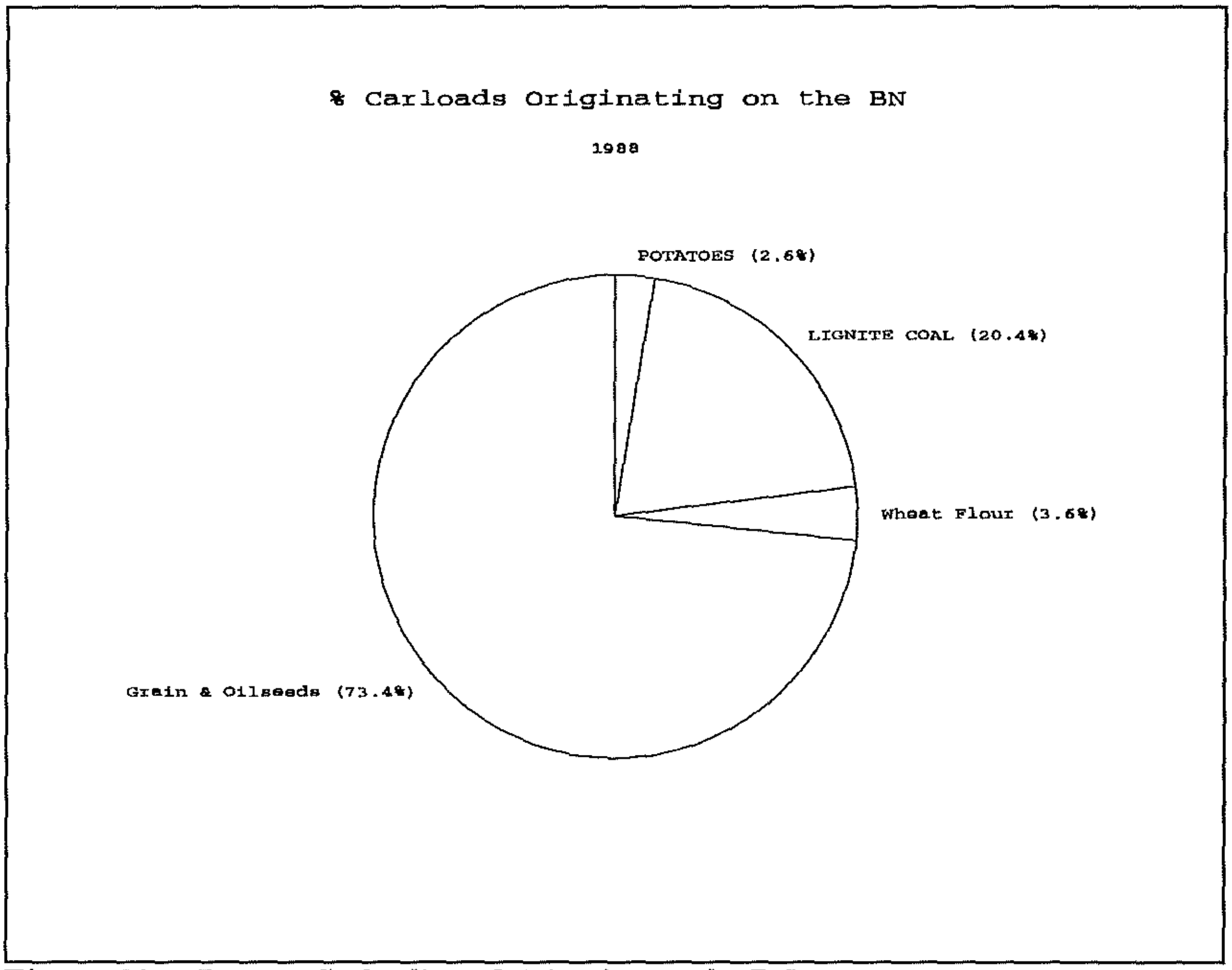

Figure 32: Percent Carloadings Originating on the BN

BN North Dakota carloadings have fluctuated considerably within commodity classifications during the last ten years. In 1979, 55,810 grain and oilseed carloads originated on the BN in North Dakota (Figure 33). Grain and oilseed shipments rose to a high of 81,594 carloads in 1986, after a large drop in 1985. However, BN's grain and oilseed carloadings in North Dakota subsequently dropped to 61,038 in 1988.

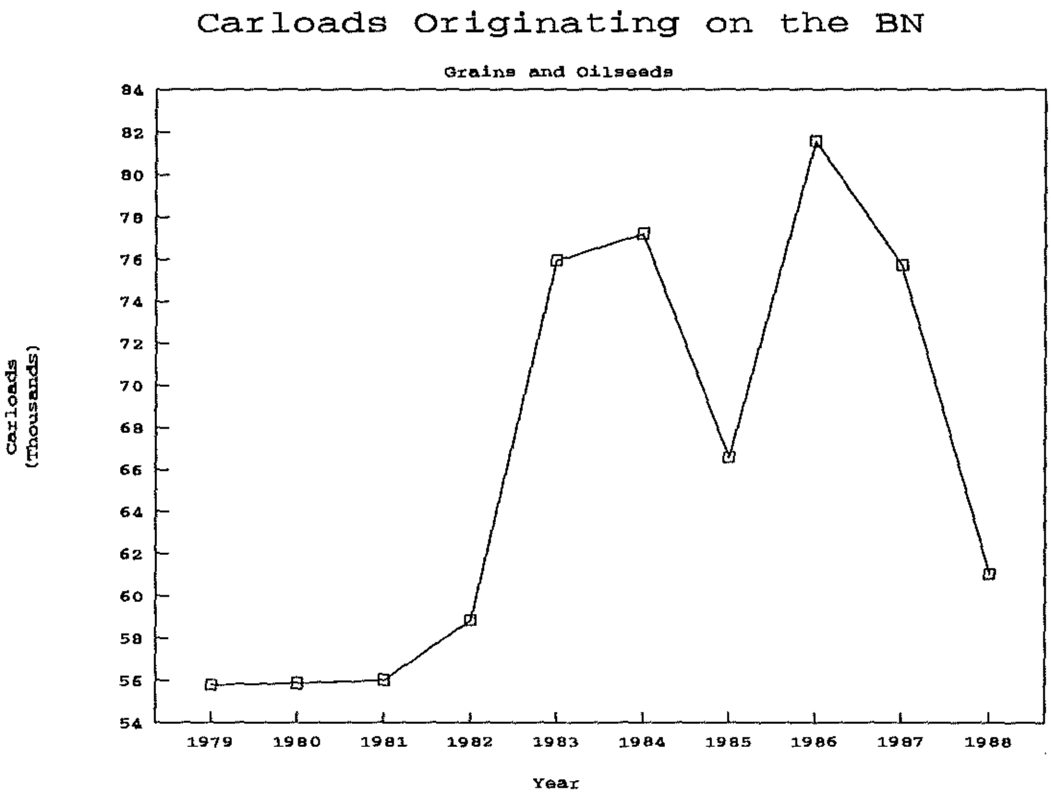

Figure 33: Grain and Oilseeds Carloadings Originating on the BN

The percentage of BN's originating carloadings attributable to grains and oilseeds has increased substantially since 1979 (Figure 34). In 1979, 57 percent of the total carloads originated by the BN in North Dakota consisted of grains and oilseeds. This percentage increased to 78.3 in 1987, and subsequently dropped to 73.4 in 1988. However, some of post-1986 decline can be attributed to drought conditions and the conservation reserve program which has taken some farmland out of production.

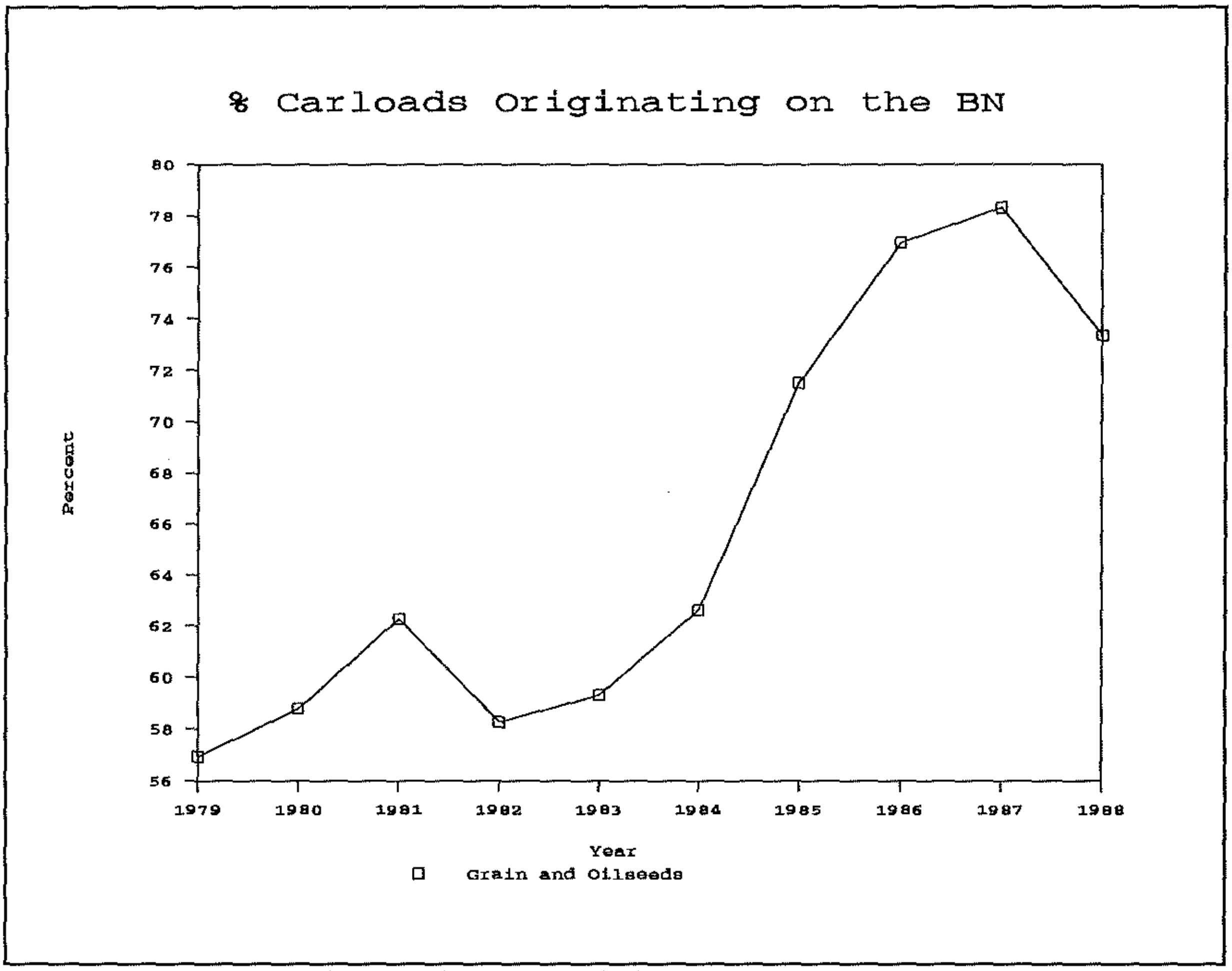

Figure 34: Percent Grain and Oilseeds Carloadings Originating on the BN

Lignite coal traffic, another important component of BN's North Dakota traffic base, has declined in recent years (Figure 35). In 1979, lignite coal carloadings on the BN in North Dakota were at a level of 33,707. After reaching a high of 44,259 carloads in 1983, lignite dropped to 16,989 carloads in 1988.

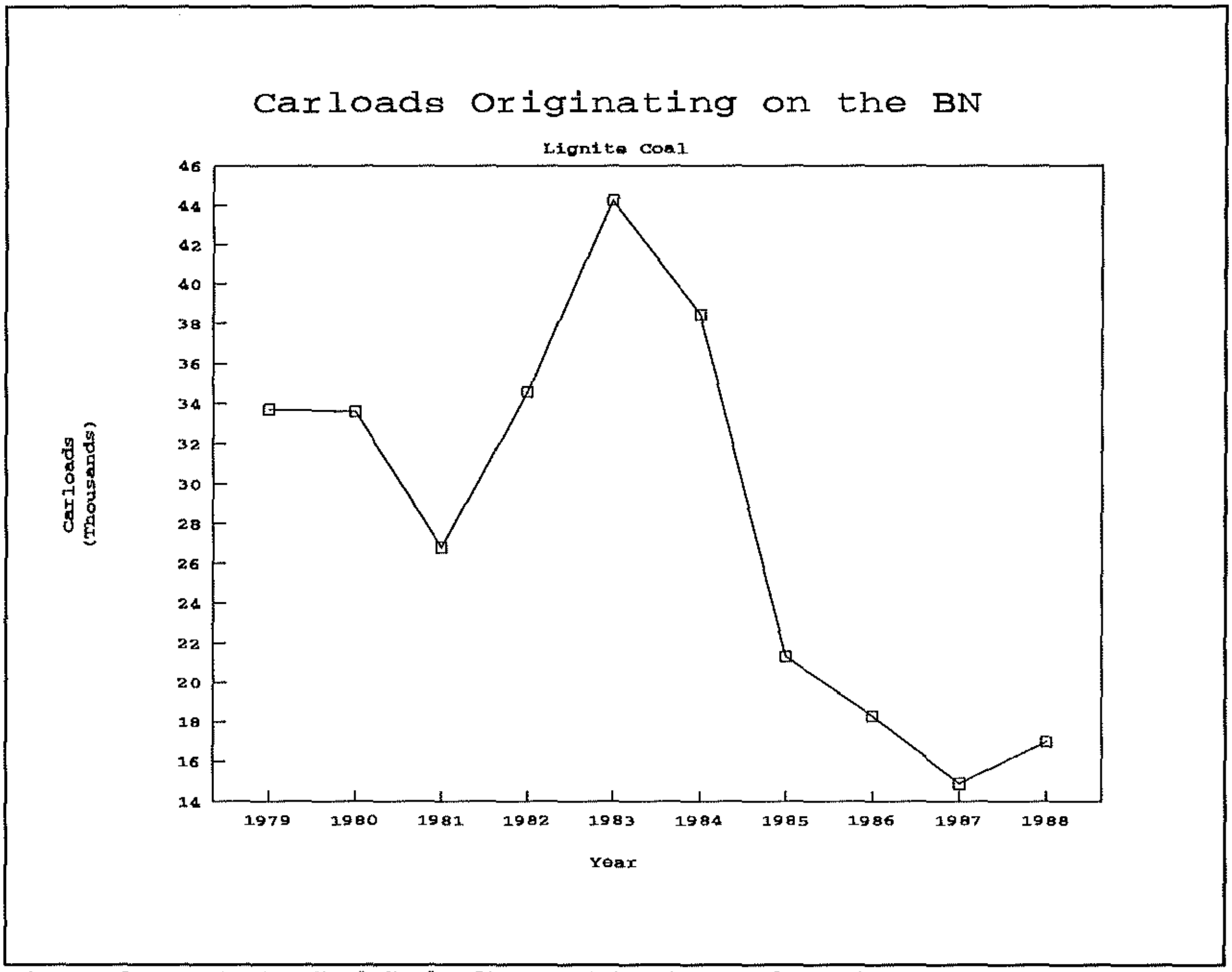

Figure 35: Lignite Coal Carloadings Originating on the BN

Lignite shipments, as a percentage of total carloadings originated on the BN in North Dakota, have also decreased since 1979 (Figure 36). In 1979, lignite coal accounted for 34.4 percent of BN's originated carloads. However, lignite carloadings subsequently declined as a percentage of total carloadings to 15.4 percent in 1987 before rebounding to 20.4 percent in 1988.

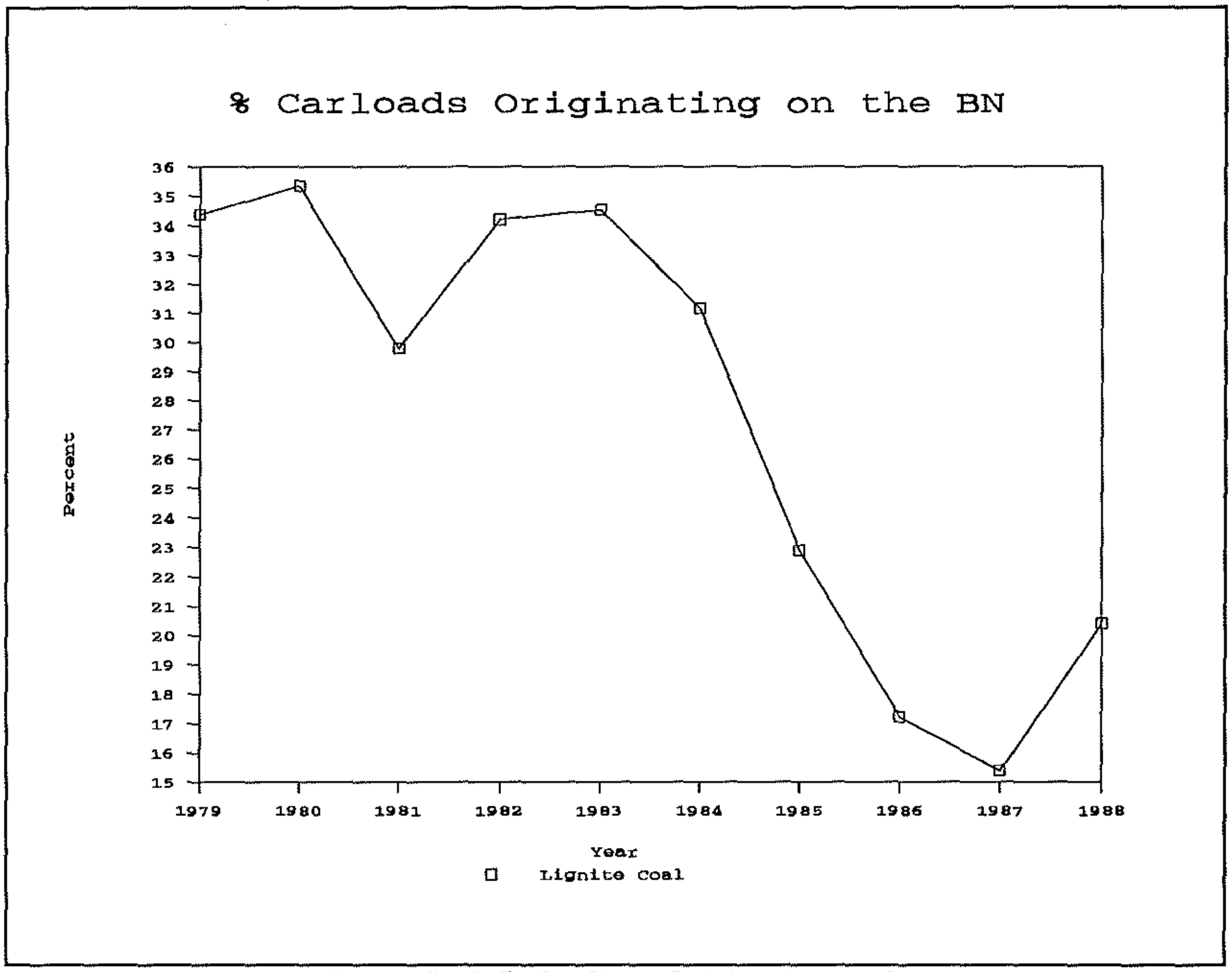

Figure 36: Percent Lignite Coal Carloadings Originating on the BN

Wheat flour and potatoes are the only other significant commodities originated by the BN in North Dakota. In 1979, the BN originated 3,079 carloads of wheat flour (Figure 37). After several fluctuations during the period, the 1988 volume was nearly the same as the 1979 total.

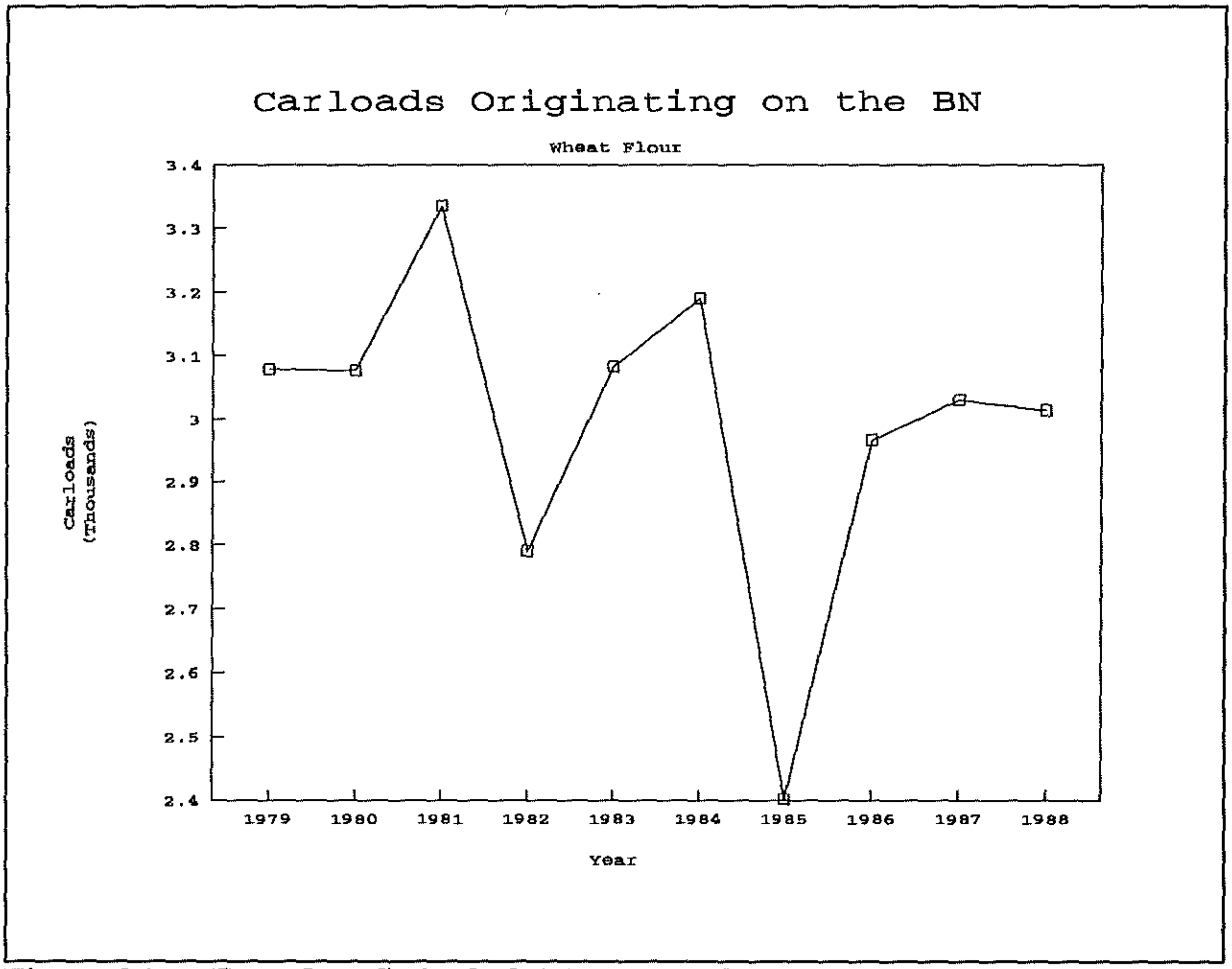

Figure 37: Wheat flour Carloads Originating on the BN

Potato shipments on the BN in North Dakota have declined dramatically since 1979 (Figure 38). In 1979, 3,967 carloads of potatoes were originated by the BN in North Dakota. This number dropped to a period low of 2,163 in 1980, but rebounded to 3,606 in 1983. However, the number of carloads of potatoes originated by the BN in North Dakota has since declined to a level of 2,164 in 1988.

Overall, the BN has shown dramatic gains in grain and oilseed traffic in North Dakota since 1979, despite a drought year in 1988. However, lignite coal and potato shipments have declined precipitously. Thus, in the aggregate, BN's North Dakota system has become even more grain-dependent than it was before.

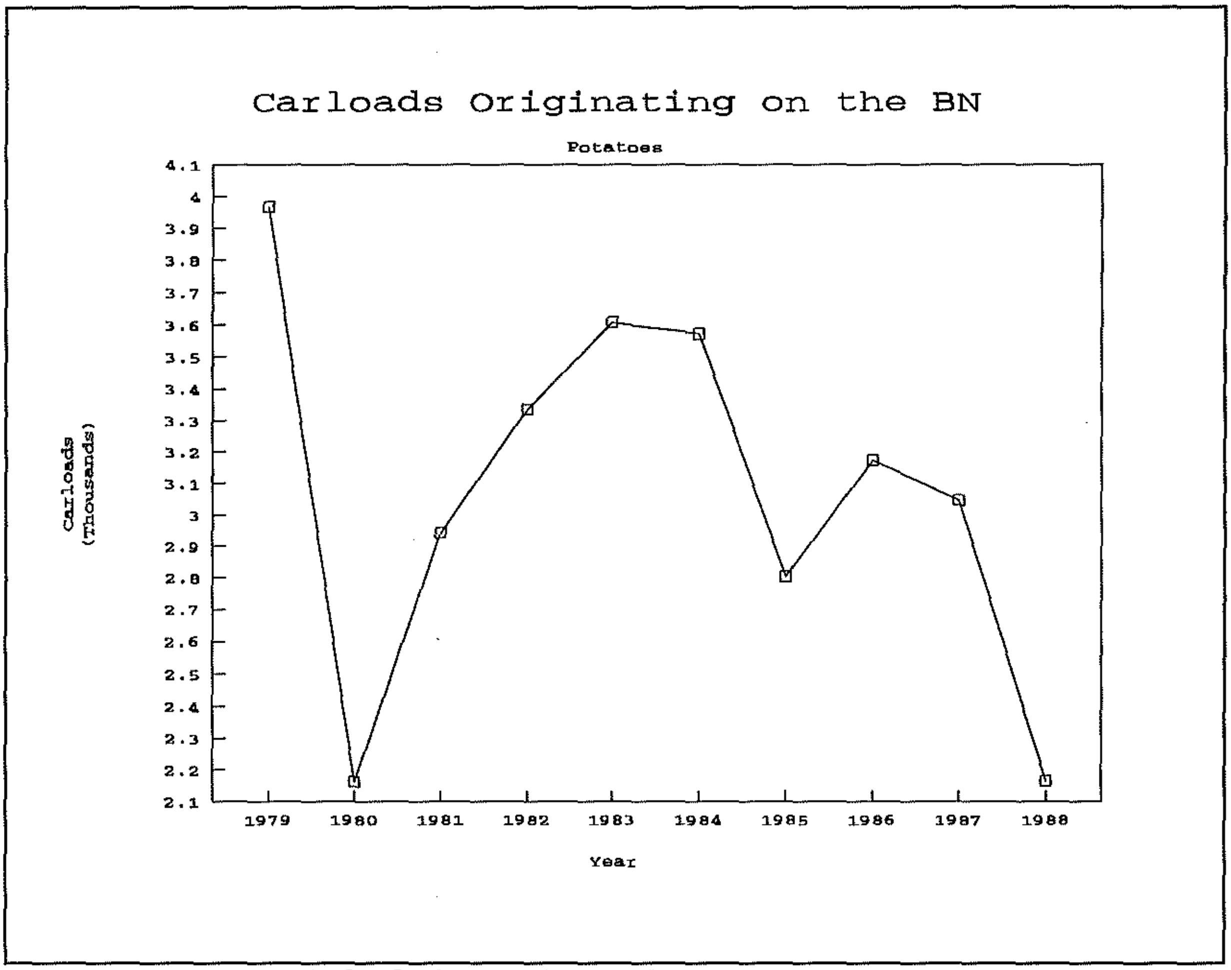

Figure 38: Potato Carloads Originating on the BN

The previous graphs depicted trends in originated traffic only. Some of the originated traffic also terminates in-state. In addition, commodities such as fertilizers and farm implements are shipped into the state each year.

The following graphs depict trends in terminated traffic. As Figure 39 shows, lignite coal is the dominant commodity terminated on the Burlington Northern in North Dakota. In 1988, lignite coal accounted for 64.3 percent of the total carloads terminated on the BN in North Dakota. Grains and oilseeds accounted for 26.3 percent, while fertilizers, cement, and wheat flour comprised smaller portions of BN's traffic base.

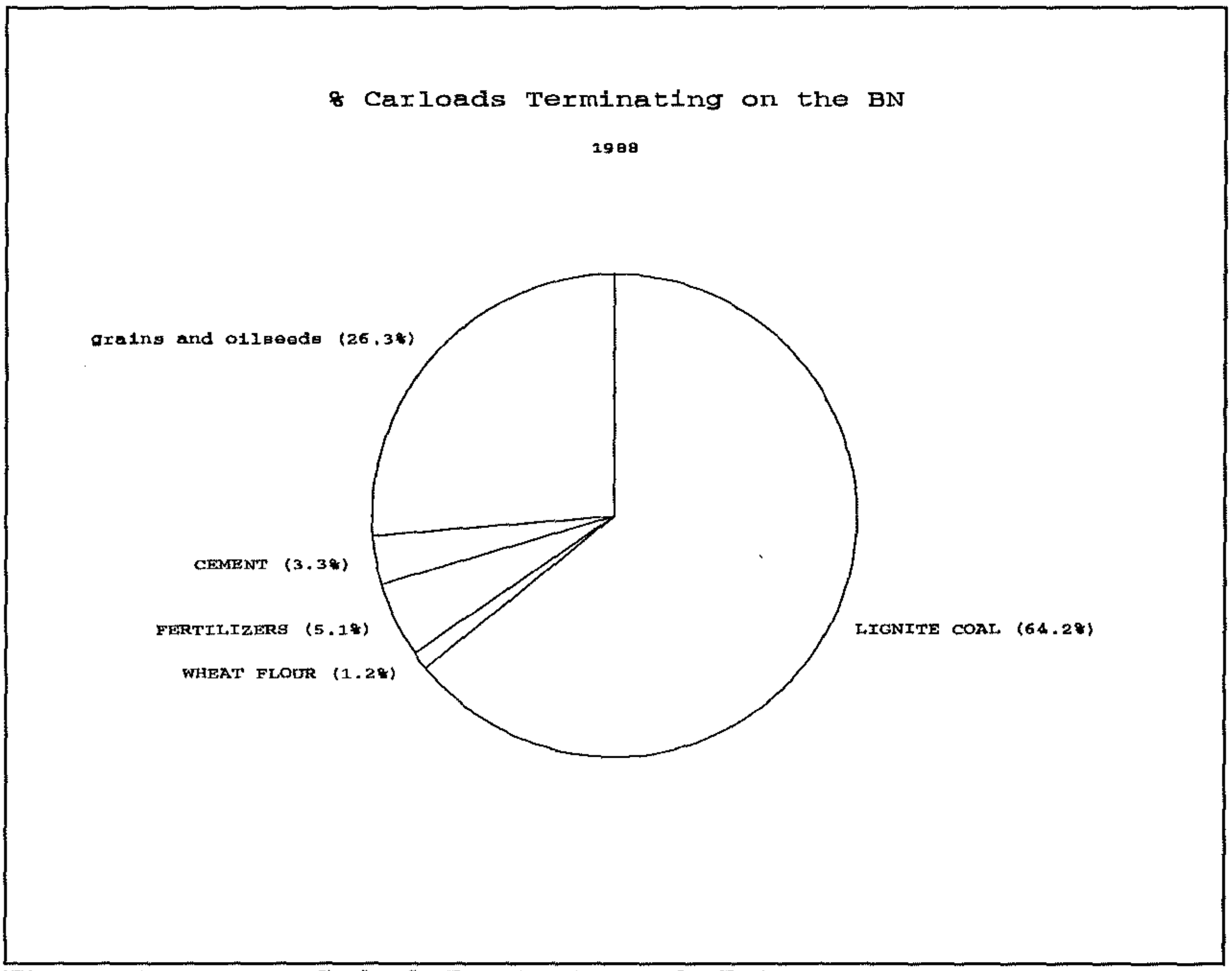

Figure 39: Percent Carloads Terminating on the BN

Although lignite coal comprises the bulk of BN's terminated traffic base, the number of carloads terminated in North Dakota has declined since 1979 (Figure 40). In 1979, 23,034 carloads of lignite coal were terminated on the BN in North Dakota. However, BN's lignite volume declined to 16,473 carloads in 1988.

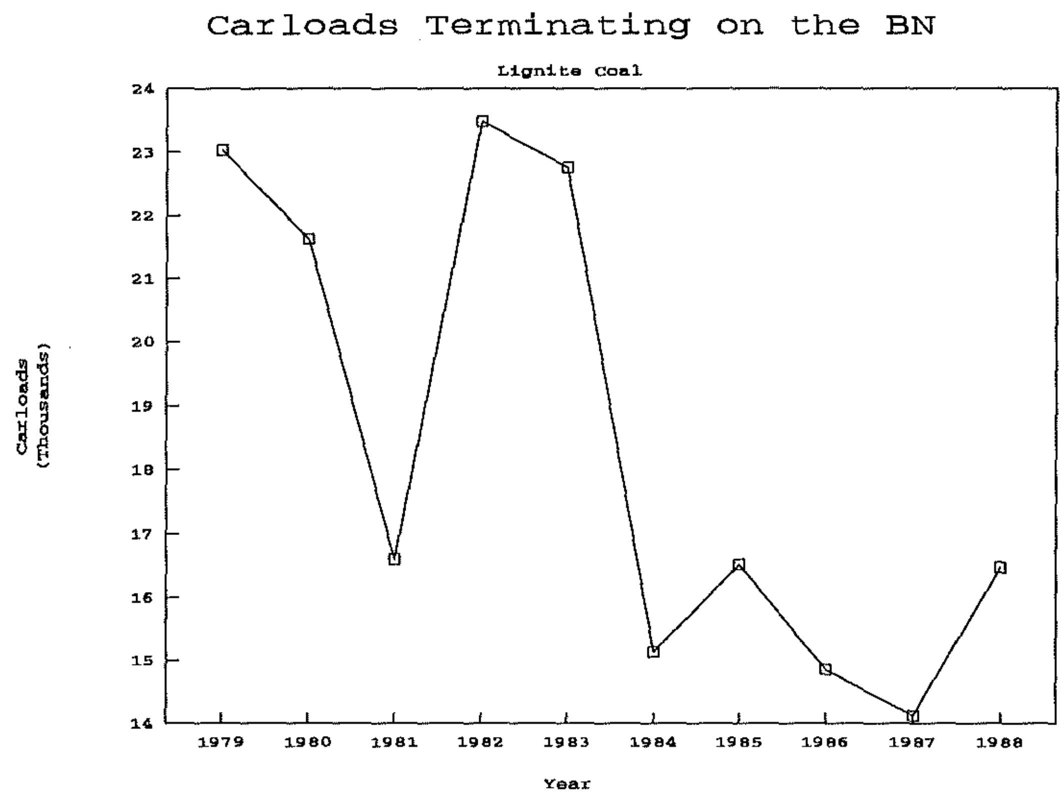

Figure 40: Lignite Coal Carloads Terminating on the BN

In 1979, lignite coal comprised 76 percent of the carloads terminated on the BN in North Dakota (Figure 41). After considerable fluctuation during the period, BN's lignite percentage was at a level of 64.2 percent in 1988.

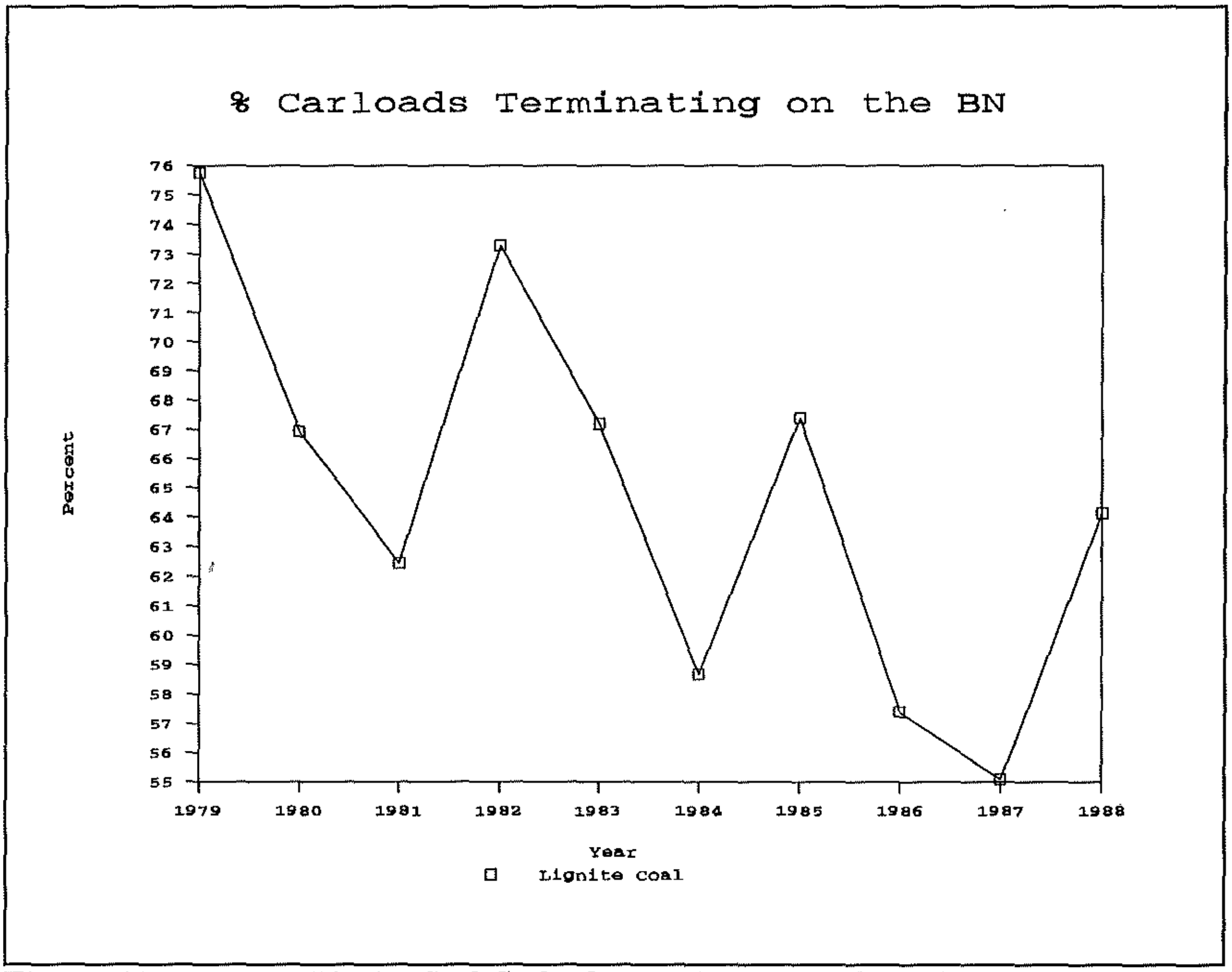

Figure 41: Percent Lignite Coal Carloads Terminating on the BN

Terminated grain and oilseed traffic has increased significantly on the Burlington Northern since 1979 (Figure 42). However, volumes have fluctuated greatly between 1979 and 1988. The growth in terminated grain and oilseed traffic reflects the development and expansion of in-state processing activities.

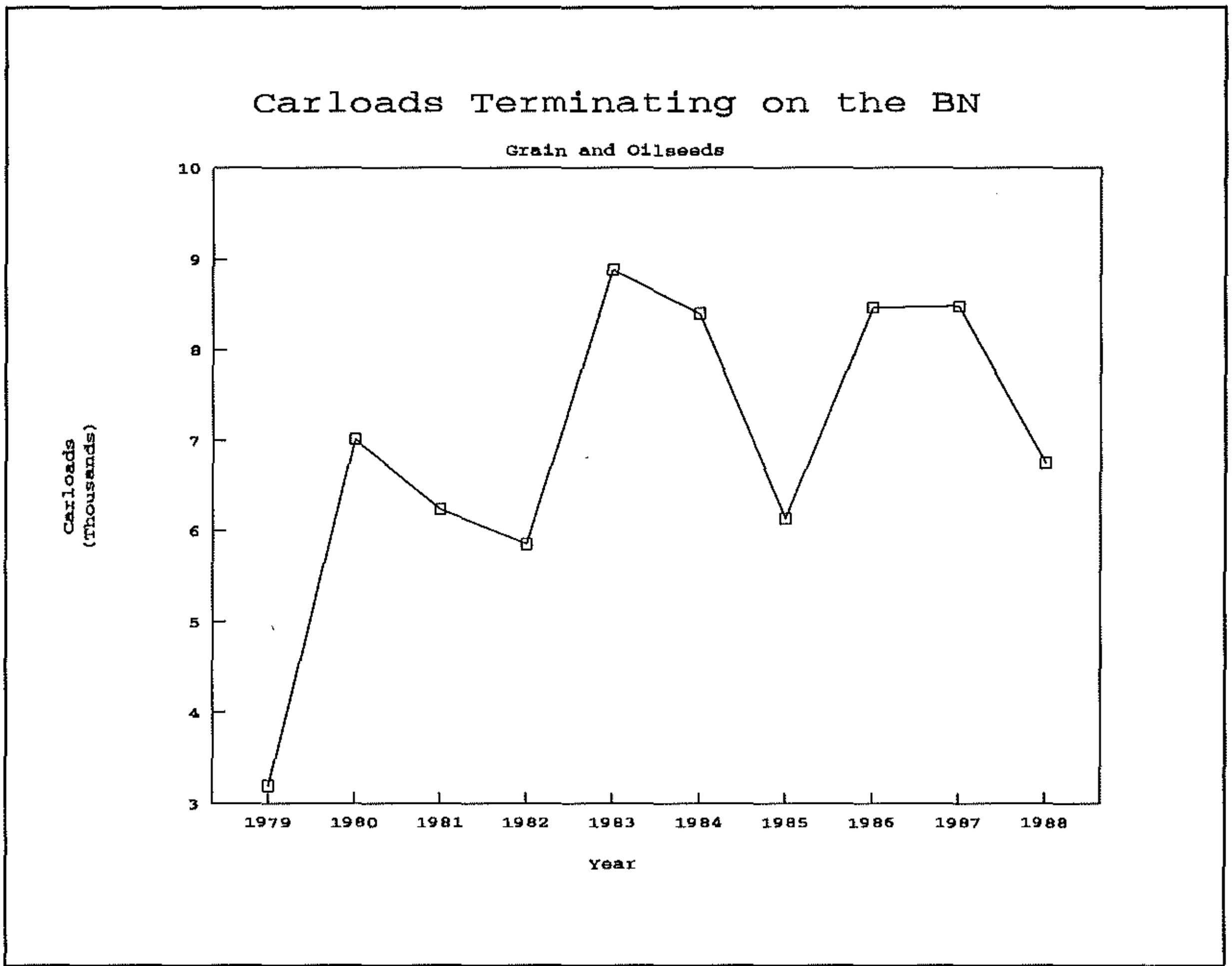

Figure 42: Grain and Oilseeds Carloads Terminating on the BN

In 1979, grains and oilseeds represented 10.5 percent of the total carloads terminated on the BN in North Dakota (Figure 43). After reaching a period high of 33.1 percent in 1987, the proportion of grain and oilseed shipments dropped to 26.3 percent of total traffic in 1988.

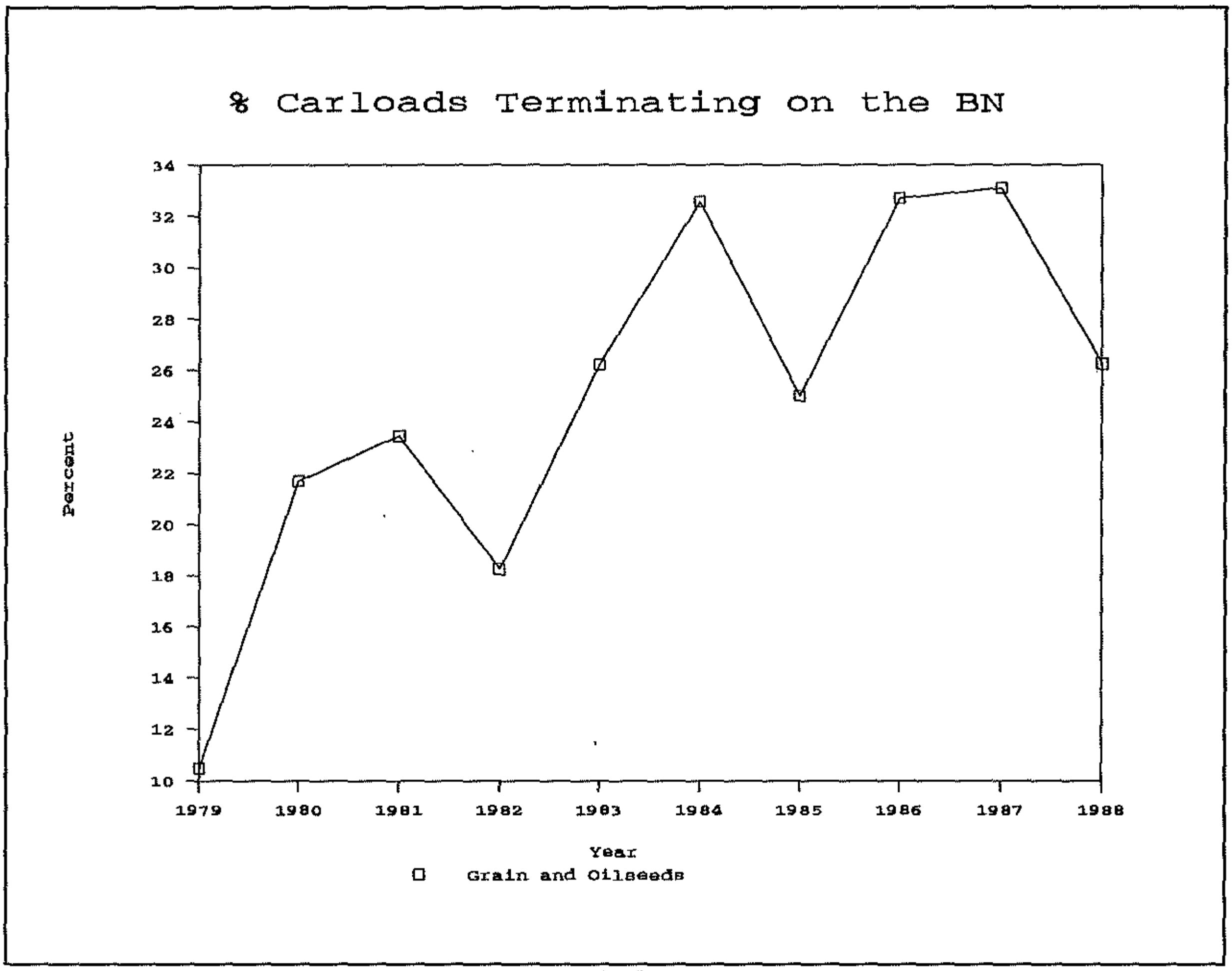

Figure 43: Percent Grain and Oilseeds Carloads Terminating on the BN

Fertilizer shipments have decreased slightly on the Burlington Northern in North Dakota since 1979 (Figure 44). In 1979, 2,209 carloads of fertilizer terminated on the BN in North Dakota. However, by 1988 fertilizer shipments had declined to 1,306 carloads.

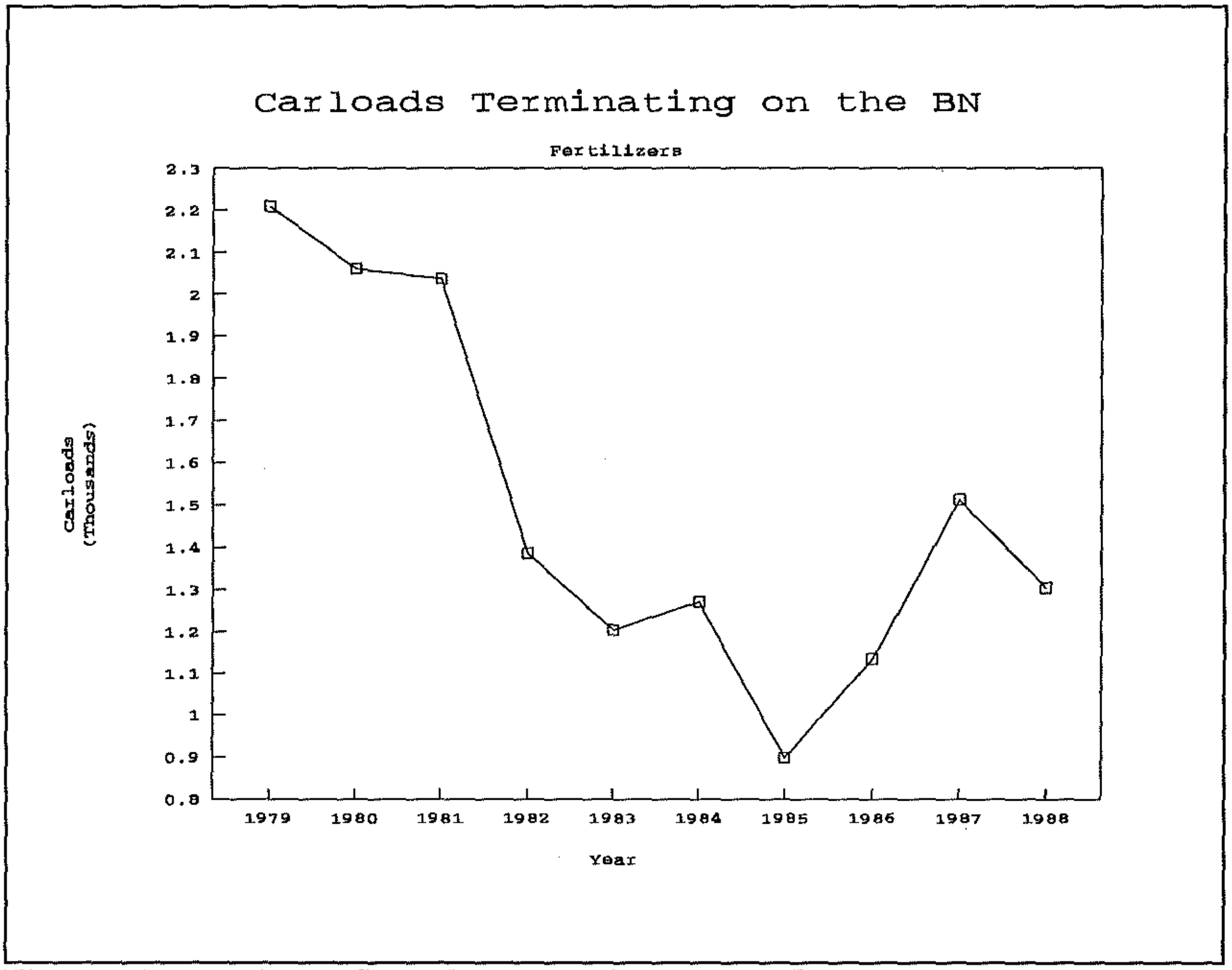

Figure 44: Fertilizers Carloads Terminating on the BN

Cement shipments on the BN in North Dakota have also declined in recent years, dropping from 1,371 carloads in 1979 to 606 carloads in 1984 (Figure 45). Since then, cement traffic has rebounded somewhat. However, only 842 carloads were terminated by the Burlington Northern in North Dakota in 1988.

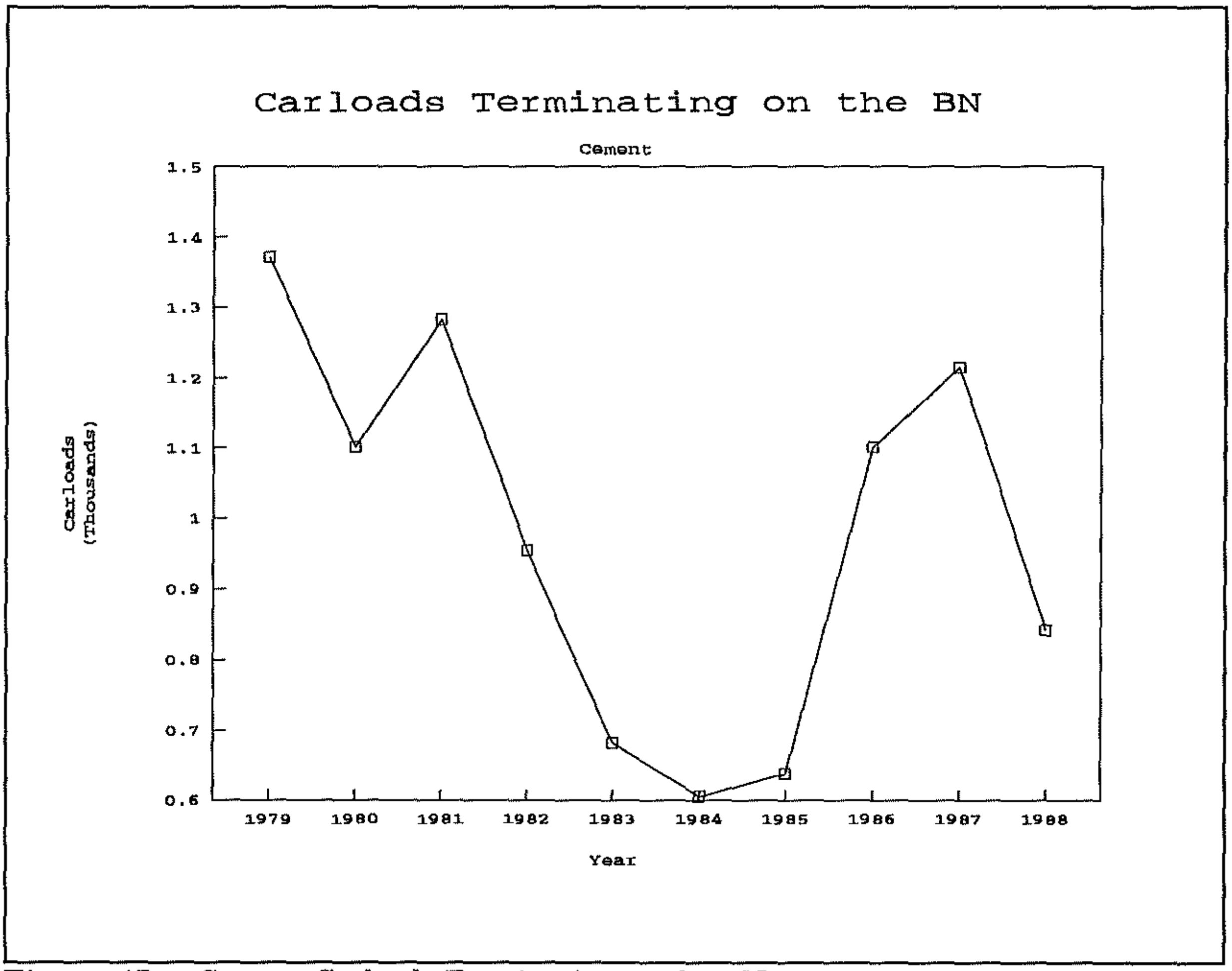

Figure 45: Cement Carloads Terminating on the BN

State-wide Soo Line Traffic Trends

Nearly all of the freight that originated on the Soo Line in North Dakota in 1988 consisted of grain and oilseed shipments (Figure 46). This illustrates the grain-dependency of the Soo Line's North Dakota System.

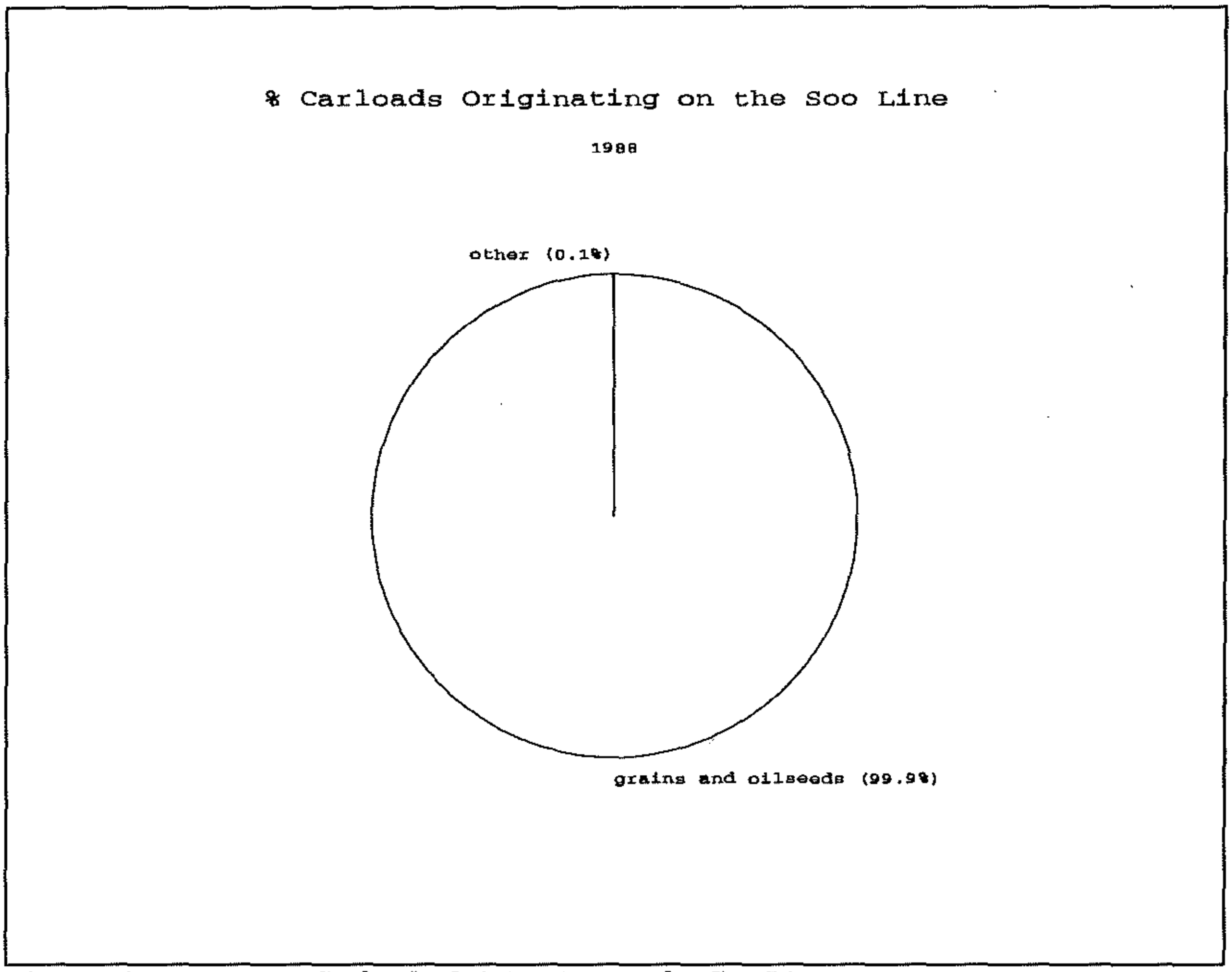

Figure 46: Percent Carloads Originating on the Soo Line

Grain and oilseed shipments originated on the Soo Line in North Dakota have increased in absolute volume since 1979 (Figure 47). In 1979, 34,705 carloads of grains and oilseeds were originated on the Soo Line in North Dakota. By 1987, grain carloadings had increased to nearly 47,000. However, they declined again in 1988, which was a drought year.

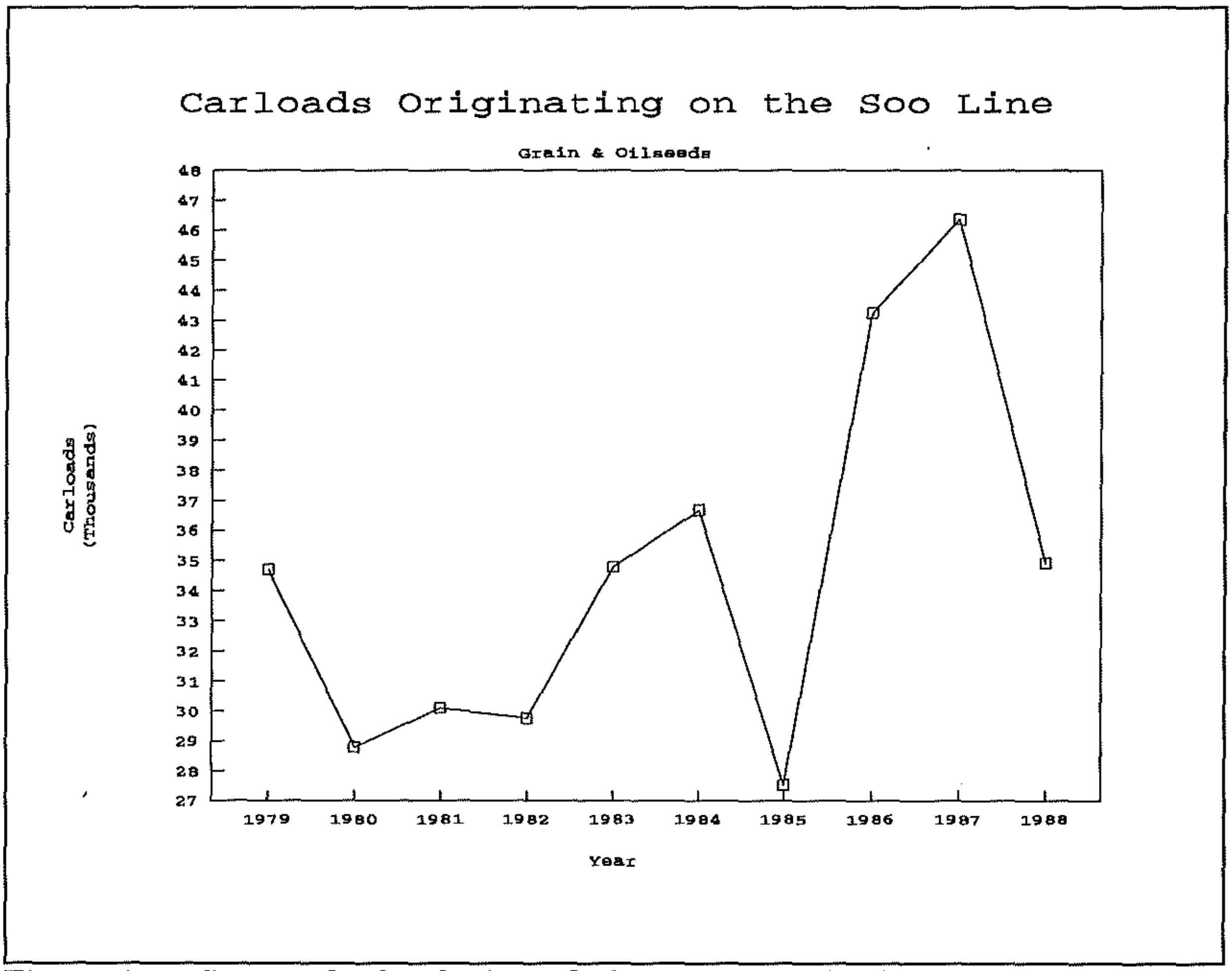

Figure 47: Grain and Oilseeds Carloads Originating on the Soo Line

In addition to increasing in absolute volume, grain and oilseed shipments originating on the Soo Line in North Dakota have increased significantly as a percentage of total shipments since 1979 (Figure 48). In 1979, grain and oilseed shipments represented 95 percent of the total carloads originated by the Soo Line in North Dakota. Today, they represent nearly 100 percent of the Soo Line's originated traffic.

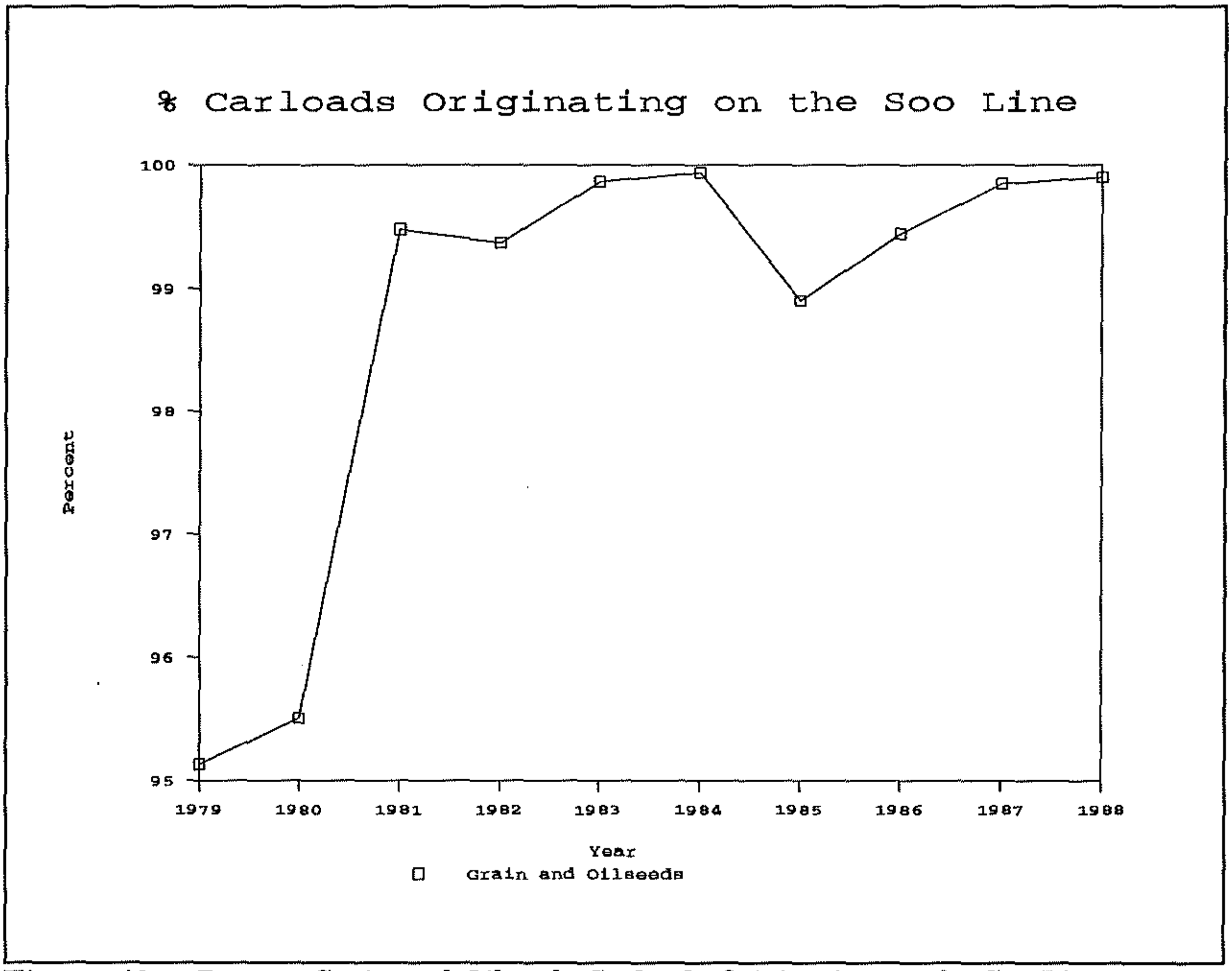

Figure 48: Percent Grain and Oilseeds Carloads Originating on the Soo Line

Grains and oilseeds also represent a large percentage of the shipments terminated on the Soo Line in North Dakota (Figure 49). In 1988, grain and oilseed shipments represented 75.2 percent of total carloads terminated on the Soo Line in North Dakota. Wheat flour and fertilizer comprised the remainder of the terminating traffic, 17.3 and 7.5 percent respectively.

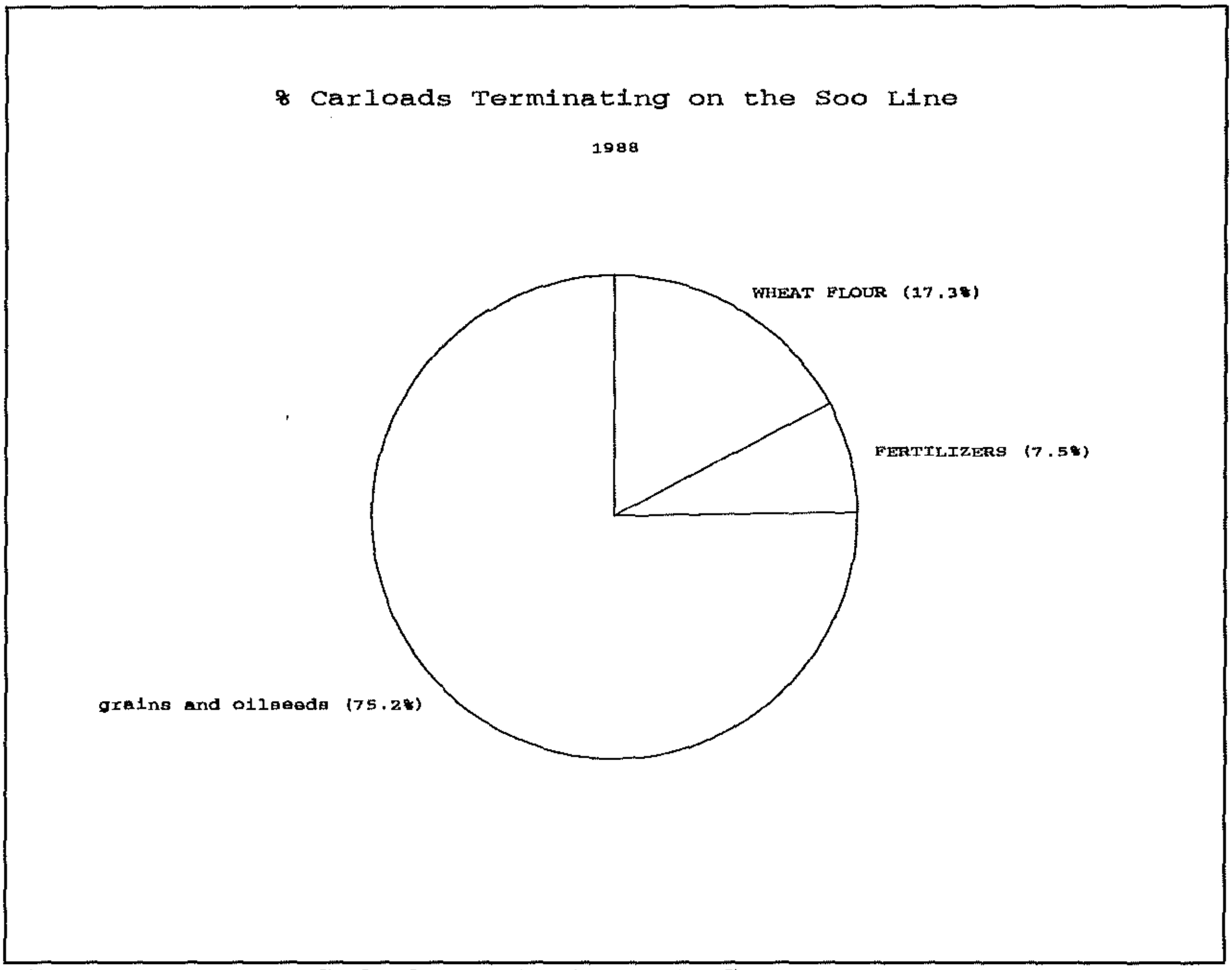

Figure 49: Percent Carloads Terminating on the Soo Line

The number of carloads of grains and oilseeds terminated on the Soo Line in North Dakota have increased significantly since 1979 (Figure 50). In 1979, only 19 carloads of grains and oilseeds were terminated on the Soo Line in North Dakota. Grain volume rose to a period high of 2,909 carloads in 1986, but fell to a level of 2,529 carloads in 1988. Again, this trend is attributable to the expansion of in-state processing plants for barley, wheat, and sunflowers.

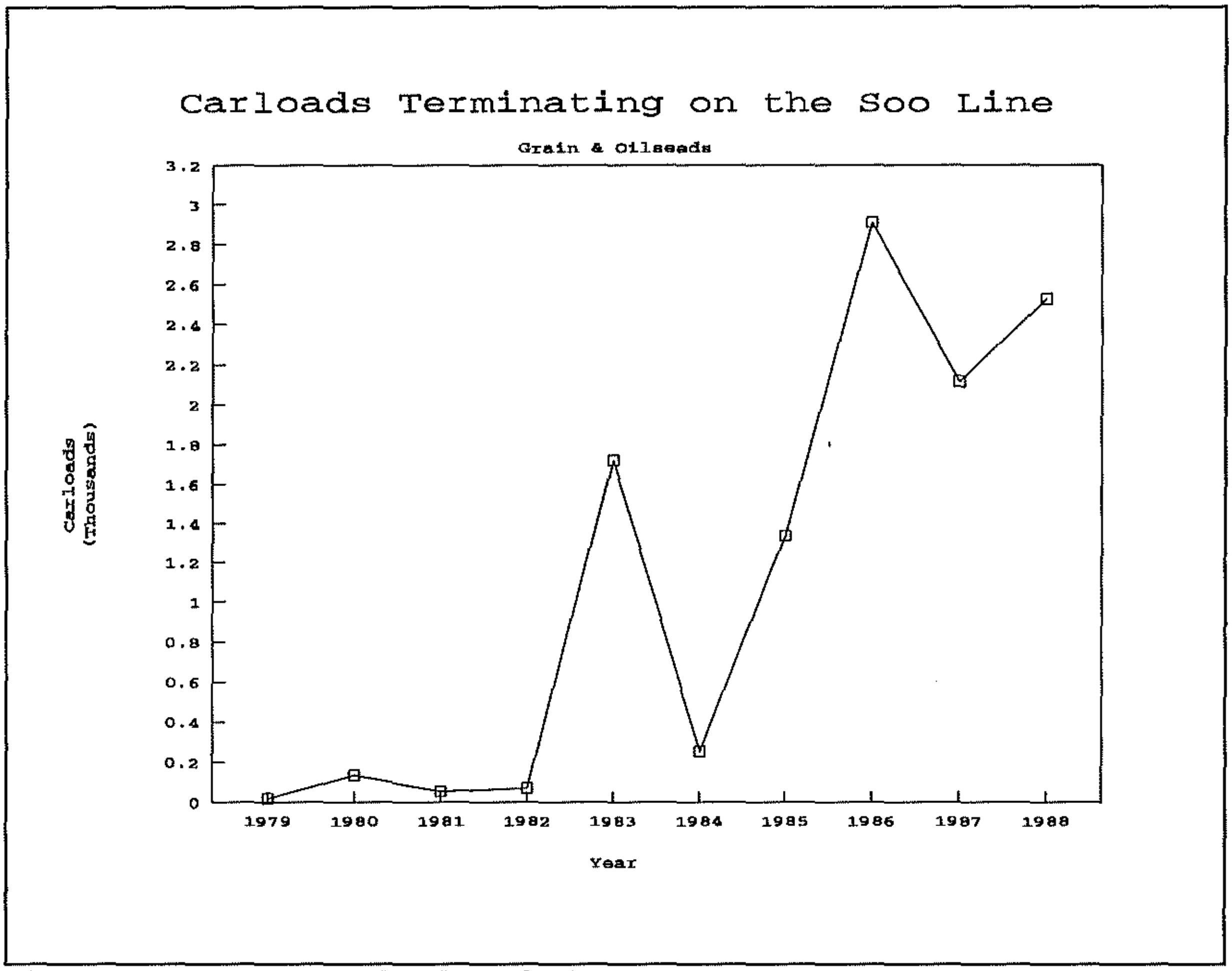

Figure 50: Grain and Oilseeds Carloads Terminating on the Soo Line

In-state wheat flour shipments on the Soo Line were almost non-existent in 1979 (Figure 51). However, since 1985 wheat flour shipments have exhibited a positive trend. In 1988, the Soo Line terminated 581 carloads of wheat flour in North Dakota.

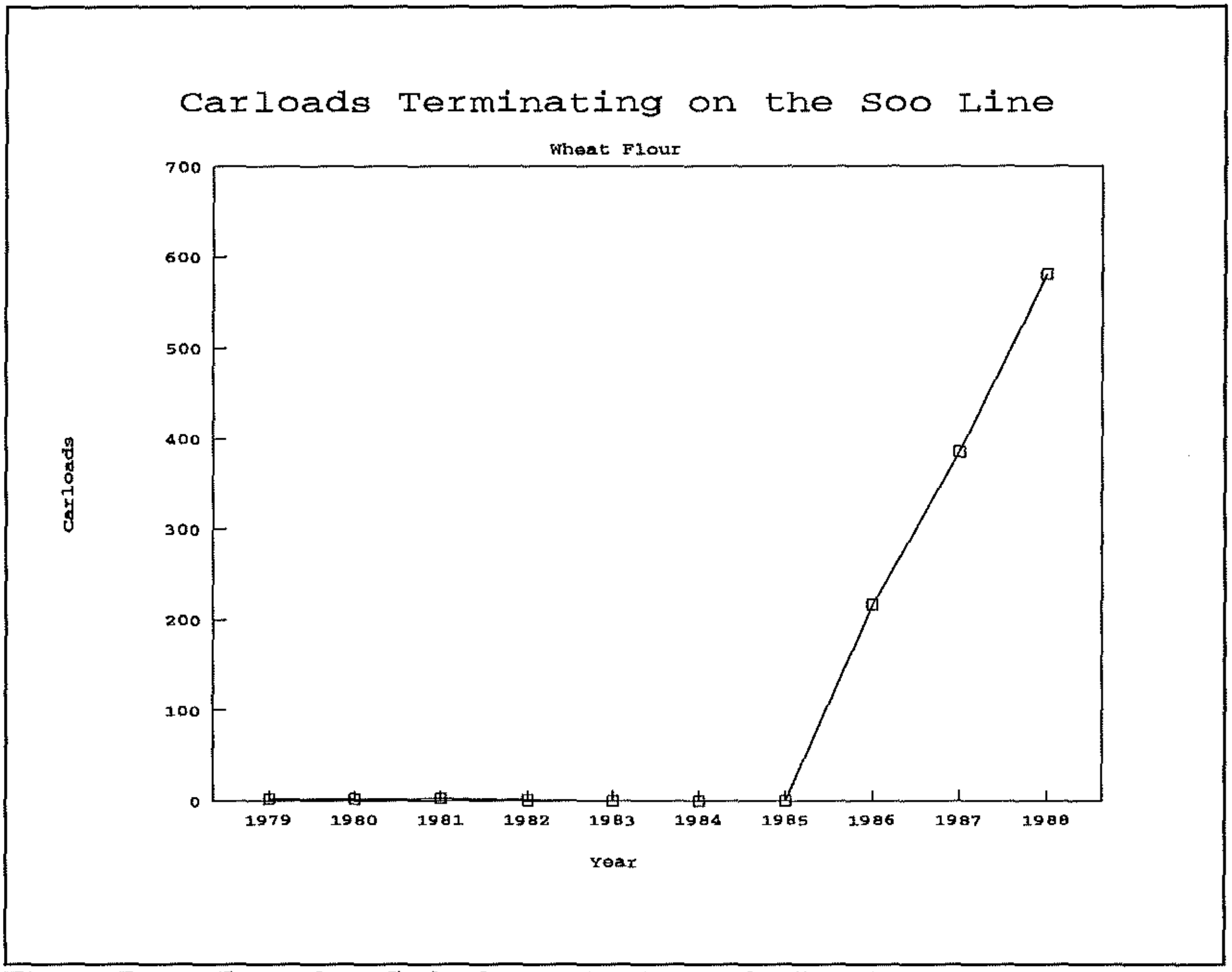

Figure 51: Wheat Flour Carloads Terminating on the Soo Line

Fertilizer carloadings on the Soo Line have increased slightly since 1979 (Figure 52). In 1979, 221 carloads of fertilizer were terminated on the Soo Line in North Dakota. After a down-turn from 1980 to 1985, fertilizer shipments rose to a level of 251 carloads in 1988.

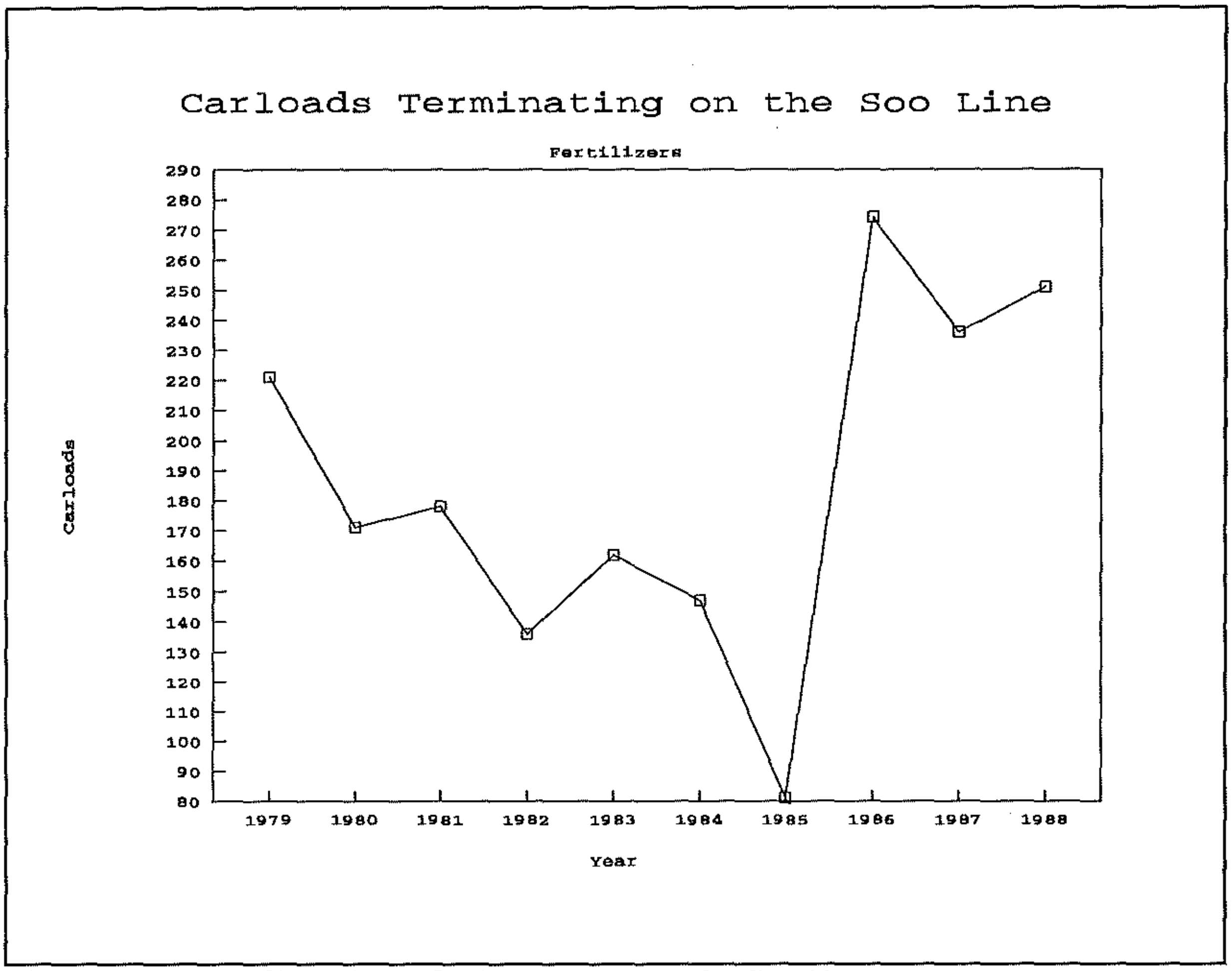

Figure 52: Fertilizer Carloads Terminating on the Soo Line

However, in percentage terms fertilizer shipments on the Soo Line in North Dakota have decreased substantially (Figure 53). In 1979, fertilizer constituted 44 percent of the total carloads terminated on the Soo Line in North Dakota. But in 1988, they represented only 7.5 percent of the total.

The purpose of this section of the report has been to describe each carrier's traffic base in North Dakota, and to highlight major state-wide traffic trends. As the graphs and accompanying discussion have pointed out, grains and oilseeds have become an even more important component of each carrier's North Dakota traffic base. Almost all traffic originated by the Soo Line in North Dakota consists of grains and oilseeds. Furthermore,

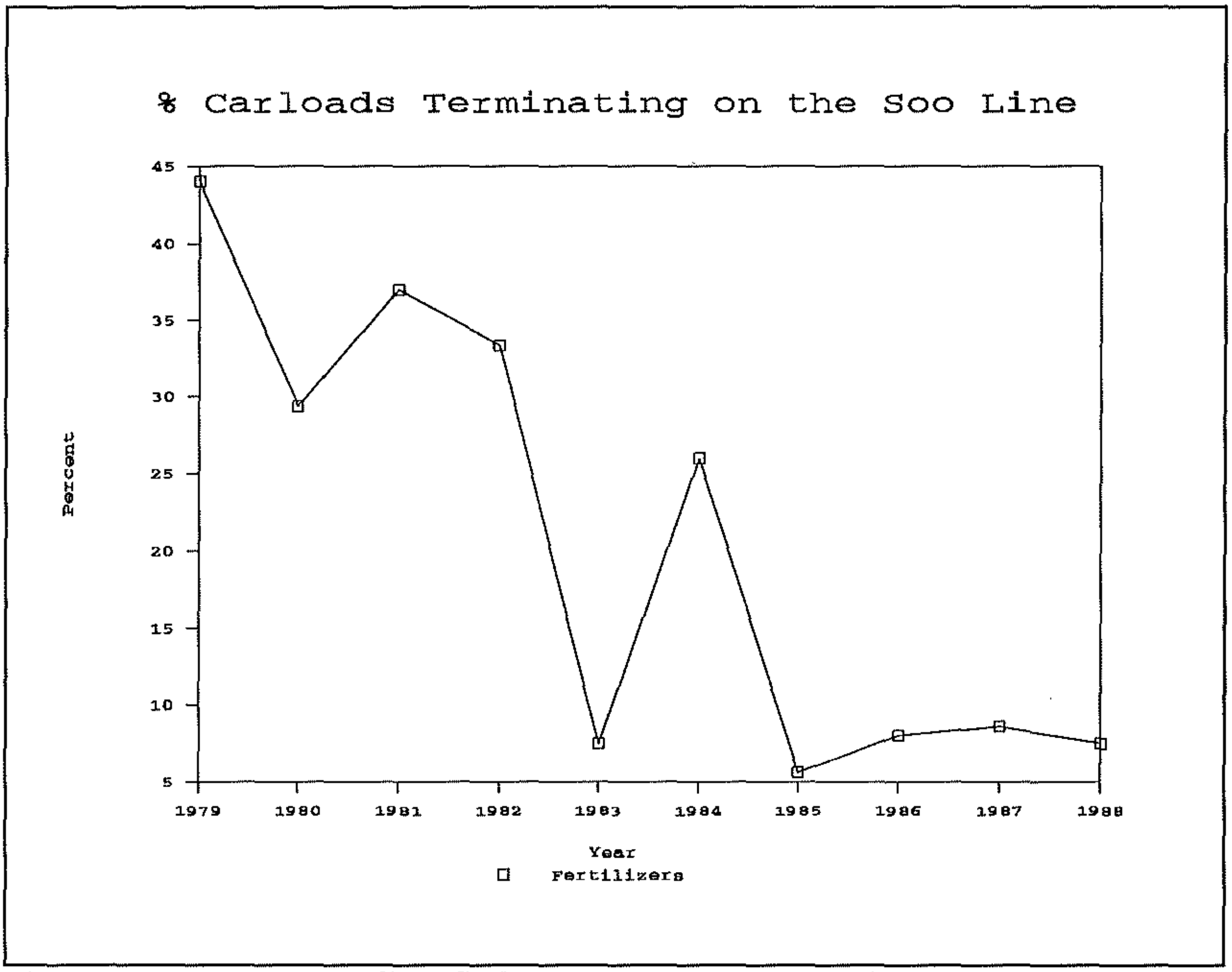

Figure 53: Percent Fertilizer Carloads Terminating on the Soo Line

with the exception of 251 carloads of fertilizer, the bulk of the terminated traffic consists of grains and oilseeds. Thus, Soo branch lines are now almost totally grain-dependent. Non-grain traffic on the BN, such as fertilizers, potatoes, and cement has also been declining, while grain and oilseed shipments have increased substantially.

The grain-dependency of North Dakota branch lines underscores the significant impact that long-term fluctuations in agricultural production could have on the viability of light-density lines. In the next section of the report, state-wide trends in grain and oilseed production are analyzed.

IV. NORTH DAKOTA GRAIN PRODUCTION TRENDS

As Figure 54 depicts, wheat production in North Dakota has fluctuated significantly since 1975, peaking at approximately 330 million bushels in 1981. The trend since 1985 has been downward, reflecting changes in farm programs and drought conditions in the Upper Great Plains. Whether wheat production returns to a level near or above its 1981 peak remains to be seen. Preliminary data for 1989 suggest that wheat production rebounded somewhat from its 1988 level. Furthermore, projections for 1990 are for a possible 350 million bushel crop.

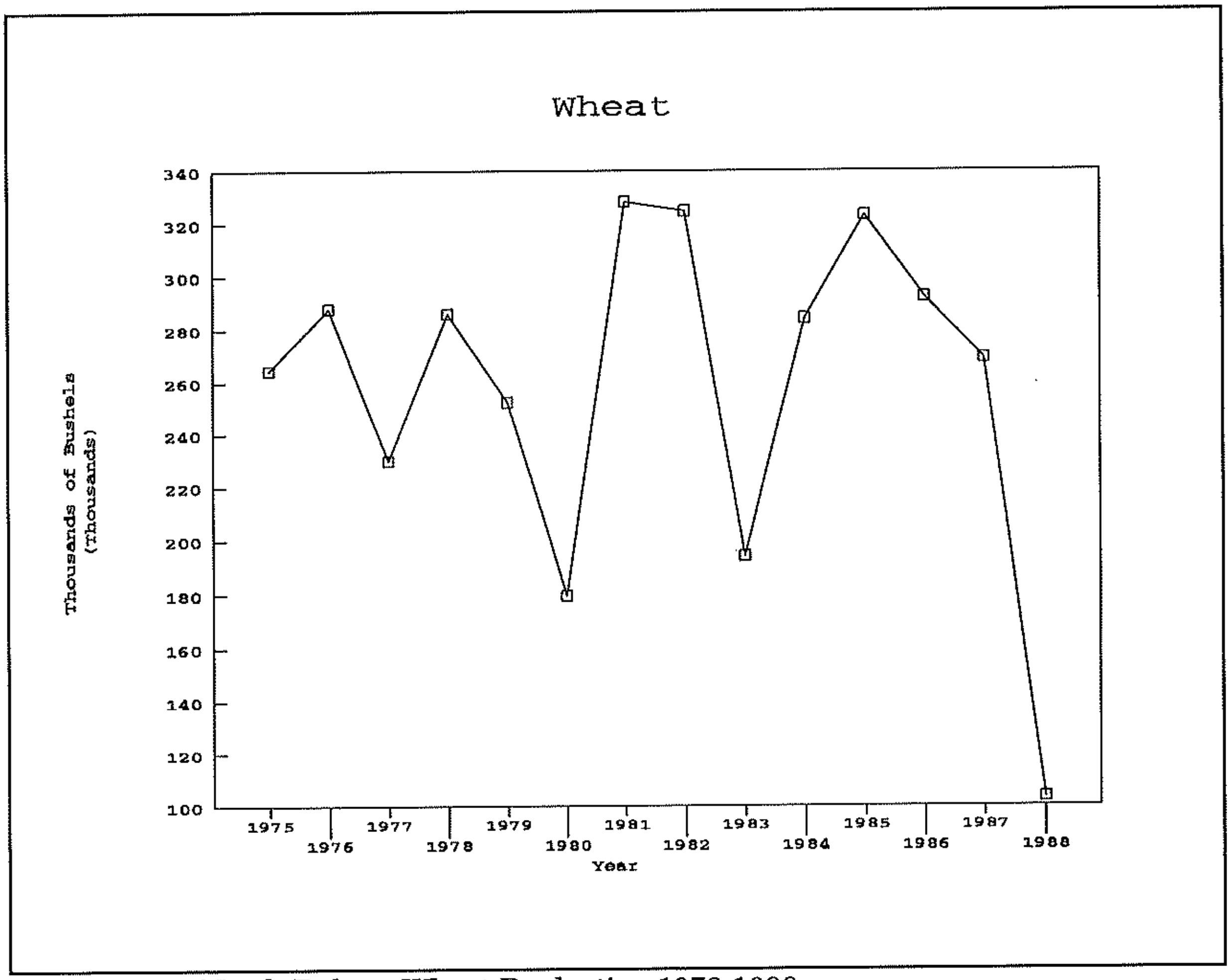

Figure 54: North Dakota Wheat Production 1978-1988

As Figure 55 shows, barley production in North Dakota increased from 80 million bushels in 1975 to approximately 190 million in 1985. Barley production has since declined precipitously, primarily as a result of the conservation reserve program and drought conditions.

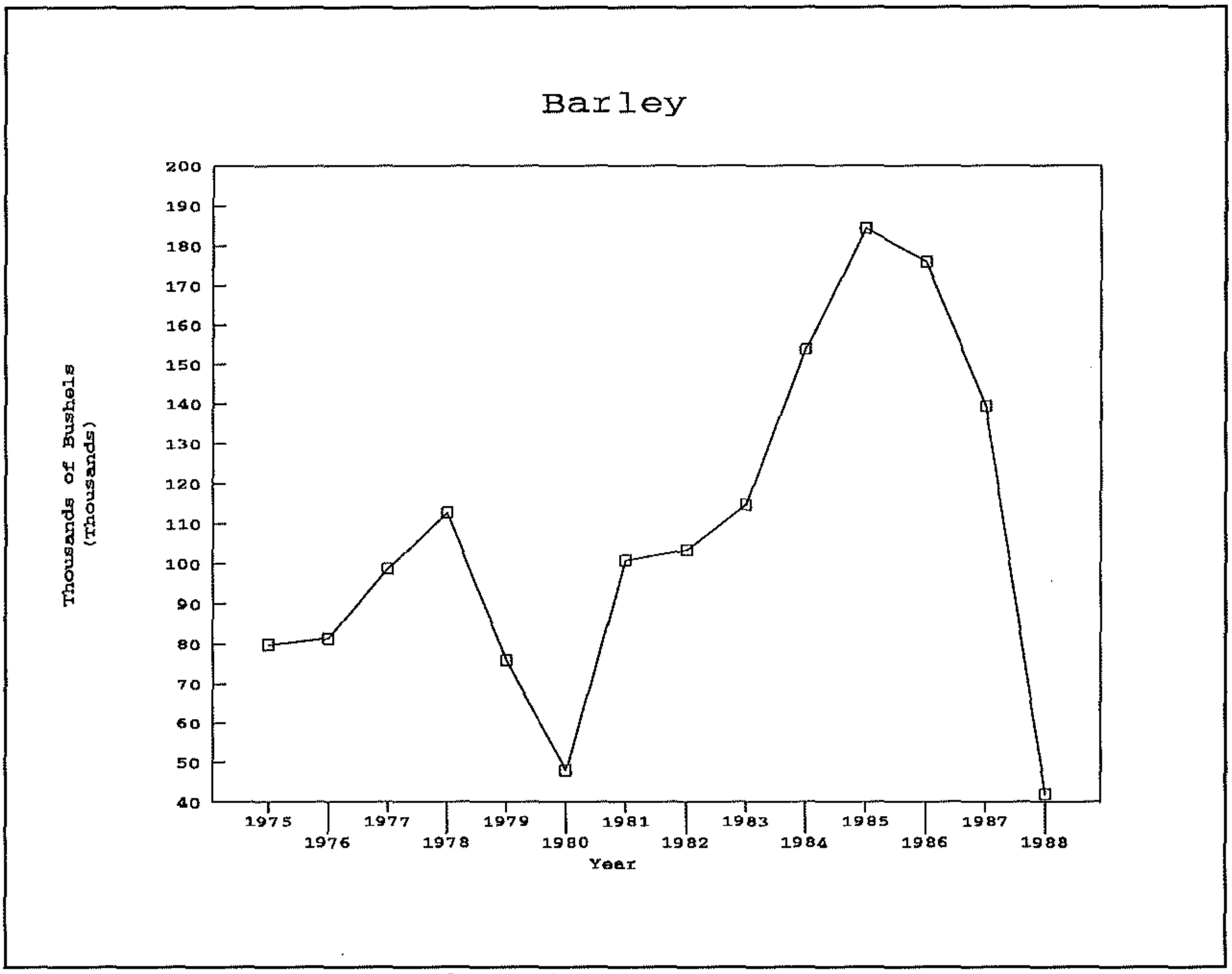

Figure 55: North Dakota Barley Production 1978-1988

Corn production has exhibited a similar trend to that of barley. In 1975, less than 8 million bushels of corn were produced in North Dakota (Figure 56). However, corn production jumped to 50 million bushels in 1985, before declining during the last two years of the period.

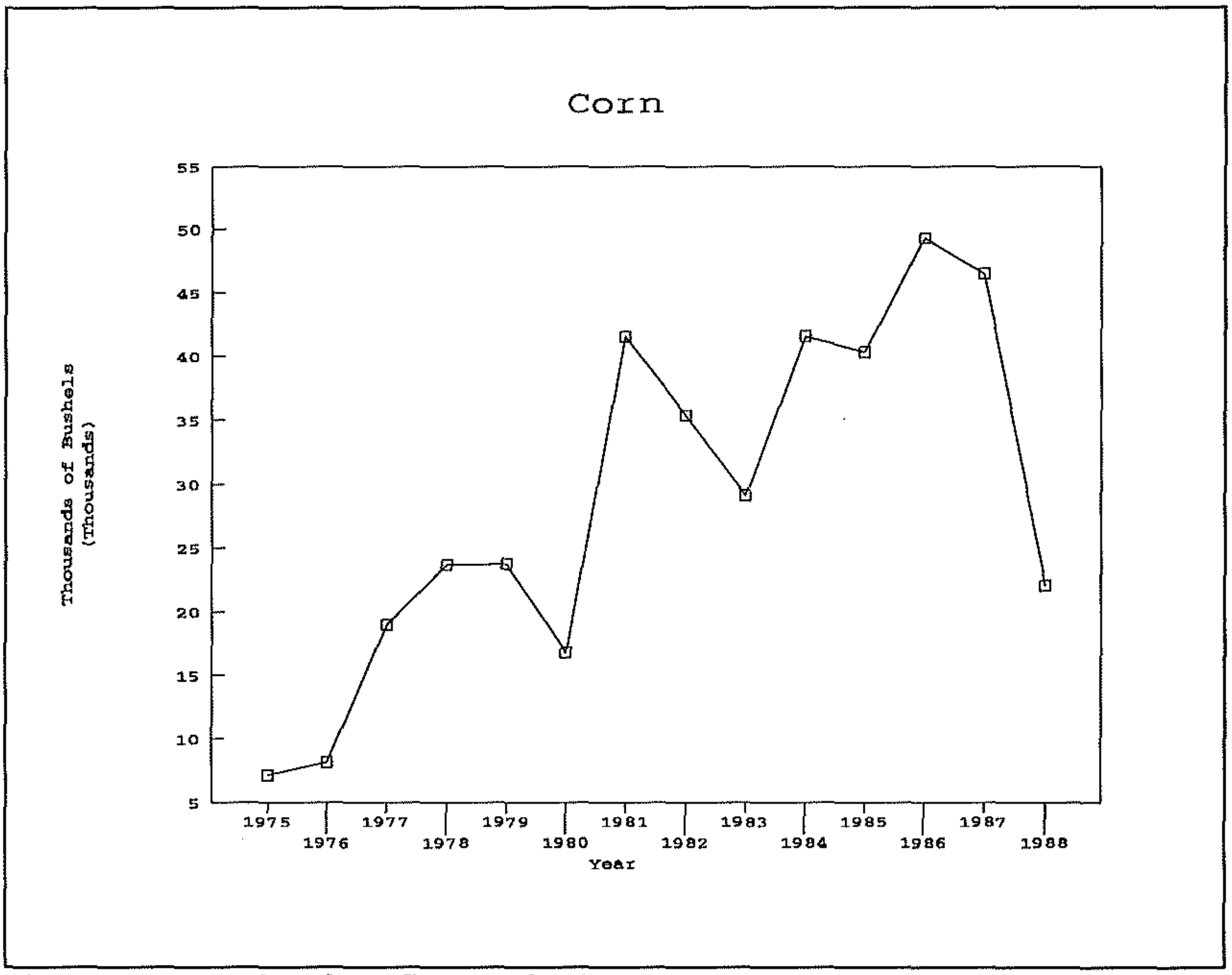

Figure 56: North Dakota Corn Production 1978-1988

If barley and corn production return to their pre-1986 trend lines, agricultural shipments in North Dakota may rebound to their 1986 levels, or even increase[28]. This would be excellent news for the railroads, who collectively handled 73 percent of all grain

[28]The level of shipments is affected by market demand, car supply, storage programs, and other factors. Consequently, there is not an exact relationship between production and shipments. However, increased production enhances the potential for grain shipments.

and oilseed traffic in crop year 1988-89. Furthermore, a return to former production levels would have a positive effect on grain-dependent branch lines. Conversely, if grain and oilseed production does not return its 1986 levels, North Dakota's grain-dependent branch lines will feel the impact over time. The viability of marginal lines, in particular, will be affected.