AGRICULTURAL TRANSPORTATION RESEARCH AND SERVICE AGENDA

By

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INTRODUCTION

A majority of North Dakota's communities are rural, and depend on an extensive transportation network for personal mobility and marketing their resource-based production. The purpose of this paper is to provide a plan for research and service that serves the transportation needs of North Dakota's rural, resource-based economy. A description of the unique characteristics of North Dakota's transportation environment are discussed and a broad agenda for research projects and plan for services is presented.

The Upper Great Plains Transportation Institute (UGPTI) provides information for establishing and maintaining North Dakota's transportation network. The UGPTI invests its resources in research, service, and problem solving activities that will benefit the state's transportation network. The future viability of this network is vital because North Dakota's resource-based economy requires timely, efficient transportation for its low-valued bulk commodities. Greater efficiency of the transportation network, translates to increased productivity that will benefit both transport users and providers.

Justification

North Dakota's rural environment magnifies the importance of transportation. Vast areas of sparse population depend on an extensive road and rail network for personal and freight transportation needs. Because state population, especially in rural areas, has been declining in recent years a smaller tax base has been generated for maintaining the transportation network. Ensuring accessibility to basic transport for marketing and personal services is an ongoing challenge.

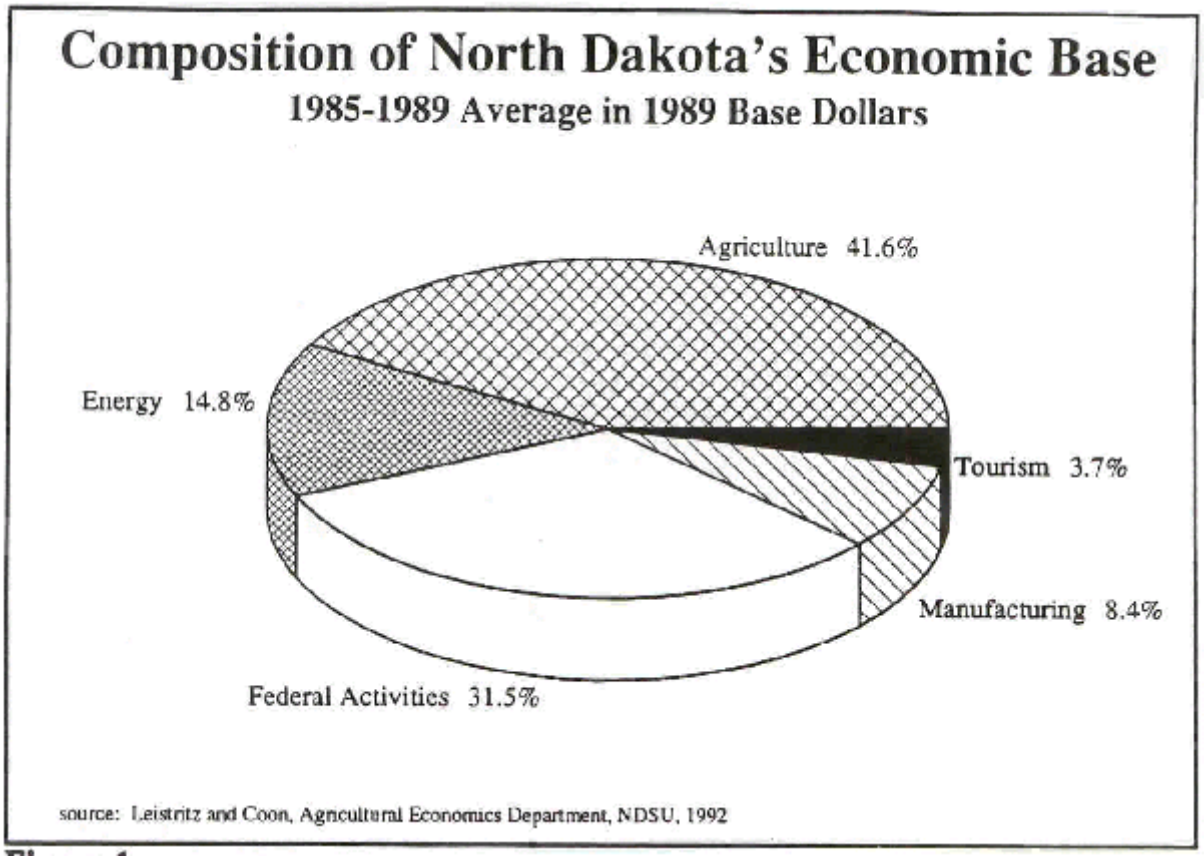

Figure 1

Transportation is an important factor in the success of North Dakota's agricultural industry. Rail and truck are utilized in moving about 500 million bushels of grain each year from North Dakota fields to domestic consumers and ports. Timely and efficient movement of agricultural commodities is important to the economic strength of North Dakota. During 1985-1989 agriculture accounted for an average of 41.6 percent of the revenues generated by industries in the state (Figure 1). The value of the state's agricultural production can be realized only when commodities are transported to the buyers.

Competition is a major factor in determination of transportation rates. Transportation rates are important to North Dakota because they (1) are determinant source of income and wealth distribution, (2) impact the competitiveness of North Dakota commodities and products, and (3) have an effect on the profitability of grain production as the rates vary. The degree of competition present in the state is important to the shippers in the state. Although many forms of competition exist, no methods are assigned by the I.C.C. for measuring them. Common considerations in examining the equity of rate structure are pricing practices and modal share. When assessing the degree of competition in the transportation industry some underlying factors need to be considered (1) information and knowledge about the market area, (2) rationality of decision makers, and (3) short term and long term goals of the carrier. These factors may directly impact the structure of competition within a region.

Organization

The first section of this report describes the environment for transporting agricultural commodities in North Dakota. Next, an agenda for research and service is described. Topics are discussed for each of the eight research categories. In conclusion, an agenda for research and services is summarized.

TRANSPORTATION ENVIRONMENT

The Staggers Act, passed in 1980 to deregulate the railroad industry, continues to impact transportation in North Dakota. The objective of this legislation was to encourage railroads to increase efficiency by allowing market supply and demand to create competition and establish rates. Since this legislation was implemented many research projects have examined efficiency, evolution, and equity in the rate structure of the railroad industry. Transportation rates are an important input in profitable grain production and marketing. The profitability of a farming operation is affected when grain prices adjust to changes in transportation rates. Transportation rates are also important to the country elevator system, an important link in N.D.'s grain marketing process. Decision makers are influenced by increases and decreases in transportation rates.

Transportation concerns in North Dakota are unique, relative to a majority of the states. Several concerns that distinguish transportation concerns of North Dakota are (1) large shipments of bulky, low-valued commodities, (2) long distances from producing region to domestic consuming region or port, (3) seasonality of demand for transportation, (4) being considered 'captive' by some in certain areas of freight transportation, (5) production of specialty crops, and (6) location as a border state in the Canadian multilateral and bilateral trade agreements. These unique characteristics make transportation research, that is specific to North Dakota, an important activity.

Commodity Characteristics

Several characteristics that should be considered when discussing North Dakota's transportation research needs are inherent to agricultural commodities. The first factor is that agricultural commodities are bulky, and have a low value relative to their transport costs. Railroads have encouraged use of multi-car (26-car and 52-car unit) trains for these low-valued commodities for two reasons: to capture economies of scale for larger shipments and to increase competitiveness relative to trucks. BN first introduced unit car rates at the end of 1980 for shipments to the Pacific Northwest. These unit car rates were a result of market forces. During the late 1970's and early

1980's trucks were able to use lumber backhaul opportunities to expand market share of grain shipments to the west by successfully competing with single car rates. To regain market share, BN implemented more competitive unit car rates for west bound grain shipments (Figure 2).

The use of multi-car shipments is increasing. In 1989-90 single car and multi-car shipments of hard red spring wheat were 29 and 71 percent, respectively. In 1991-92 the single car share had declined to 19 percent. A shift has also taken place in durum shipments. In 1989-90, about 46 percent of the durum was shipped under single car rates, by 1991-92 single car market share had declined to 37 percent.

Another characteristic related to nature of agricultural commodities raised in North Dakota is the seasonal demand for transportation (Figure 3). The demand for transportation in North Dakota is tied closely to harvest activities. The 1990-91 cycle for grain shipments is representative of a typical crop year. In 1990-91 about 45 percent of the grain and oilseed movements occurred in a four-month period, between August and November. This cyclical demand for rail cars has typically contributed to difficulty North Dakota elevators have in obtaining

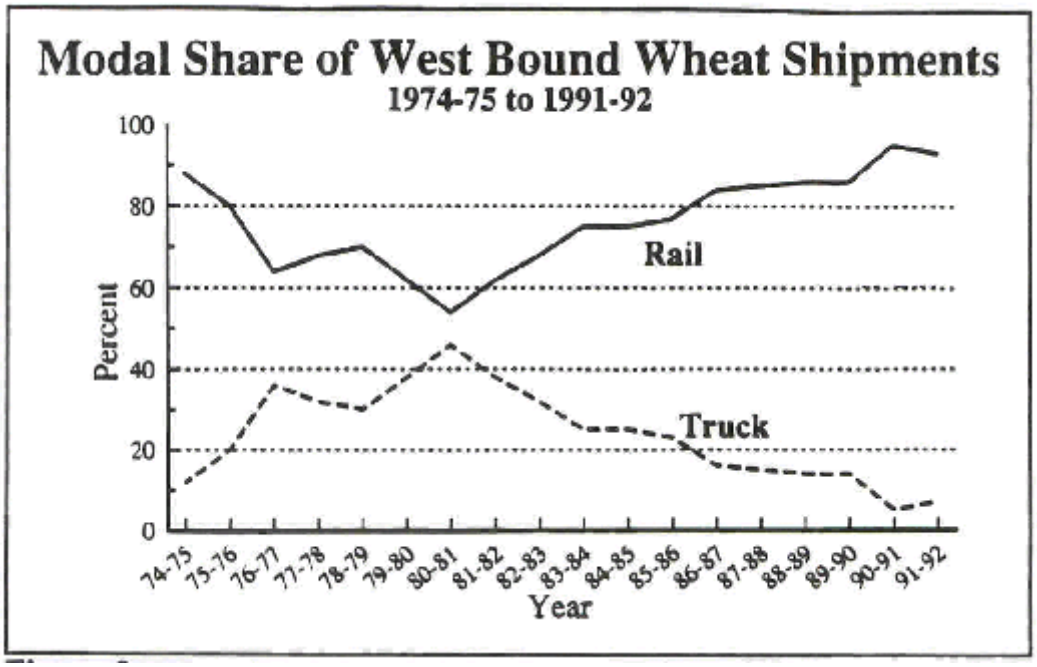

Figure 2

rail cars, especially during large harvests. Due to the costs associated with excess capacity, railroads do not have enough equipment on line to meet rail car demand during peak periods. The opportunity to forward contract rail cars was proposed as a method for easing some of the problems associated with the seasonality of demand for grain transportation. As an application of this theory, BN implemented its COT program was in 1986. It allows shippers to forward contract rail cars in an open market, rather than relying on contracting and the spot market for cars. The success of this program is still to be determined.

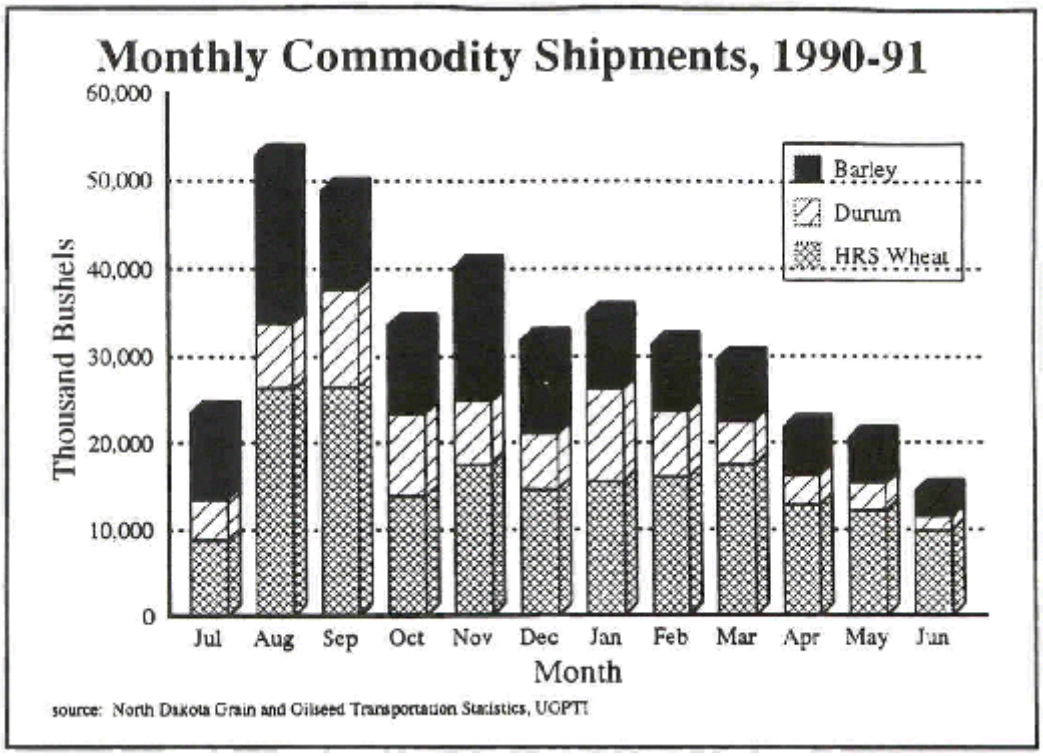

Figure 3

A third characteristic that influences transportation in the state is the production of 'specialty' crops. Durum and barley are considered specialty crops because substitutes do not exist for their end uses of semolina milling and malting. Other regions do not produce these crops in the quantities that North Dakota does. Because other regions and railroads are often unable to supply these specialty crops, it is termed a lack of geographic and product competition. Interstate Commerce Commission definitions are: "product substitution refers to the shipper's or receiver's option to use commodities which are interchangeable for the commodity named in the issue tariff; geographic competition is shipper use of alternative destination or sources for the products to which the rate applies[1]." Although railroads from other regions often cannot supply crops to substitute for these commodities the railroads in North Dakota compete on an intramodal basis by offering competitive rates and services, such as timely delivery.

Geographic Factors

The location of North Dakota also makes its transportation interests distinctive. The first factor is the long distance commodities must be moved to reach consumers and ports. Long distances to domestic consuming regions and export ports give North Dakota a comparative disadvantage when competing with other agricultural states that are located in the central United States.

Another consideration related to state geography is that North Dakota is termed a by some 'captive' state, in which lack of effective transportation competition exists. The term captive refers to the I.C.C. definition of market dominance. The presumptions of market dominance, as defined by the I.C.C., are: *(1) a carrier maintains a 70 percent share of the market, (2) or had rates that exceeded variable costs by 80 percent or more, and (3) if a shipper had made a substantial investment in rail related facilities.*

Intra- and intermodal competition are often used by the I.C.C. as indicators of market dominance. Intramodal competition is defined as competition within a sector of the transportation industry (eg. Burlington Northern Railroad vs. Soo Line Railroad). Intermodal competition occurs among different modes of grain transportation.

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[1]Interstate Commerce Commission, *Ex Parte No. 320 (Sub-No. 2), Market Dominance Determination and Consideration of Product Competition, 365.* June 24, 1981: 118-35.

Geographic and product competition have also been proposed as indicators of market dominance. The geographic and product competition are indicators of the degree of substitutability among regions and products, and the affect this has on rates. Many other agricultural states, in addition to being located closer to consuming regions and ports, also have inland waterways available for transporting commodities. When both rail and barge facilities are available competition between these modes is intense and very competitive transportation rates are often provided for shippers.

Railroads have an advantage in supplying transportation for North Dakota's grain. Railroads are price leaders in the transportation market, trucks follow rail rates by pegging truck rates in relationship to rail rates. Although trucks are available for moving commodities, they are often unable to offer cost competitive rates, relative to railroads, for distances over 400 miles. Though trucks may be able to increase this distance when backhaul opportunities are available, railroads are responsible for a majority of N.D. grain and oilseed movements. In 1991-92 railroads controlled 73 percent of the principal commodity movements, with trucks handling the remaining 27 percent.

The final geographic consideration relates to the recent multilateral and bilateral trade agreements. North Dakota is a border state in trade agreements involving Canada, so special consideration should be given to the agricultural sections of the agreements. Because of similar climates and soil conditions North Dakota and the Canadian provinces have a comparative advantage in producing and marketing many of the same crops. Agriculture is a major industry in North Dakota and in bordering Canadian provinces, so it is very important to North Dakota's economy that the trade agreements provide a 'level playing field' for the agricultural producers to compete for market share.

RESEARCH AND SERVICE AGENDA

Transportation of agricultural commodities is a dynamic subject. Research provides important insight into effects of change and allows shippers, carriers, and logistical enterprises to prepare for the future. A research agenda should first be defined by the concerns and interests of those directly and indirectly involved in transporting agricultural commodities. Eight broadly defined categories that provide a basis for grouping possible research topics are rate structure, regulatory changes, economic impact, modal share and commodity flow analysis, efficiency, infrastructure, equipment supply and availability, and international transportation (Figure 4). Each of these categories will be separately addressed in the remainder of this section of the paper.

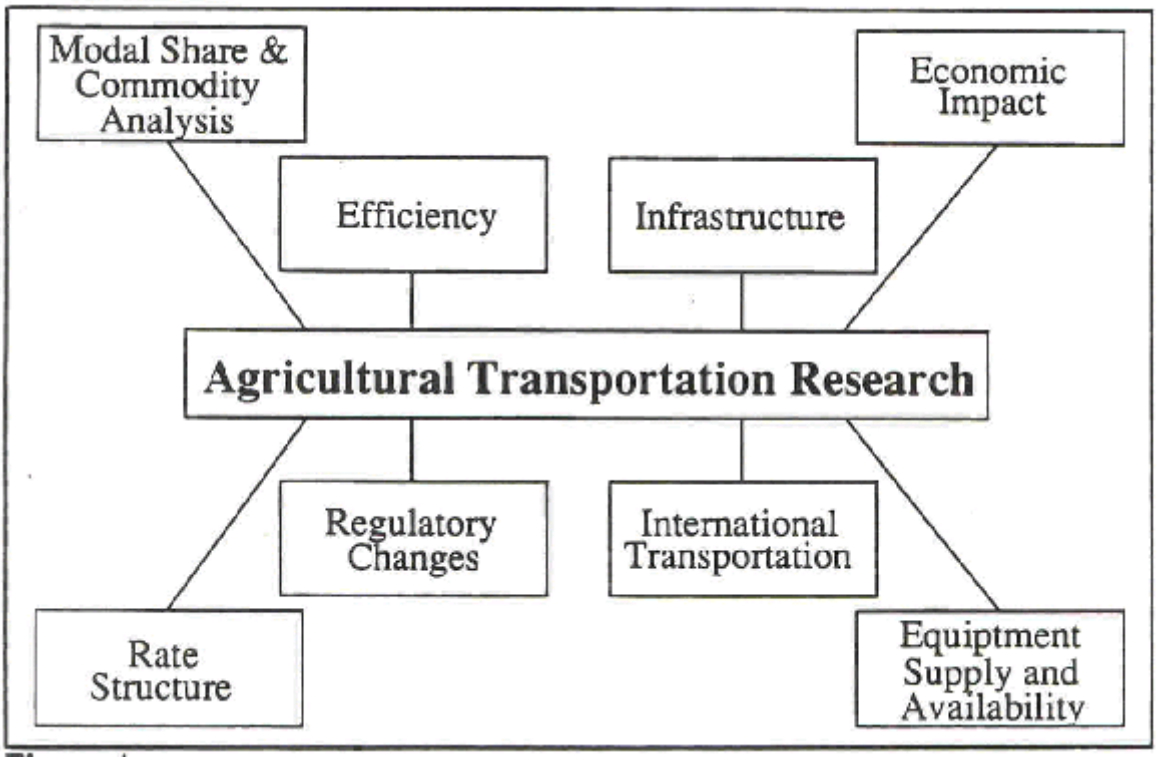

Figure 4

Rate Structure

Rate structure is an important aspect of transportation in North Dakota. Rates, while being equitable, should reflect market supply and demand conditions. With agricultural commodities, however, demand for transportation is actually derived from the demand for a commodity. While in theory transportation rates should peak when demand for transportation is greatest, this relationship is overshadowed by demand for the commodity. The supply of agricultural commodities is rather inelastic, thus there is a rather unlimited supply at any given price in the short run. The demand for transportation from an origin to a destination, and the demand for a mode to move a commodity are rather elastic, because substitutes are available. Thus, the cross-price (rate) elasticities between modal and origin choices are a more important factor in the determination of transportation rates than the demand for transportation. The cross-price elasticity refers to the competition between modes for shipping grain from an origin to a destination. For example, a one percent decrease in the rail rate for moving grain between Minneapolis and Fargo may negatively impact the amount of grain trucks will transport between Fargo and Minneapolis. The elasticity is important for estimating the quantity of grain that will shift from truck to rail.

Another factor that may influence the rate structure is degree of competition. The I.C.C. often analyzes the degree of competition in a market by comparing market shares of the participating carriers. Intra- and intermodal competition are commonly used when assessing the competitiveness within a region. Geographic competition and product substitution may also influence transportation rates, as previously recognized. Because North Dakota raises specialty crops the levels of geographic and product competition are probably limited. It has been shown that these forms of competition affect freight rates, but the importance in the establishment of freight rates is not certain. It is important to producers in North Dakota to understand these forms of competition because they may directly effect the profitability of the agricultural sector.

Regulatory Changes

Government decisions can cause changes that manifest themselves in increased or decreased transportation rates. The deregulation of rail under the Staggers Act is the source of many of the

recent and ongoing changes in agricultural transportation in North Dakota. The effects of exemption and re-regulation proposals may be of interest to North Dakota farmers. Studies may be done to estimate the effects of exempting commodities from jurisdiction the Interstate Commerce Commission has concerning the equity of transportation rates. Research may also be conducted to assess the costs and benefits of re-regulation of transportation rates for a commodity, and other areas. This research is important for assessing the success of current policies and for formulating future transportation policy.

Efficiency

Because the success of North Dakota's agricultural industry depends on delivering commodities to an end user in a timely manner at a relatively competitive and low cost, and efficient transportation system is vital. Transportation costs are an influential factor in the cost of marketing agricultural commodities. Efficiency gains in the transportation sector contribute to the competitiveness of North Dakota in marketing its commodities. Operational, service, and cost are three categories used for defining efficiencies. When efficiencies can be realized in any of these areas there is an increase in the productivity. Increased efficiency is achieved through eliminating waste by discontinuing some historical practices and implementation of other new practices. Shippers gain from efficiencies in the rail and truck industries because efficiency gains are realized in reduced transportation rates in competitive markets. To achieve this competitive market, carriers in the market must be healthy, and able to compete effectively.

The I.C.C. monitors the productivity of railroads through the rail cost adjustment factor (RCAF). The RCAF is an inflation index for the rail industry. One component of the RCAF is the productivity adjustment. This measure converts the price index into a cost index. Railroads are allowed to automatically raise their rates to recover inflationary cost increases in accordance with the RCAF, that is approved by the I.C.C. quarterly.

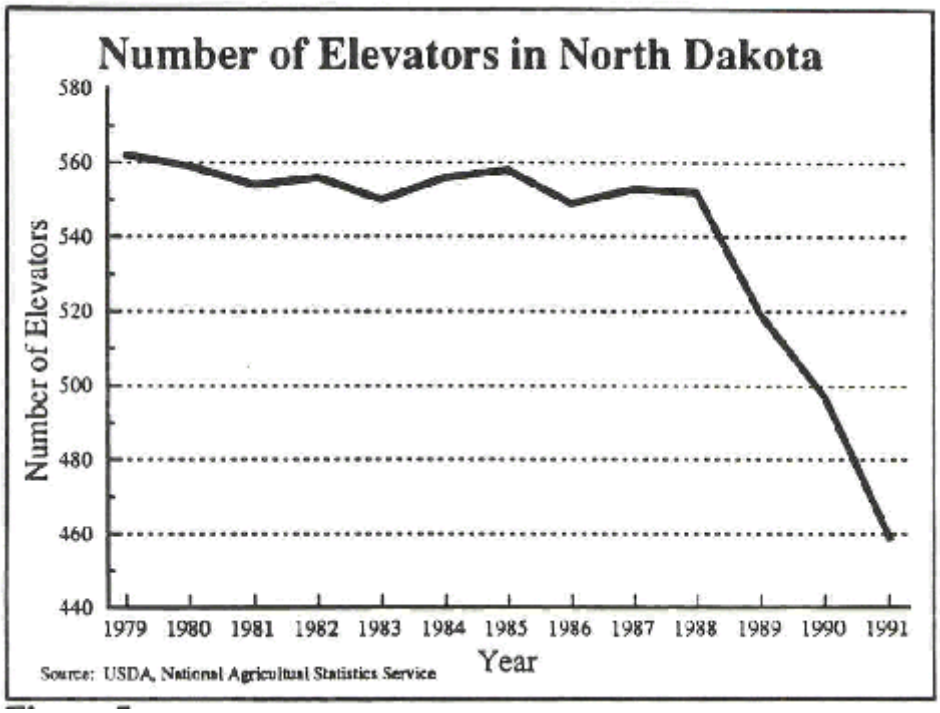

Figure 5

As a source of efficiency railroads have encouraged multi-car shipping of grain. The shift from single-car to multi-car loading initiated adjustments in the structure of North Dakota's elevator system. Unit car shipments have contributed to the decline in the number of elevators (Figure 5). The number of loading stations may not show the same sharp decline due to small elevators working cooperatively to operate as sub-terminal loading facilities. Encouraged by lower rates for multi-car shipments some elevators in North Dakota installed unit car loading facilities. Because of a rate structure that favors unit car loadings, many country elevators are unable to compete with prices offered by sub-terminal elevators (equipped to load unit trains).

Since the Staggers Act many railroads have begun to sell off unprofitable branch lines as another source of increasing efficiency. In North Dakota branch line operation is an important phenomenon. Many country elevators are located on branch lines, and although some branch lines continue to operate as short line and regional railroads, many are abandoned. Elevators on abandoned lines may be closed, this forces farmers to travel greater distances on county roads and

bridges trucking commodities to other elevators. Current trends indicate that branch lines sales by Class I railroads are likely to continue in North Dakota. The effect of these branch line sales will be important to decision makers who are considering new policies or investments in the infrastructure.

Economic Impact

The economic impact of changes in the transportation industry is also a basis for research. Branch lines have been a source of interest for economic impact studies recently. A few topics associated with branch lines are the effects of abandonment of the community and local roads, the effect of elevator closings, and the factors that contribute to the success/failure of short line railroads. It seems likely that as Class I railroads seek to increase efficiency more branch lines will be spun off and sold as short lines or abandoned. Because North Dakota has hundreds of miles of branch lines, more research analyzing the impacts of abandonment and the benefits/costs of continuing operations may be of interest.

Equipment Supply and Availability

Rail car availability has historically been a problem for North Dakota shippers, especially during times of peak demand (eg. harvest periods). As mentioned previously, railroads avoid excess supply problems by targeting equipment investments at satisfying demand during normal demand periods. Because the demand for rail cars is derived from the market demand for a commodity railroads have little effect on transportation demand when rates are adjusted to reflect rail car supply and demand conditions. BN was unsuccessful when it attempted to reduce the effects of cyclical demand (shortages of rail cars) for grain transportation during the 1980's. Under this program BN set prices for the peak period and then reduced the cost of rail cars for during other months, to induce a more stable demand for rail cars over a 12 month period. This rate structure had little effect on the demand for rail cars while it was in place. BN has since initiated the COT program, that may reduce car supply problems through forward contracting of rail cars.

Modal Share and Commodity Flow Analysis

Intra- and intermodal share are important research areas because the trends and shifts in market share of a mode or individual carrier may provide information about the competitiveness of the transportation suppliers. Price is an important determinant in modal share, but service and other non-quantifiable factors also contribute the success of an agricultural commodity carrier. In the absence of rate regulation, modal share and rate competition are major determinants of service and rate structure. Insight into the decision process of a shipper may provide additional information for measuring the competitiveness. Competitiveness of carriers is directly related to the 'health' of a firm and that of its competitors. 'Health' refers to the viability of a firm. Healthy firms are likely to compete aggressively to capture market share.

Modal share is also important for identifying trends in the investment needs for highway and rail industries. Policy decisions and investment allocations may be based on the trends observed in the modal share assessment. Investment in the infrastructure is an important basis for economic development and continued success of our agricultural industry. Shifts in modal share may require that strategies for investment of limited resources in the infrastructure should be re-examined.

International Transportation

International transportation issues are becoming more prevalent as our agricultural economy is globalized. Export sales are important to future expansion of the income generated by North Dakota's agricultural commodities. Timely, low-cost transportation is a valuable asset when assessing the competitiveness in the national and international markets. Though the state may be at a disadvantage because it is a greater distance from a potential importing market, advantage may be gained for serving a market if a lower transportation rate can be offered. The ability of a supplier in North Dakota to offer a lower transportation rate for a greater distance may result from an efficient system for transporting agricultural commodities. Research may be used to identify advantages that North Dakota has in producing and transporting agricultural commodities for the world market.

Infrastructure

Investment and maintenance are tied closely to efficiency in the transportation system. North Dakota has an extensive transportation network available for moving commodities from farm to consumer. In recent years a smaller tax base has meant less funding at the same mill levy for maintenance of county roads, while in many cases, rail line abandonment has meant increased wear on local roads. Research may be directed at providing assistance for developing a long term strategy for meeting transportation needs of agricultural commodity producers, within budget constraints. Cooperative planning and prioritization of maintenance and investment will be needed to ensure the future availability of a good transportation system for North Dakota.

CONCLUSION

These eight research categories have been defined to encompass the transportation concerns and interests of North Dakota agricultural producers. A brief discussion of each provides an overview of a few more specific research topics included under each broad category definition. As the transportation industry changes, interests and concerns regarding the transportation of agricultural commodities will continue to evolve. It is important to the future of North Dakota's agricultural industry that research is done on a continuous basis to provide suggestions for improving the efficiency and ensuring the longevity of North Dakota's transportation network.

UGPTI has also sought to increase it resource base and facilitate cooperation among rural states through membership in the Universities Transportation Centers Program (UTCP). The UTCP was established by the U.S. Department of Transportation in 1987 as a means of addressing the need to encourage efficient movement in all transportation sectors. Thirteen UTCP Centers have been established within ten regions that span the U.S. The Centers *have become focal points for addressing transportation issues, attracting talent, resources, and facilities for promoting individual initiatives and scientific innovation in and across transportation modes and disciplines*.

Under the UTCP the UGPTI, is member of the Mountains Plains Consortium (MPC), and has been designated as one of the 13 UTCP Centers. The focus for the MPC projects is *Rural and Non-Metropolitan Transportation*, because the MPC region primarily rural and has a resource-based economy. Ideally, cooperative agreements, such as this, will enhance the ability of our organization to serve the interests of the users and suppliers of agricultural transportation.

In addition to new research projects the Upper Great Plains Transportation Institute will continue to serve the interests of North Dakota's agricultural community through other means. These other services include providing information upon request, collection and interpretation of the grain and oilseed movement data, and distribution of a transportation newsletter.