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GLOBAL GRAIN DISTRIBUTION SYSTEMS: IMPEDIMENTS TO INCREASED EXPORTS

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GLOBAL GRAIN DISTRIBUTION SYSTEMS: RESEARCH NEEDS

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I want to commend Roland Robinson, Leo Polopolus and C. Phillip Baumel for their foresight in the organization of this symposium. Further, I want to applaud the authors of the three papers for offering a myriad of issues that seem to encompass the entire global grain distribution system. My task is to select those issues which seem to lend themselves to economic analysis and offer some subjective conjecture regarding the potential value of such an analyses. Remember that the selection of a research problem and a researcher's approach to a particular problem is highly personal and is conditioned by values and beliefs regarding involved parties and institutions as well as their perspective of economics and its various methods and tools.

In general, my approach is simply to classify the outlined transportation issues and offer judgements about those which I believe are deserving of research attention. Figure 1 includes in abbreviated form the issues forwarded by our issues authors and my classification of the issues. I have elected to categorize the issues as (1) public goods issues; (2) transportation markets and industry performance issues; (3) public policy issues and, finally, a catch-all identified as other.

Research Opportunities/Needs

Initially, I attempted to offer a prioritization of the issues but that seemed difficult and unrewarding in view of possible differences in regional research needs. Figure 2 includes my selected grain transportation research needs. In some cases, my list of selected grain transportation needs directly parallels the issue as outlined by the authors of the issues paper, in other cases, my identified need serves as an umbrella to include multiple issues.

Rural Roads and Bridges

There is mounting evidence that our rural road and bridge system is in serious disrepair in important grain surplus regions in the United States. Based on a recent benchmark survey of 533 counties in Illinois, Minnesota, Ohio and Wisconsin, 37.5 percent of the county-maintained road mileage was classified as barely adequate and nationwide over one-third of the county bridges were found not to meet tolerable limits (Walzer and Chicoine). A similar survey of township governments in these midwestern states showed only half of the township roads are expected to remain serviceable at current maintenance expenditures while the remaining half will require

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Figure 1. Grain Transportation Issues

Public Goods	Transportation Markets and Industry Performance	Public Policy	Other
• rural roads - rationalization - management	• adequacy of capacity - barges - railroads	• merger policy -railroads -barges	• USSR grain distribution
• river infra-structure	• technology adoption - railroads - grain handlers	• railroad abandonment	• funding
• port infra-structure	• alternative distribution systems - truck/barge/rail trade offs - micro, macro	• restructuring rail-road debt and equity	• welfare economics
• financing in-frastructure	• viability of regional and short-line railroads	• cargo preference	• engineering needs -railcars
	• ocean freight market	• Panama Canal	• grain quality
	• truck/rail/barge trans-port markets - demand/supply analysis	• public ownership of railway	
		• subsidy to foreign buyers for infra-structure	

Figure 2. Grain Transportation Research Needs

Rural Roads and Bridges

* Rationalization
* Privatization, financing schemes, liability
* Organization of governmental unit to attain efficiencies

Ocean Freight Market

* Firm risk
* Port hinterland, grain flows and prices, infrastructure needs
* Effect on comparative advantage, market share

Truck/Rail/Barge Markets -- A Positive Analysis

* Demand/supply analysis on transport corridors
* Dynamic properties
* Policy analysis

Rail/Barge Capacity -- A Normative Analysis

* Normative capacity vs. actual capacity

Rate Determination in Oligopolistic Transport Markets

* Dominant Mode, concentrated structure
* Merger policy
* Experimental economics and game theory

Interdependence of Modes in Grain Distribution Systems

* Multicounty planning
* Regional/national planning
* Transportation mode trade-offs
* Effect on producer, consumer prices
* Competition in transport markets

accelerated maintenance to reach an acceptable level of service (Walzer, Chicoine and McWilliams). Surveyors conclude that many of these small jurisdictions must decide whether they can maintain low-volume roads in view of a shrinking population and fiscal base (Walzer, Chicoine and McWilliams).

Although the benchmark survey did not include states in the Great Plains, it is my judgement that the plains region is probably characterized by more dismal rural road statistics than those of the surveyor corn belt states. The Great Plains has more agriculturally-dependent road jurisdictions, a lower population density and, in general, a more limited set of revenue options than the corn belt. Consider that the average population in the surveyed corn belt counties was over 100,000, whereas the Great Plains counties generally average less than 20,000 inhabitants. This translates into a per capita rural road commitment which is about 3.5 times higher for inhabitants of the Great Plains. That is, in the Great Plains there are about 155 miles of rural road per 1000 rural residents, while in the corn belt the ratio averages 44 (Chicoine, Wolzer, Deller). In addition, many counties in the corn belt have substantial non-farm employment and income which offer rural road financing alternatives not available to the agriculturally-dependent plains.

Alan Bird, in a recent edition of Choices, offers a futuristic view of the Great Plains. Bird envisions the region as becoming what he terns a "Big Meadow", a region which continues to be a major producer of grain but generally devoid of a rural population. Bird even offers a view on the grain assembly system.

> "Croppers use ... road trains to convey the harvested crop to an elevator ... . These road trains consist of a huge tractor and a series of wagons which travel overland as well as on roads".

The rural road system is a vital link in the grain assembly system and I believe its deterioration, in combination with a declining fiscal base and rural population make it a priority research issue in selected portions of the nation's surplus grain producing regions. Research by Hamlett and Baumel, and Baumel, Hamlett and Lee represent a blueprint that might be followed by others as they offer ways to restructure and rationalize the rural road system. Research that focuses on reorganization of local government units to attain possible economics in maintenance of rural roads would offer useful information on alternatives as would studies which examine various means of financing the maintenance of the rural road system.

Ocean Freight Market

Hauser and Parker show there is substantial variation in the Rotterdam/Gulf grain basis and suggest about 50 percent of its variability is explained by ocean freight rates. They observe foreign price risk facing U.S. exporters is generally high and note that this may unfavorably impact the U.S.'s competitive position in international grain markets.

Because ocean rates are the principal source of this variability they argue the need to learn more about ocean freight rates and strategies (futures, etc.) to reduce this risk. I concur with their argument. In general, agricultural economists have given modest attention to the international grain transportation market, forces which bear on these rates, and their effect on the u.S.'s comparative advantage. Changes in relative ship rates from competing U.S. port areas affect the dimension of port hinterlands, grain prices, grain flows and the location of necessary market and transportation infrastructure. A more complete understanding of the ocean freight transportation market would provide insight into its various and possible substantial effects.

Truck/Barge/Rail Markets (A Positive Approach)

Historically, agricultural transportation economists have carried out little analysis into the nature of transportation demand and supply relationships, elasticities, cross-price elasticities or other descriptive measurements. In part, this was probably due to the highly regulated nature of some transportation modes; however, with the reduced role of government, studies into the nature of transportation demands and supplies on the major grain transportation corridors seem in order. Our issues authors have noted concern about the capacity of the rail and barge modes. Conceptually, supply functions which identify quantities of transportation service supplied as a function of rates, available transport units (rail cars, barges), costs, shipment size and other supply sifters would offer valuable information on corridor transportation capacity. Similarly, demand analysis might offer perspective on the effect of an increase in export grain demands on transportation rates on particular corridors or the interplay between rates of competing modes. Further efforts which examine the dynamic nature of transportation price and the effect of spatially separated transportation markets on each other could offer important and useful information. Our counterparts in market and policy analysis have successfully used the products of demand and supply analysis to reason through the likely effect of selected exogenous happenings. Should we be equipped to do anything less? Finally, the linking of transportation rates into regional grain prices would facilitate measurement of producers and consumers surplus, thus facilitating policy or welfare analysis. This framework would allow more complete insight into the effect of transportation policy on producers, consumers and foreign buyers.

Rail/Barge Capacity (A Normative Approach)

Kober and Baumel and others Norton and Klindworth) have suggested that the rail and barge industries may be providing less than optimal capacity in the form of insufficient rail car and barge numbers. A suspicious economist knowing the derived demand for grain transportation service is probably inelastic and suspecting inadequate competition in some transportation markets may view under capacity as a means of increasing revenues. The economist may be correct with his conclusion or he/she may be erroneous. There is a known seasonality in the demand for grain transportation service and possibly a longer-run demand cycle which makes identification of the

optimal number of rail cars, barges and power units less obvious. It is very probable that the optimal level of transportation capacity involves some shipper waiting in peak periods of demand. This is an empirical question, and a question which I believe deserves our attention. Resolution of the capacity question would offer some perspective on the performance of these industries and provide direction on the need for any following research effort.

Rate Determination in Oligopolistic Transportation Markets

Neither of the issues authors from the midwest universities strongly suggested a research focus on carrier rate determination. This is understandable since their region's barge and rail industries in combination with the Great Lakes creates a competitive rate making environment on most of their region's major grain transportation corridors. This is in contrast to the landlocked Plains region where railroads represent the only carrier alternative and pricing efficiency depends on intrarail competition among a few and decreasing number of rail carriers. Deregulation of the rail industry in 1980 led to railroad rate reductions of up to 30 percent on some transportation corridors in the central Plains; several studies suggest that confidential rail/shipper contracting and the abolition of rate bureaus created uncertainty among members of the oligopolistic railroad industry and this subsequently fostered intrarail competition and the lower rates. It seems this competitive environment is fragile and potentially vulnerable to modest changes in industry concentration and regulation. For example, there are some who suggest that the recent and modest change in contract disclosure has altered the price making environment and this has subsequently reversed the downward rate trends in some regions of the Plains (Fuller, Ruppel, Bessler). I believe it is important that transportation economists more fully understand carrier rate making in those transportation markets dominated by a single carrier structure. Researchers must be sensitive to the effect of mergers, changes in carrier industry concentration and modified regulations.

Neoclassical economics and the structure-conduct-performance paradigm may offer little to assess some of the more interesting questions regarding carrier performance. Consider as an example, the recent modification (1987) regarding disclosure of rail contract terms which increased availability of information to market participants. Because traditional approaches seem inadequate to address these issues, economists are increasingly turning to laboratory experimentation (Ruppel, Fuller and McKnight). This methodology might be used to address some carrier performance issues as well as new developments in industrial organization which focus on game theory.

Interdependence in Grain Distribution System

Kober and Baumel correctly observe the interdependence between truck, rail and barge modes in grain distribution and inquire into (1) the effect of roadway

disinvestment on assembly of grain to nearby rail and barge locations, (2) the ability of railroads and trucks to meet grain haulage demands if river infrastructure is not maintained, and (3) the effect of additional railroad abandonment and the evolution of "spine lines" on rural roads and efficiency of the marketing system. Historically, some grain transportation economists' best work has focused on grain distribution systems and their efficiency -- this would seem an opportunity to recalibrate and restructure some of our existing models for purposes of offering insight on these transportation system interdependencies and tradeoffs. I suggest two types of models which would involve a different focus -- a micro or multicounty model and a macro or national model. The micro model would incorporate details of a multi-county road system, rail lines, grain gathering locations, intermodel transfer points and any necessary extraregional features. This would facilitate measurement of any changes in efficiency that may result from modification in micro features. In contrast, the macro model would have the capacity to focus on the regional impact of modification in the transportation system. As an example, what happens if portions of the upper Mississippi are closed as a result of further infrastructure deterioration? Output of the macro model might be fed into other models which measure the likely effect on regional grain prices, producer and consumer surplus and the U.S.'s comparative advantage in national markets. It seems some modifications in the transportation system may affect competition in regional transportation markets, thus the need to also evaluate the effect on pricing efficiency.

I found the paper by Laserson and Baumel to be very informative and interesting, in particular, as it offered testimony to the dynamic efficiency of the U.S. grain distribution system as compared to that of the USSR with its planned economy. Throughout the paper they hold to the premise that the Soviet Union and Eastern Europe will be major buyers of U.S. grains and subsequently argue the need for technology transfer so as to improve the efficiency of their grain distribution system. I'm less confident than the authors about the likelihood for expanded sales to these countries in the longer-run. In the short-run, they are probably correct. I expect the Soviets will experience delays as they move toward a market economy and the associated legal, financial and governmental institutions that facilitate it. In view of this expectation, it is doubtful that their producing agriculture will exhibit much efficiency or bountifulness. Further, in the short-run, if there is real growth in per capita income, there may be a substantial increase in demand for poultry and red meat and subsequently for grain. In which case, these countries' grain demands may be substantial in the short-run. However, in the longer-run, the prospects for exports are less obvious. Granted an increase in the region's per capita income and its climatic constraints,it seems we may underestimate the longer-run productivity of their agricultural sector.

If we were to superimpose the USSR's economic system and in situations onto U.S. agriculture, I doubt the United States would be a major grain exporter. Similarly, it is likely that the implementation of a market-oriented economic system by the Soviets will dramatically boost the productivity and output of their agriculture. And, since their demand for grain import infrastructure is a derived demand for foreign produced grain,

there may be value to developing projections of USSR import demands based on likely demographic, income and agricultural productivity trends. This effort supports our authors' premise that the Soviets will continue to be important buyers. I support their agenda of proposed activities.

I appreciate the opportunity to have reviewed these three thoughtful papers and offer my judgments about research needs. Thank you.

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GLOBAL GRAIN DISTRIBUTION SYSTEM: COMMENTS

Won W. Koo[11]

The papers cover important issues related to shipping of agri cultural products from producing regions in the United States to domestic consuming and foreign importing regions, and implications of U.S. agricultural products on international competition. While Laserson and Baumel (1990) and Hauser and Parker (1990) focus on ocean transportation and handling facilities in importing countries, Kober and Baumel (1990) discuss issues related to the infrastructure for shipping of agricultural products in the United States.

Distance is a natural barrier of trade especially for trade of agricultural products due mainly because (1) agricultural products are specialized to some extent on the basis of weather and soil type; and (2) shipping costs of agricultural products are higher than processed products. The United States has a comparative advantage in exporting agricultural products because of not only advanced production technology and farming practices, but also an excellent transportation system with interstate highways, railways, and the Mississippi and Columbia River systems. While production technology can travel rather rapidly across countries in the world, the transportation advantage is unique to a region and cannot be transferred. The U.S. transportation system contributes more to its competitiveness than production technology according to Koo and Drennen (1989). The United States must improve its domestic grain handling system to increase and/or to maintain its market shares in the world market. Therefore, I firmly believe that we continuously should improve the current transportation system for shipping agricultural products to maintain our competitiveness in the world market, and agree with Kober and Baumel on the research needs discuss-ed in their paper.

Over the 10-year period from 1973 to 1983, consumption of grain in developing countries, mainly wheat, coarse grain, and rice, increased from 36.4 million tons in 1973 to 74.2 million tons in 1983 (International Wheat Council) mainly because of increases in population and income level. Consumption of coarse grain increased most from 7.9 million tons to 27.5 million tons followed by increased wheat consumption from 23.2 million tons to 40.0 million tons and rice from 5.2 million tons to 6.7 millions tons.

In most importing countries, the increased consumption of grain outpaced the increased productivity of agricultural products, and it resulted in increased imports of agricultural products from 44.8 million tons in 1973 to 92.8 million tons in 1983. This trend will continue in the future, especially in Southeast Asia.

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Most exporting countries, including the United States, Australia, and European Community (EC) have better transportation and handling systems than do developing countries, which are not large enough to meet increased import demand, resulting in delays and congestion of grain movements. The Soviet Union is a classical example of transportation problems importing countries commonly face (Laserson and Baumel). Improvements in grain transportation and handling systems will increase intra- and inter-country specialization of agricultural production on the basis of the principle of comparative advantage and increase trade volume among countries. Consequently, the ocean transportation and handling problems should be considered not only as an export promotion but also as a global welfare problem.

Transportation connects surplus and deficit regions. Improving the facilities in exporting countries, therefore, will not increase a trade volume if the facilities in importing countries are not efficient. The facilities in importing countries are a common problem faced by all exporting countries. The benefits, when the facilities are improved, are not the same for all exporting countries since their competitiveness in the market differs. This implies that the United States should focus on grain handling facilitates in the region where it has a competitive advantage. It is important to know physical constraints for handling agricultural products in importing countries to maintain smooth flows of agricultural products from the United States to the importing countries. The International Wheat Council, in its 1985 report on grain handling and transportation facilities in developing countries, characterizes ports and grain handling constraints in most developing countries. This information should be updated for use in ocean transportation research.

Inadequate facilities in importing countries delay unloading grain with congestion of grain cars at port, increasing ocean freight rates. This is especially true in developing countries. In the mid-1970s, the 46 ports around the world could discharge grain from ships of 35,000 tons or larger. Only four were in developing countries. While certain improvements have been made since then, few developing countries can accept large vessels of 50,000 tons or more (International Wheat Council), causing greater uncertainty in international grain trade. I agree with Hauser and Parker on price uncertainty stemming from rapid changes in exchange rates. Inadequate grain handling facilities in importing countries also causes price uncertainty.

While many techniques can be used to analyze research issues discussed in these papers, the authors do not recommend modeling the transportation problems to evaluate the transportation system for shipping of agricultural products and optimizing the system. One of the techniques is a spatial equilibrium model based on the mathematical programming algorithm which contains domestic transportation activities in exporting countries and ocean transportation activities for shipments of grains from export ports in exporting countries to importing countries. The objective function of the model is to minimize grain handling and transportation costs in shipping grains from producing regions in exporting countries to importing countries through ports in both countries.

The model will include grain handling capacities in exporting and importing countries as constraints of the model. The model is capable of optimizing the world grain distribution system, international competitiveness in shipping agricultural products, and evaluating impacts of changes of the port facilities in a country on trade flows of agricultural products. The model could project transportation capacity needed to meet demand for agricultural products in importing countries.

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GLOBAL GRAIN DISTRIBUTION SYSTEM: COMMENTS

Lowell D. Hill[12]

I will make only a few comments relative to the papers presented because they were very well done. My notes are more in the nature of elaboration than a critique of content.

The paper of Hauser and Parker, correctly identifies the importance of price variability as a source of uncertainty for exporters. Risk of adverse basis movements is a cost that must be incorporated in merchandising margins. However, the price variability between U.S. exports and Rotterdam has different significance than the price on basis variability between Chicago and the Gulf Ports. Nearly all U.S. grain is sold FOB the port and the price change between the time of loading and the time of arrival in the foreign port is generally borne by the buyer and not by the seller.

I will add my support to the suggestion of Kober and Baumel for nationalizing the roadbed for the railroads. It was proposed by several of us involved in the early research of NC-137. I would have liked to see some additional discussion in this paper about the effect on competition when the roadbed is owned by the public, and the rolling stock is owned and operated by private firms. Barriers to entry in the water and truck transportation industries are low and the industries are highly competitive, because the high fixed costs of roadbed are provided by government. Fixed facilities such as the inland waterway system and the interstate highway system are provided by government with individual firms. Public ownership of the roadbed for the railroads would provide the same form of competition among individual firms operating private vehicles. It is of interest to note that we are discussing the possibility of nationalizing our roadbed, while Argentina has just completed the sale of portions of their government owned railroads to private firms.

The paper by Laseron and Baumel refers to privatizing the Soviet grain industry. I am sure he would concur with my elaboration, that privatizing the Soviet grain industry will take more than the importation of a few grain merchandisers. In the USSR, as well as Eastern Europe, we are talking about privatizing a grain industry in a country with no market infrastructure, no experienced private grain buyers, no price making system, no system of price information, no concept of price-value relationships, a cultural fixation against the concept of arbitrage over time, form, and space, no concept of private credit and banking, and limited trust of verbal contracts in buying and selling large volumes of grain. Research is needed, not only to identify what is included in a market economy, but to implement those recommendations. Implementation and the process of change is the real challenge.

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The three papers presented provide observations on several aspects of grain transportation and distribution. Each makes a contribution to understanding the impediments in the system. I would like to generalize these impediments and follow with a suggested research approach based on the premise that research on the grain marketing system must encompass the importing as well the exporting nations. I grouped the impediments under three general headings.

1. Physical Impediments: This includes lack of storage, lack of transportation equipment, lack of roads, inadequate communication, and general absence of the necessary infrastructure for physically moving and marketing grain.

2. Logistical Impediments: This includes the inability to schedule arrivals and departures such that the availability of transport facilities are matched with the arrival of grain for export. Seasonal demands must be coordinated with supplies of transportation, and storage as well as with the supply of grain. Logistics also requires appropriate institutions such as futures markets, pricing mechanisms, and market information.

3. Policy Impediments and Barriers: Policy issues range widely from who should own and control the Panama Canal to tax incentives and tariff barriers. The policy area also includes issues of public investments. The efficiency of the market system rests heavily on the policy framework. Government grain boards provide some of this framework but they are notorious for not generating efficiency in storage, handling, and resource allocation. Many policies also influence the physical and logistical impediments.

Research is needed in each of these three areas, and the source of funding and the responsible entity varies among topics:

1. Physical facilities: Much of the research on facility requirements will be done by private enterprise if the government provides the proper framework in which they can operate. Research on the infrastructure and the development of that infrastructure, will usually involve government and academic researchers because benefits cannot be captured by individual firms making private investment. Researchers operating in this area must maintain close communication with industry and government personnel in order to properly identify problems and approaches.

2. Logistical impediments: Daily logistics are provided by private enterprise in their response to economic opportunities. The larger logistical plan of organizing the total system crosses the boundaries of firms, states, and even nations. This type of research fits well with academic research

capabilities and the models familiar to academic and government researchers.

3. Policy Impediments: The research in this area is the most crucial because it creates the environment for response by firms and industries to the other impediments and generates incentives for research. With the proper policies, private enterprise will respond to economic incentives and provide investment in physical facilities. With freedom to arbitrage across time, form, and space, the logistical problems are often resolved by individual firms. A stable government is essential to encourage private investment. Instability in political and economic systems and the associated risk restrict investment and increase the cost of transport. The "proper" role of government in investments, market transactions, and transportation regulation is a research issue that involves balancing the trade offs among goals. It will, therefore, provide a fertile field for research until the end of time.

All of you can readily list the specific research projects required under those three headings -- a spatial equilibrium model of the Soviet grain importing/transporting system; a study to assess risk associated with basis uncertainty in Rotterdam or Yokohama; impact of deregulation on grain prices. I won't take your time to create a list which would be incomplete at best. Instead I will suggest an approach for the research that needs to be done.

1. Researchers should concentrate on policy issues. Policy issues (broadly defined) are the most far reaching of our research recommendations. Although the implementation of research conclusions is often difficult and frustrating, persistence can produce change and impact the performance goals of efficiency, equity, competitiveness, etc. Changing the rules of the game offers much greater potential than just fine tuning our game skills.

2. Internationalize your research. Policies are international in their scope and implications. Our research must include the actions and responses from the importing country as well as from our firms. It is presumptuous (if not arrogant) of us to sit in our offices and run computer models to help organize the Soviet grain marketing system. My recommendation is that we develop a research program that actively involves the country that we are researching. The paper by Laseron and Baumel referred to input from the researchers from the USSR. I concur with that recommendation. They have some excellent scientists in the area of transportation, storage, and drying. So do most other importing countries and we should take advantage of that expertise.

Success of our research requires the correct assumptions about data, physical and cultural limits in the country and firm behavior. Too often we impose our assumptions about other countries on our models, with little factual basis, or little evidence that the assumptions are correct or relevant. We complete our research and deliver the results to the recipient government or foreign firm and are disappointed when the recommendations are rejected. The foreign firms and governments should be involved in planning and conducting the research -- not just in reading the executive summary. I propose that we find a way to integrate research from other countries in our projects -- an extension of the regional research strategy to an international research committee. The researchers from the other countries should be involved in all phases of the project, including problem identification, objectives, methodology, analysis, conclusions, and implementation.

There are many political, physical, and logistical impediments to the distribution of grains. The political impediments are the most challenging for researchers but also have the greatest potential for impact. Only if the object of our recommendations is receptive can we be effective. One of the best ways to gain their response and their respect is to include their concerns and their expertise in the original design of the research program.