THE GRAIN INDUSTRY — COUNTRY ELEVATORS, GRAIN MARKETING AND TRANSPORTATION

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Historical Setting

Early agricultural development in North Dakota can be traced directly to development of the state's railroads. No practical means of shipping bulk commodities to consuming regions from North Dakota existed prior to railroad construction in the late 1800s. In fact, grain production did not even develop on a commercial scale until the means to ship the commodity existed.

Rails were first laid in North Dakota in June 1872. The state had over 2,000 miles of rail lines by 1890 and over 5,000 miles by 1915. Concurrent with railroad building came the country grain elevator. By 1884, just 14 years after the Northern Pacific Railroad crews crossed the Red River into Dakota Territory, 206 grain elevators and 54 warehouses had been constructed (Robinson, 1966). The limited range of horse-drawn conveyances necessitated construction of elevators six to nine miles apart, enabling a round trip by farmers in one day. Elevators were small by today's standards. For example, those owned by the Northern Pacific in 1884 represented 30 percent of existing total capacity and each facility averaged 35,000 bushels of storage capacity. Many elevators were needed due to the short distance farmers could haul grain, but large capacity was not required because of the few patrons each firm served.

The number of grain elevators in North Dakota grew rapidly as additional rail lines were built into new tillable regions. Although specific data prior to 1920 are scanty, elevator numbers peaked around 1915 when there were 2,031 elevators in North Dakota (NDPSC). Since then, however, numbers have declined due to economic pressures for increased capacity and throughput, technological improvements in farm and over-the-road truck transport, and physical deterioration of facilities. While elevator numbers have been declining, the average storage capacity and annual volume of grain handled has been increasing (Table 1). This trend was abated somewhat in 1980 when the total number of elevators increased slightly and the average volume of grain handled declined from the previous year's all-time high of 808,000 bushels.

Ownership of the elevators in their early stages included line ownership (many houses owned by a larger, generally out-of-state firm), cooperative ownership (owned collectively by a group of producers), and independent ownership.

Table 1. Number of Licensed Country Grain Elevators, Average Storage Capacity and Average Volume Handled, North Dakota.

Year	Licensed Elevators	Average Storage Capacity	Average Volume Handled
	number	bushels	
1915	2,031	30,000	---
1922	1,832	30,000	---
1952	936	68,000	---
1964	789	159,000	---
1969	663	188,000	460,000
1971	650	197,000	460,000
1973	636	207,000	647,000
1975	617	204,000	519,000
1977	600	229,000	598,000
1979	589	248,000	808,000
1980	592	263,000	678,000

SOURCE: North Dakota Grain Dealers Association, **Directory of Licensed and Bonded Country Elevators in North Dakota,** Fargo, 1981; Griffin, Gene C., **North Dakota Grain and Oilseed Transportation Statistics 1980-81,** UGPTI Report No. 42, Upper Great Plains Transportation Institute, North Dakota State University, Fargo, March 1982; and North Dakota Board of Railroad Commissioners, Annual Report to the Governor, for the biennial period ending June 30, 1916.

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This article is a sequel to a series of research reports published under a joint research effort entitled, "North Dakota Grain Handling, Transportation, and Merchandising Study." This joint undertaking by public and private interests was designed to provide relevant information to decision makers meeting the challenges of a changing business environment in the handling, transporting, and merchandising of grain in North Dakota.

Cooperative elevators played an important part in development of North Dakota's grain elevator industry. Cooperative elevators were first organized shortly after the railroads were built but few survived the turn of the century. Several waves of enthusiasm to organize cooperatives subsequently swept the state. Most of them were organized between 1913 and 1932. By 1920, cooperatives represented 24 percent of all elevators. Today roughly half of all country elevators are cooperatives and half of these are either affiliated with a large regional grain cooperative or are regional cooperative line elevators.

Farmers organized cooperatives because they felt exploited by unreasonably high margins charged by existing elevators and by unfair trading practices such as short weights and inequitable grading. In some cases, competition among private companies was sufficiently active that there was no reason for farmers to tie up their scarce capital in a country elevator. Cooperatives were also formed because existing elevators were too far apart.

Virtually all grains produced in the state were shipped to the domestic milling and malting markets until the opening of the St. Lawrence Seaway gave the Port of Duluth/Superior access to the export market. The opening of the seaway and the development of the Pacific Northwest market in the 1960s provided alternative outlets for North Dakota grains and oilseeds.

The Changing Scene

Recent developments have probably had greater effects on, and caused more changes in, country grain elevator operations than any time period since the turn of the century. Some of these changes involve transportation of grains and oilseeds, including regulatory changes in the rail industry, mergers of large rail firms, and more recently, the introduction of multiple-car or "unit train" rail rates. Introduction of unit train grain rates is often cited as one of the more dramatic developments in grain marketing in recent years. These rates have contributed to the ongoing reorganization of the country elevator industry.

Cooperatives are responding in several ways. One of the more apparently successful approaches is the merger of several local cooperatives into one unit large enough to load unit trains. Existing elevators serve as feeders. Another route is to organize a small federation where surrounding locals remain independent but divert grain to unit train facilities built nearby by the federated cooperative. Other cooperatives are attempting to build unit train loading facilities on their own. These cooperatives will generally be faced with attracting a substantially larger volume of business from surrounding country elevators. Still other cooperatives are apparently ignoring the unit train rate development. They may be located in an area where production does not warrant unit train loading facilities.

The country grain elevator, although still performing its basic role as the link between producers and terminal markets, has found its functions to be changing and becoming more complex. The number of elevators has decreased significantly, and their average capacity and throughput has increased many times over that of elevators operating in the early 1900s. Elevator management has been forced to adjust to changes in traditional marketing patterns, as well as to changes in the social and economic environment in which they operate.

Factors Providing Impetus for Changes in the North Dakota Grain Marketing Industry

Changes in the manner in which grain is marketed in North Dakota have been caused by several factors. More gradual changes in regional production patterns and methods farmers use to market grain have influenced country elevators for decades. More pronounced changes that have had more impact recently include an evolving transportation system and the economic forces on elevators to expand or consolidate.

The Evolving U.S. Transportation Environment

Rail transport of North Dakota grains remained the standard for shipment for decades. Single-car shipments to domestic markets once constituted the only form of transport available to North Dakota shippers. In the more recent past, however, the system has been affected by several transportation-related factors.

Technology

The evolution of high capacity farm and over-the-road trucks, coupled with development of an extensive road structure, has permitted shipping alternatives for both producers and grain elevators. Farmers now have the capability to transport their grain to any one of several local markets in a matter of minutes. A year-round road system and farm storage allows for more producer marketing alternatives. Also, North Dakota grain elevators have the option of shipping grain to terminal markets via rail or truck. Development of higher capacity, more fuel-efficient trucks and construction of an extensive state and interstate road network aided trucks in competing with railroads for grain shipment from North Dakota. Maintenance of the road network at a quality level sufficient to meet the needs of country and interstate grain shippers is essential, especially as elevator numbers decline. Concerns have been expressed recently as to deterioration of the road network, causes of such deterioration, and future capitalization of the system.

Technological developments in transportation vehicles have also affected grain marketing patterns in North Dakota. Railroads have virtually eliminated the boxcar as a vehicle for grain shipment and replaced it with the covered hopper car. The hopper car is not only larger in physical capacity but also much more efficient in terms of loading and unloading. Similarly, interstate grain truckers are utilizing hopper bottom truck trailers for grain shipment. Although a more specialized, less versatile piece of equipment, it does permit time and labor savings for loading and unloading grain.

Deregulation of Railroads

Railroad regultory reform at the federal level was brought on by congressional concern over the financial health of the nation's railroads. Federal legislation enacted in the 1970s and 1980s relaxed many restrictions on railroads as a means to keep them out of bankruptcy. Some of the changes affecting country elevators and grain marketing are increased freight rate flexibility, easier abandonment of unprofitable operations and legalizing the making of confidential contracts between railroads and individual shippers.

Although the absolute level of freight rates may not affect country elevator operations, volatile rates may interfere with elevator pricing activities. Also, abandonment of rail service at a particular elevator will force the firm to resort to truck service , truck/rail shipment in cooperation with another elevator, or abandonment. Contracts for rail rates and services between carriers and shippers have added uncertainty to the elevator pricing mechanism. Some shippers are now unsure of competitors' freight costs due to the confidential nature of shipper/railroad contracts.

Railroad Mergers

Railroads have become increasingly larger in size and fewer in number, a result of mergers, consolidations, and purchases of bankrupt and other firms. The Burlington Northern Railroad, North Dakota's largest carrier and the nation's largest grain carrier, serves Great Lakes ports, Gulf of Mexico ports, and Pacific Northwest ports, as well as points inbetween. Although North Dakota is still served by two railroads, further reduction in rail firm numbers may have implications for the country grain shipper such as access to (or insulation from) new markets and extent of intra-modal rate competition.

Opening of New Domestic and Export Markets

Prior to 1959, North Dakota commodities were generally shipped to domestic markets. In 1959, however, the opening of the St. Lawrence Seaway made the Port of Duluth/Superior an export point, eventually to become the primary market for North Dakota grains and oilseeds. Shortly after Duluth/Superior became an export market, rail freight rate changes were implemented which promoted movement of North Dakota grain to Pacific Northwest ports. Also, increased Japanese demand for grains at the West Coast helped promote westward grain shipment from North Dakota. North Dakota shippers, particularly those in the western half of the state, have alternatives to the traditional markets of Minneapolis and Duluth as well. Many commodities are also shipped directly to miscellaneous markets such as Gulf ports, east central plains states, and others.

Availability of Equipment

The orderly marketing of grain depends to a great deal on the availability of transportation equipment. Increased export demand throughout much of the 1970s resulted in rail equipment often being in short supply. Managers of country grain elevators in North Dakota turned to shipper-provided equipment to enhance marketing efficiency. Leasing rail cars and purchasing trucks were popular alternatives. The added cost of acquiring transportation equipment was often offset by increased marketing flexibility since elevator managers had access to markets when carrier-provided equipment was in short supply.

Multiple-Car Rail Rates

Probably the most significant recent change in transportation of North Dakota commodities has been the implementation of multiple-car rail rates for grain shipment. Introduction of multiple-car rail rates in North Dakota in December 1980 has had significant impacts on country elevators (as well as others in the marketing chain). Decisions concerning capitalization of facilities and marketing have increased in importance as elevator managers and directors assess proposed changes in the marketing system as a result of the new rate structure. Foremost has been the decision to invest in fixed plant assets based on multiple-car rate savings. Implications of such decisions ultimately depend on the level of rail rates in the future and the extent to which the rate savings can be realized through intensive utilization of the multiple-car rates.

Some of the more common multiple-car rates currently in effect (July 1984) include 3-car, 26-car multiple origin, 26-car single origin, and 52-car single origin rates. The relative level of each of these rates can be of extreme importance to grain shippers as they consider the decision to invest in their facility. Examples of rail rates applicable on wheat to eastern markets are given in Table 2.

Table 2. Examples of Wheat Rail Rates from North Dakota to Minneapolis, Minneapolis Transfer, and St. Paul Destinations, 1984.

Origin	Single-car	3-Car	26-Car Single Origin	52-Car Single Origin
	cents per hundredweight			
Minot	127	123	111	106
Carrington	96	93	82	77
Casselton	74	70	61	55
Wahpeton	60	56	48	43

SOURCE: Burlington Northern Railroad Company, **Freight Tariff BN 4022-D,** Supplement 29; Rates at RCCR X-084 level (not subject to RCCR X-084A, effective 7/1/84).

Uncertainty as to future rate levels and spreads compounds investment decisions regardless of whether or not fixed plant assets are capitalized. For example, a decision to invest may be enhanced if future rate savings on multiple-car rates increase relative to single-car rates.

Also, a decision not to invest may be strengthened if future rate spreads decline.

Rationalization of the Grain Handling and Transportation System

Country elevators have traditionally been the focal point through which grain moves from North Dakota to final destinations. Early development of country elevators and towns in the state was aligned with development in the rail transportation system. Elevators were typically located within six to nine miles of each other in order to accommodate delivery of grain from the farm by horse and wagon. Consequently, a very extensive rail and elevator network was developed, primarily in response to the technology of the time (delivery by horse and wagon and small, labor-intensive country elevators). As motor transportation developed, producers were able to transport grain greater distances and no longer required such close proximity to country markets. Since this early development there has been a trend toward fewer elevators in the state and increased distances for truck haulage. Major factors contributing to this trend are economies of size in elevation and in transportation. This is referred to as "rationalization" of the grain handling and transportation system.

Economies of Size

Larger elevators or subterminals have the potential to operate at lower unit costs than smaller elevators. This gives larger elevators a competitive advantage over smaller elevators. It also gives an incentive to expand in order to exploit economies of size in elevation. One factor which is crucial in the transition in the grain handling and transportation system is that economies of size exist in elevation. Many studies have analyzed economies of size in elevation.

Economies of size exist if average total costs (ATC) decrease with increases in output. These are mostly attributed to decreasing average fixed costs (AFC) as output increases. Diseconomies of size exist if ATC increases as output increases. The statistical relationship between ATC, AFC, AVC (average variable costs), and output were analyzed for 212 North Dakota elevators using 1978-79 data (Chase, Helgeson, and Schaffer, 1983). These results indicate (Figure 1) that: AVC is relatively constant throughout the relevant range of output; both AFC and ATC decrease with increases in output. For elevators handling 400,000 bushels, ATC equal $.16/bushel; for an output of 1.1 million bushels ATC decrease by $.04/bushel to $.12/bushel. No minimums were observed in the sample which indicated that ATC are decreasing throughout the range of output normally observed in North Dakota elevators.

The economics of constructing and operating new subterminal facilities in North Dakota were also analyzed (Chase and Helgeson, 1983). Four different sized subterminals were analyzed. Costs of construction were $2.45, $2.35, $2.25, and $2.15 per bushel for subterminals with 300, 500, 850, and 1,100 thousand bushels of storage capacity. The large subterminals have greater economies than smaller facilities, due primarily to the decrease in AFC as output increased. AFC decreased from 17.4¢/bushel to 9.8¢/bushel as the size increased from 300 to 1,100 thousand bushels, respectively. Similar decreases were observed in AVC and ATC. These results assume a turnover ratio of 10:1.

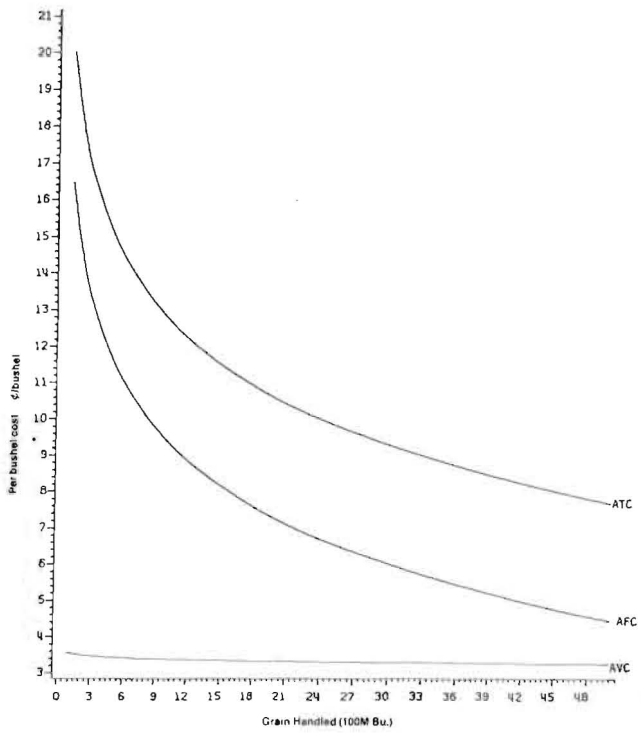

Figure 1. Statistical Cost Structure for North Dakota Grain Elevators, 1978-79.
Source: Chase, Helgeson, and Schaffer, p. 43.

Economies of Multiple-car Rates

Another source of economies which is important in the evolving grain handling and transportation system is economies of multiple-car rail rates. The grain handling and transportation system in this region was built around use of single-car rates — i.e, the same rate charged regardless of the number of cars shipped. Indeed, until very recently investment decisions and marketing practices were based on the concept of single-car rates. However, the introduction of multiple-car rates — i.e., reduced rail rates for shipments in greater than single-car lots — has had significant impacts on the grain industry. This has also given further impetus to the development of larger elevators and subterminals.

Economies of expanding elevator capacity or constructing new facilities depends, in many instances, on rate spreads between single-car and multiple-car rail rates. These spreads are currently being experimented with by the railroads. Cost savings in using multiple-car rates over single-car rates are illustrated in Table 3.

Table 3. Cost Savings Based on Multiple-Car Shipments, by Volume From Carrington, North Dakota to Minneapolis, Minnesota, July 1984.

Volume of Shipment	Savings Over Single-Car Shipment		
	3-Car (3¢/Cwt.) 1.8¢/Bu.	26-Car Single Origin[a] (14¢/Cwt.) 8.4¢/Bu.	52-Car Single Origin[a] (19¢/Cwt.) 11.4¢/Bu.
bushels	----------	dollars	----------
9,900	178	---	---
87,500	1,575	7,350	---
175,000	3,150	14,700	19,950

[a]26-car shipments are 87,500 bushels while 52-car shipments are 175,000 bushels. These volumes are based on hopper car capacities of 200,000 lbs. 60 lbs. per bushel wheat.

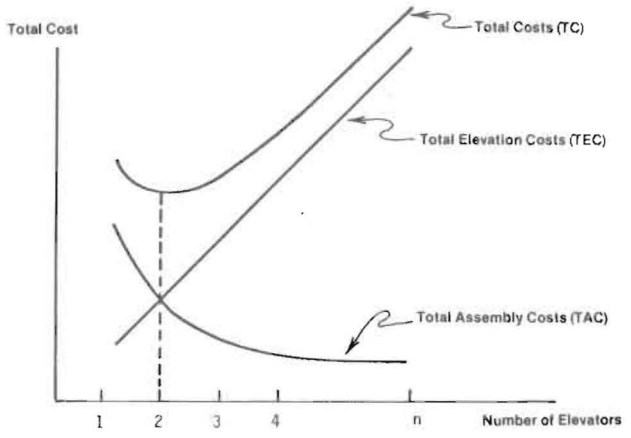

Figure 2. Total Costs of Assembling Grain in a Particular Region.
Source: Bressler and King, p. 147.

Current spreads vary throughout the state but are approximately 8.4¢/bushel between the single-car and 26-car rates and 11.4¢/bushel between the single-car and 52-car rates. For a shipper, multiple-car rates can be interpreted as savings due to an ability to ship in multiple-car units. There will be economic incentives to expand elevator capacity and ship in greater than single-car units as long as rate spreads exceed the marginal costs of shipping.

Rationalization

Rationalization refers to adjustments in the size and components of a system so the same output can be produced from less resources. In the case of grain handling and transportation, there are several important components to the system and changes in one have effects on the others. The system includes farm trucks, small country elevators, branch line rail service, main line rail service, and larger country elevators or subterminals.

For a very simple case, the effects of system rationalization can be illustrated by Figure 2. The system includes assembly costs by trucks (TAC), elevation costs (TEC), and the summation or total costs (TC). As the number of elevators decreases in a region, elevation costs decrease and truck assembly costs increase. The decrease in total elevation costs is due to each of the fewer firms operating more efficiently and due strictly to economies of size. The increase in truck assembly costs occurs because with fewer elevators, farmers have to haul their grain longer distances, thereby increasing truck costs. In the extreme case with many elevators in a region, truck costs are very low but elevation costs are high. Minimization of the total costs for a region, in the case of Figure 2, is two elevators yielding optimal results. The concept of rationalization is that if too many elevators exist, there will be a gradual transition to fewer elevators, resulting in increased truck haulage. This conclusion is due entirely to the assumption of economies of size in elevation. Indeed, if no economies exist, an optimal organization would require an elevator at every location. But due to the economies, rationalization involves balancing of decreases in elevation costs against increased collection costs. Introduction of multiple-car rates and/or branch line abandonment into a system such as described above complicates the results further. However, the general effects of multiple-car rates and branch line abandonment would be to expedite an otherwise gradual transition to a more rationalized system.

One of several studies conducted to analyze these effects (Hertsgaard) estimated the optimal (least-cost) patterns for moving grain from northeastern North Dakota farms to terminal markets in Minneapolis/St. Paul, Duluth/Superior and the Pacific Northwest. It also provided estimates of the costs of alternatives for transportation and handling grains in their movement from farm to the terminal markets. A computer simulation model was used to find the least cost combination of shipments from farm to country elevator to terminal markets. Transportation alternatives from farm to country elevator were single- and tandem-axle farm trucks. Transportation alternatives considered for shipments from country elevators to terminal markets were semi-trailer trucks and single-car rail. After the optimal solution was found for movement of grain from the farm to terminal markets via the existing country elevator system, the simulation model was modified to include subterminal elevators in the region. The routing of grain in this model could include movements either from farms or country elevators to subterminals and then to terminal markets via 52-car lots. All combinations of 22 different sites in the study area and five subterminal sizes were considered. A final variation in the model considered the use of those existing country elevators that were capable of being modified to accommodate the loading of 26-car rail shipments.

The results of the analysis indicated that the optimal pattern for movement of grain was via existing country elevators modified to accommodate 26-car rail shipments. The second lowest cost alternative (in terms of total cost of transportation and handling) was a configuration that included about eight or nine subterminal elevators that shipped grain in 52-car lots. A more costly

scenario was the shipment pattern involving shipment from country elevators in single-car shipments or by semi-trailer truck. The most costly scenario was the one involving 22 subterminal elevators because none operated near capacity.

Another study (Marshall, 1984) analyzed the cost savings for the system associated with alternative rail rate structures. Transportation costs for the state decreased by $62 million by using the rail rate structure in effect in 1983 versus that in 1980. This study also analyzed the economic benefits of adding more subterminal elevators to the system and the effects of alternative rate spreads on these economies. The results indicate that additional subterminals would be viable in some regions but not others under the current rate structure. Increases in the rate spreads make additional subterminals viable.

International Trade

Trade is an important part of the world economy. Most countries tend to produce and export those commodities in which they have a comparative advantage. As a result, most countries' economies depend upon trade.

The United States has a comparative advantage in producing several agricultural products. Furthermore, the U.S. is the largest grain and oilseed exporter, accounting for approximately 50 percent of world trade in grain and oilseed. North Dakota is a major grain and oilseed producing state, exporting approximately 48 percent of its spring wheat and sunflower production. Consequently, a large part of the farm economy in North Dakota depends upon exports.

Exports, however, are highly volatile due mainly to economic and crop conditions in exporting as well as importing countries. Consequently, farmers face great uncertainty in their income. The uncertainty recently has been fueled by trade restrictions, world-wide recession, current U.S. economic and farm policies, and changes in domestic and ocean transportation systems. U.S. wheat exports have increased at a much smaller rate than production from 1981 to 1982 (Figure 3). In these years, the ratio of U.S. wheat exports to the total production decreased to 40 percent.

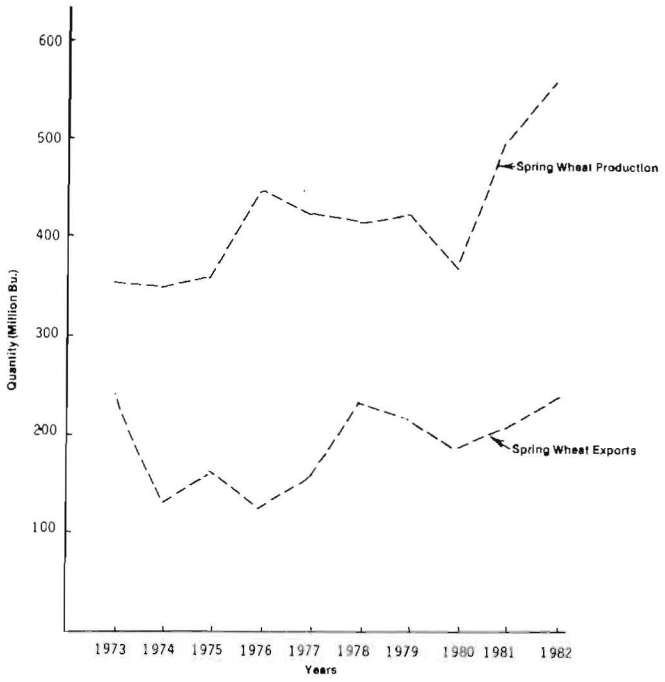

Figure 3. U.S. Spring Wheat Production and Exports from 1973 to 1982.
Source: U.S. Department of Agriculture, Agricultural Statistics, 1983.

Trade Restrictions

There are two different types of trade restrictions — tariffs and quotas. While tariffs are a tax imposed on commodities traded, quotas limit the quantity of commodities traded. The purpose of trade restrictions is to protect domestic industries from foreign competition.

Japan imposes quotas and the European Economic Community (EEC) imposes tariffs. Koo found that about 45 percent of the incidence of these trade restrictions are absorbed by U.S. farmers. Trade restrictions also increase prices of agricultural products in importing countries and consequently reduce demand for those products. For example, a tariff of $1 per bushel of wheat imposed by the EEC reduces the price at U.S. ports by 45 cents and reduces exports to the EEC by 10 percent. If there were no trade restrictions, U.S. farmers would have higher grain prices and export more.

Ocean Transportation

Ocean transportation is an important factor affecting trade of agricultural products. A study by Koo concluded that changes in ocean freight rates influence wheat prices at U.S. ports more than in importing countries. Approximately 80 percent of ocean freight rates are borne by U.S. wheat producers, resulting in substantial decreases in wheat prices at U.S. ports. These transportation issues are especially important for North Dakota farmers.

North Dakota is isolated from major grain export ports. Over 60 percent of the state's exports moves through Duluth and the balance is shipped to Gulf and Pacific Northwest (PNW) ports for export. In the last three years (1981 to 1983) ocean freight rates from Duluth to most foreign destinations are higher than those from other ports, indicating North Dakota's disadvantage in shipping grain to foreign destinations. The U.S. will become more competitive as improvements in efficiency are made in domestic and ocean transportation.

Economic and Farm Policies

Trade in agricultural products is also affected by U.S. economic and farm policies. Current economic policies

(monetary and fiscal) result in high interest rates which make the U.S. dollar more expensive in foreign money markets. As a result, U.S. agricultural products became more expensive compared to those products produced in other grain exporting countries such as Canada, Argentina, and Australia, and therefore, less competitive in the world market.

U.S. farm policy is basically divided into income support and production control programs. Income support programs have been implemented by target prices and loan rates, while production control has been implemented by acreage diversion and set-aside programs. However, those agricultural policies have been less effective with stronger competition from other grain exporting countries. Reductions in U.S. grain production through production control programs have been offset by increased grain production in other countries. Consequently, the supply of grain in the world grain market has remained almost constant. Price support programs have also made the U.S. less competitive in the world grain market. The U.S., therefore, has become the residual supplier in the world grain market even though the U.S. is the largest grain exporting country in the world. U.S. farm policies should be formulated on the basis of not only the domestic situation but also based on changes in the world market for agricultural products.

U.S regional promotion of agricultural exports produced in the area is important. However, export promotion efforts cannot be effective unless there is a close coordination among the private sector, state, and federal governments.

Implications

The implications of the evolving grain handling and transportation system can be grouped into three areas. One of these relates to the economics of rationalization. There is a trend toward fewer and larger elevators trying to exploit the economies of high throughput. This strategy is precipitated largely by the introduction of multiple-car rates and branch line abandonment. The effect of this is for a reduction in total assembly and shipping costs. However, the costs of trucking from farm to country elevators will increase as producers haul greater distances. This increase in farm truck transport will place increased strain on the system of rural roads and bridges, many of which were not designed to handle this volume of traffic and size of trucks.

A second implication relates to pricing at country elevators. Currently, elevators and subterminals have different capabilities to utilize and exploit economies of size and multiple-car shipments. Consequently, there is potential that bid prices to producers will differ across these elevators. Indeed, producers and elevators are already cognizant of price differentials across elevators and through time, most of which can be explained by the evolving trading practices associated with the multiple-car rate savings.

These economies imply cost savings which are shared throughout the marketing system. Competitive pressures will eventually force elevators to pass savings on to producers in terms of higher prices. Reduced shipping costs also allows products from North Dakota to be more competitive at the ultimate destination relative to products from other regions and countries.

A final implication relates to the potential for "excess capacity" to evolve in the elevator sector. Some elevators have already expanded to take advantage of economies that exist and others are evaluating plans for expansion. Elevator management generally feels that the first to expand in a trade area will survive, recognizing there is insufficient production density for all of them to be economical. The number, size, and distribution of large elevators which are economical varies by region and depends on this density of production, economies of size, and transportation rate spreads.

It is unlikely at this point that subterminal construction has contributed significantly to excess capacity, because the major impetus for expansion is relatively recent. Subterminal development in both Iowa and Nebraska preceded that in North Dakota by about 5-10 years. The current problem in both of these states is excess capacity in the elevator sector — there are too many large elevators each trying to operate at a high level of utilization. The same problem may eventually develop in North Dakota. Many elevators in the state are currently underutilized operating at low turnover rates. Excess capacity implies underutilization which results in higher unit costs given the economies of high throughput.

Exports of agricultural products are an important part of the farm economy. Exports, however, are highly volatile due to economic and crop conditions in exporting and importing countries. Exports also are influenced by trade restrictions, world-wide recession, changes in the domestic and ocean transportation system, and U.S. economic and farm policies. U.S. regional efforts to promote agricultural products are important, but must be coordinated with economic and farm policies of the federal government.

Easing of trade restrictions by importing countries, improvements in efficiency of U.S. grain and oilseed distribution systems, and changes in our economic and farm policies in addition to our export promotion will improve the farm economy in North Dakota as well as that of the U.S. Agriculture is no longer a domestic industry, it is an export industry.

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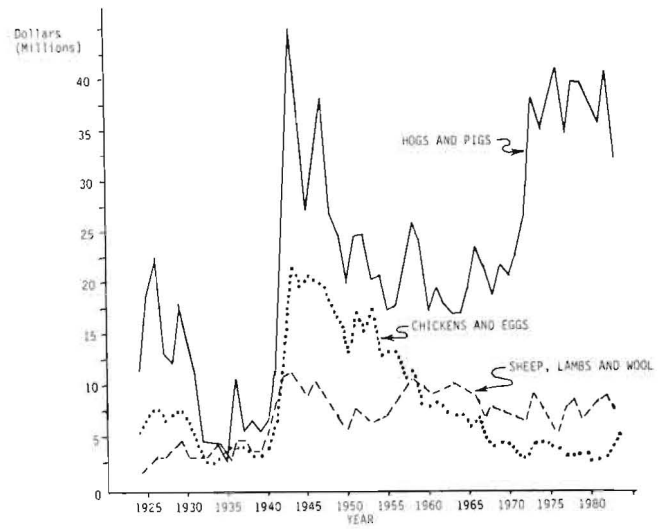

Figure 4. Cash Receipts From Sales of Hogs and Pigs; Sheep, Lambs and Wool; and Chickens and Eggs, North Dakota, 1924-1982. Source: North Dakota Crop and Livestock Reporting Service, USDA, Fargo, N.D.

1). Since World War II, hog numbers have averaged about 300,000 head. Cash receipts increased markedly in the 1970s with inflationary prices.

Changes in Sheep Production

Sheep production was at its highest level during World War II and the period immediately preceding the war. Cash receipts from sheep and wool have been steadily declining and now account for about 1.5 percent of the total farm income derived from livestock and product sales (Figure 4). Sheep were kept on 11,951 farms in 1945. This has dropped to 1,711 in 1982. The average size of the ewe flock was about 50 in 1945 and had increased to about 100 in 1982. The percentage decline in sheep numbers in North Dakota has paralleled the decline in numbers nationwide.

Changes in Production of Chickens and Eggs

Most chickens currently raised on North Dakota farms are for egg production. There were about 625,000 chickens on farms in 1983 with only 5,000 kept for other than egg production. This compares to 4,162,000 kept for egg production in 1950 and 242,000 raised for meat production. Cash receipts from the sale of chickens and eggs in North Dakota for 1983 amounted to $5.1 million which was about 1 percent of cash receipts from all livestock (Figure 4).

Summary

Until 25 years ago, most North Dakota farms had more than one species of livestock. Cattle and sheep utilized land that was more suitable for hay and pasture and provided meat and milk for home consumption. Hogs and chickens utilized screenings and lower-valued grain and also provided meat and eggs. A few head of livestock, cream, and eggs were sold and made a contribution to farm income. Diversification in both livestock and crops helped to dampen wide variations in yields and prices.

Since that time both livestock and crop production have become more specialized and larger scale. Farms that produce livestock generally specialize in one kind. Cattle enterprises usually produce either beef or milk instead of having dual purpose breeds. Sheep, hogs, and chickens are generally produced on large scale commercial farms.

The fact that livestock contributes about one-fourth of agricultural income does not adequately document the importance of livestock production in North Dakota. In some counties, cash receipts from livestock and products (including milk and eggs) are the most important and amount to about three-fourths of the total. Communities in these areas are highly dependent on livestock production and the public sector is financed significantly through livestock production.