RESEARCH CONSIDERATIONS IN IMPROVING
TRANSPORTATION FOR AGRICULTURE AND RURAL AMERICA**

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Commonly, the title of some of our academic endeavors has little or no specific reflection on the content of the papers themselves. However, in this particular case, I would like to point out that the title accurately describes the objective of this paper. To wit, we are going to be talking about research considerations affecting improvement in the function of transportation for agriculture and rural America. The words "agriculture" and "rural America" also add information about the contents of the paper. In examining the research needed to improve transportation, it becomes important and useful to differentiate between agriculture and rural America. Although this differentiation may have originated in agricultural policy writings, it does specifically allow an examination of separable, if not separate, problems for these two areas. This paper is based on the investigative activity of the Ad Hoc Committee on Agricultural Transportation Research established at the request of the National Agricultural Research Policy Advisory Committee (ARPAC). This Committee on Agricultural Transportation Research was established to review and evaluate needs for research concerned with transportation services for American agriculture, and recommend

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program priorities within existing levels of effort, and for program expansion within the Department of Agriculture and the land grant universities. The Committee spent about ten months, meeting in Washington, D.C., on three separate occasions, to evaluate the needs and opportunities for agricultural transportation research. That final report has been published by the U.S. Department of Agriculture, and is available from that agency.1/

The first section of this paper will identify in a straightforward fashion the principal committee recommendations. The final section of the paper will deal with some of the ancillary issues surrounding transportation research, particularly some elements that may condition both the approach to the research and the impact of that research.

Major Research Needs

In identifying research needs, the Committee had the normal difficulty of generating a framework with which to examine the broad and complex problems of transportation for agriculture and rural America. It was finally established that the problems could be examined in the context of three broad areas: Public Policy Research, Transportation User Research, and Transportation Systems Research. Let's examine this research framework, paying particular attention to those areas that appeared most crucial.

Public Policy Research

I. Service Availability in Rural Areas

The nation has recently adopted a policy of rural development. In general, the objectives of this policy are to improve the standards

of living of rural people in the short-run and to facilitate the redistribution of population in the long run. This is to be accomplished by increasing the rate of economic growth in rural areas. Transportation, as a service, is important in rural economic development processes. Yet, there is increasing evidence of selectivity among both regulated and unregulated carriers in providing service to rural areas, with resulting service deterioration and erosion. The problem is to determine policies that will insure adequate service so rural communities can remain viable and make their contribution to our national economy.

The specific needs of this area of research include the following: (a) determine the current status of transportation facilities and services in rural areas, (b) identify the present contributions of private transportation agencies and public bodies to the transportation component of rural economic development, (c) delineate major impediments in utilizing a policy of public services coordinating with private transportation services that have been curtailed or withdrawn, (d) to delineate and evaluate the benefits and costs of alternative strategies (policies and programs) for moving from current to desired rural transportation systems.

II. Government Regulation of Transportation

There currently exists differing degrees of regulation of transportation by governmental authority. More precise information is needed on which to formulate transportation policy regarding the cost and service advantages and disadvantages for both commodities and carriers concerned. The service obligations of regulated carriers need to be reviewed in view of the shrinkage of both passenger and freight service in rural areas.
Particular objectives of this area of research include the following: (a) ascertain the cost and service advantages and disadvantages of the interstate motor and water carrier exemptions to shippers, receivers and carriers of agricultural commodities and supplies, (b) determine the economic effects of state and federal transportation regulations on transportation services available in rural areas, on the development of intermodel systems, and on the allocation of traffic among transportation modes, and (c) assess the benefits and costs of alternative regulatory applications in rural transportation.

III. Transportation Impediments and Subsidies

During the past several decades, efforts have been made on the part of the Federal Government to move in the direction of lowering both direct and indirect subsidies to intercity domestic transportation. Yet these subsidies may, in reality, be adding to net social welfare. Remaining subsidies can, in fact, act as impediments to evolution of an efficient (if that is the objective) transportation system. The more significant impediments exist at the points of interface between different transportation firms and particularly, between the different modes of transportation. Also, since it is necessary that the transportation system examine every component of the total service in order to identify and work toward minimization of such impediments, a wide range of factors must be considered; such as work stoppages, equipment shortages and documentation procedures.

Particular objectives of this area of research include the following: It becomes imperative for research to measure social benefits to the public of government-financed transportation equipment, facilities and rights of way in rural areas, as they pertain to both
surface and air transportation, and to determine the place of subsidies in building better rural and urban food delivery systems. Other effects of transportation barriers and impediments to the United States domestic and foreign commerce must be investigated as well. Examples are state motor carrier size and weight limits; labor strikes in transportation and allied industries; design, size and availability of United States and foreign ships; distribution systems from foreign ports to consumers; etc.

Transportation User Research

Users of transportation are concerned that they receive adequate service at reasonable cost. The attributes of their demands for transportation service have serious impacts on the costs experienced by transportation firms. Similarly, the attributes of the supply of transportation services offered to users have serious impacts on the costs of the users. Among the principal research areas needed, and of particular interest to the users of transportation in agriculture and rural areas, are the following general areas.

I. Impact of Changing Transportation Technology

Transportation has facilitated continuous economic development in the United States, benefiting both the users and suppliers of those services. But, transport is a dynamic function, one that is constantly changing. Agriculture and rural America need to know the effects of changing transportation technology and productivity on individual sectors of our rural economy, both agriculture and nonagricultural. Specifically, the objectives of this section are to provide more information to ascertain the probable impacts on location of agricultural production, markets, and so forth. Additionally, particular attention must be paid to the potential gainers and losers from each
economic reorganization. The trade-offs between user and supplier efficiency will also need to be identified.

II. Transportation Needs of Rural Areas

One hundred years ago our nation was 85% rural and 15% urban. Today, the distribution of activity is 65% urban and 35% rural. This movement of activity has not been without its maladies. Often the individual moving from a rural area and a predominantly agricultural-based occupation, is untrained and unfit for the city life-style and occupational demands. Thus, the problems of poverty, welfare needs, and housing in urban areas are magnified by the shift. This has left the rural areas exhibiting every characteristic of a declining economic region. And, this trend is occurring at a time when the problems of urban and rural America need a balanced growth if solutions are to be found. Hence, the transportation needs of rural areas are two-fold: a spur to economic activity, and a "public service" to the existing rural inhabitants.

Particular objectives of this research area include the proposition that the needs of rural areas, as users of transportation services, must be identified and itemized on a dynamic basis. The needs of the existing agricultural production industry and the agribusiness marketing system, as well as the needs of regional development demands, must be classified as to technical production versus social needs. Underlying an examination of changes should be impact studies specifying the trade-offs between carrier and production efficiency versus the economic and social health of rural regions. In designing transportation systems capable of providing those services needed by rural area users the technical and operating characteristics of the various modes,
the financial structure of the carriers in rural industries, as well as the dynamic nature of the demands for rural transportation, must all be combined to generate the "optimum transportation system."

III. Food Distribution Systems

One sub-sector of the total transportation system of vital importance to the consumer of agricultural commodities is the food distribution system in both urban and rural areas. Yet, at the interface of long-distance movement and local distribution, significant changes in speed of transfers and costs of transportation per unit of volume occur. These possible inefficiencies can hinder the transmittal of effective demand signals from concentrated urban areas back to the producers, thus holding resources from moving to their most productive use. In rural areas with their large proportion of low-income people, an effective lower-cost food delivery system is also a necessity. Research on a food delivery system for spatially-dispersed rural consumers has been very limited, and investments in modernization have lagged.

IV. User-Operated Transportation Equipment

Our nation has historically had large amounts of capital invested in transportation facilities. Agricultural shippers appear not to have exercised their right to use private trucks and barges nearly as extensively as other industries. As increasing freight rates are witnessed, this has placed increasing importance on the question of whether these firms should continue to go to the market place to purchase their transportation services, or develop their own internal transportation service.
In order to entertain the question of whether to buy transportation or provide it at the producing firm's level, it is necessary to ascertain the future availability and cost, on a for-hire basis, of the transportation service being considered. Additionally, general information is needed that will identify the technical capabilities of specialized transportation firms. This material can be combined into a systematic procedure of identifying the relevant variables for each management decision that must be made. This systematic procedure should be general in nature, but allow the specific characteristics of each firm's environment to be considered.

V. Matching Transportation Services with Surge Demands

The cyclical nature of agricultural production has long caused transportation-distribution problems with related costs and wastes. The varying demand for transportation services results from seasonality of production, different production characteristics of commodities, varying demands for these products, etc. The geographically and temporally varying demands for the services of the transportation industry have been met in the past by a continuing supply of transportation services that is greater than average needs justify. However, this condition of excess capacity is changing and the ability of the transportation system to meet surge demands is now being questioned (and yelled at!).

A general, broad examination of the components of demand for transportation services must be undertaken. An inventory of existing equipment in the transportation industry will also be necessary. These preliminary studies will generate data for identifying any excess or shortage of capacity, and under what specific conditions. This will allow identification of needed capital investment and needed directional
communications, as well as identifying the opportunity costs of not equating supply and demand of facilities.

Transportation Systems Research

The third entity besides public policy and users of transportation is the provision of services by the transportation system. A wide variety of firms including agricultural producers and marketing firms provide transportation for agricultural products. If considered as an industry, it is as large and complex as agriculture. So are its problems. The role of publicly supported research in agriculture is to estimate whether the transportation industry will provide services compatible with agriculture's and rural America's needs and their ability to pay. Further research could be directed toward helping carriers in providing that service.

I. Improved Transportation Services and Equipment

While large volumes of agricultural commodities await transportation services, rail and highway equipment may sit idle due to lack of proper scheduling or because the equipment is not considered adequate for the service requested. Substantial problems exist in handling equipment and procedures, in transportation refrigeration and environmental control, in packaging, and in overseas shipment of agricultural products. Deficiencies in these areas result in high cost, substantial losses, and limit existing and potential markets for United States farm products. This suggests improvement must be attained in transportation equipment, handling systems, product protection, etc.
II. Improved Coordination of Transportation Services

In spite of the development of inter-model equipment such as piggy-back trailers, van containers and pallets, agricultural goods are largely trans-loaded at most transfer points at high costs with accompanying product deterioration and losses. Coordination of transportation services should be improved by developing methods of simplified documentation that will reduce the paper work load and permit minimum delays; develop inter-model transportation services so agricultural products will not have to be trans-loaded, but can be moved in the same vehicle; and finally, encourage transportation companies to provide adequate inter-model equipment for agricultural products as needed.

III. Improved Food Delivery Equipment and Methods

Moving food from terminals to warehouses and delivering it to retail stores, food service outlets, or private homes, has been estimated to cost more than half as much as long-haul transport. Yet, little research attention has been given to this section of the food distribution system. As a result, people at the lower end of the economic scale in urban and rural areas have an inefficient distribution system, commonly composed of marginal firms with old facilities and equipment. To improve food delivery systems and methods so all segments of society can have food stuffs delivered promptly, at low cost, and in a manner reflecting the nutrient value of the food, it becomes necessary to devise, develop and demonstrate new equipment and direct delivery systems that will increase efficiency for deliveries to urban and rural communities.
IV. Improve the Transportation System in Rural Areas

Transportation facilities and services in non-urban areas have deteriorated to the point where rail and regulated for-hire truck and bus service in many small towns in rural locations is severely limited or non-existent. Economic and social viability of our rural areas is adversely affected, thus accelerating the migration of rural and small town residents to already overcrowded cities. The lack of transportation facilities has surfaced as a primary problem for older people in rural areas, limiting their mobility and contributing to the social disorientation. It becomes necessary to study possibilities of providing passenger transportation alternatives to the private automobile in rural areas. Work should be done to develop new concepts and organizational forms for servicing the transportation needs of rural America. This work will include the development of equipment designs and demand-responsive routing and scheduling procedures adapted to service in rural areas.

For more complete treatment of the various recommendations covered in this paper, I urge you to write for the Committee report. The complete report examines past and present agricultural transportation research, as well as developing more fully the needs and opportunities for transportation research for both agriculture and rural America, and has served as the major source of material for this section of the paper.

Special Topics Affecting Future Transportation Needs

At this point, I would like to abstract from the specific recommendations of the Committee and examine some topics closely associated to the principal thrust of the research report. These
topics are either relevant to the framework used to identify the research needs or topics that are simply "nouveau" to the present and future concerns of economists working in transportation or agriculture. The first two of these topics are more intimately concerned with the deliberations of the National Committee, while the latter four refer specifically to the topical items of interest. These items will affect not only the need for research, but the approach taken in developing the research topics and projects.

Rural America Versus Commercial Agriculture?

Economists, while working in applied fields such as agricultural and transportation economics, are finally realizing that the problems of commercial agriculture may be distinctly different from the problems of rural America. The same dichotomy established now in our agricultural policy textbooks and writings is evident when we examine the needs of transportation. As the Committee deliberated and discussed research opportunities, it became evident that some members of the Committee thought of transportation needs for agriculture as solely the movement of commodities as efficiently as possible. Others on the Committee pointed out that the transportation function could be a strong aid to mitigating problems of the rural poor, as well as aiding in rural development. It is evident, and I believe the Committee now feels, that transportation can be directed at the people and institutions of agriculture rather than simply at the commodities and associated marketing chains within commercial agriculture. The term Rural America was finally utilized by the Committee, and myself in my own work, to signify that often what is good for commercial agriculture may not necessarily be good for the people living, moving into, or wanting to live in rural areas.
Transportation: Demand Response or Demand Creation?

Recent writings in the area of transportation economics related to program planning and budgeting suggests that although transportation in the 19th Century was regarded as a prime instrument of economic development, today's transportation is designed more as a satisfaction of demand, rather than any conscious stimulation of demand. People writing in this area are of the mind that the role of transportation, since we are now a highly developed nation, is only to respond to the noticeable characteristics of the demand curve rather than try to create or modify the characteristics of that demand. However, it is evident now that transportation, particularly in the area of rural development needs, can not only satisfy existing demands but can serve as the facilitating mechanism to further create demand for its service. This creation can be in the form of increased industrialization in an area, in increased recreation in an area, or in other forms of economic activity reflecting a "higher level of living" for the rural inhabitant.

The Energy Crises, "Again"

Enough articles have been written concerning the energy crisis to make the problems of energy one of conventional wisdom. The crisis is caused by increasing demand for fuel and energy while various institutional and physical factors are limiting the supply and availability of this energy. However, it has been suggested that transportation utilizes up to 30% to 40% of the energy consumed in the United States. The critical question then becomes: What effect will this

lack of energy, higher priced energy, or rationing of energy, have on the transportation function as made available to agriculture and rural America? A recent article in the Michigan State University Business Topics examined the energy crisis, but only relative to the potential revitalizing of the railroads in the United States. I submit that that isn't the important question for the applied agricultural economists. Rather, the important questions are in the areas of the impact of the energy shortage on the users or potential users of this transportation service and not on transportation's internal peculiarities solely. We can quote figures "ad infinitum" as to what form of transportation uses less energy, what form of transportation is most efficient, etc. But the figures we need to know are "Who gains and who loses as energy becomes a rationed item, or a more expensive item relative to servicing the needs of rural people? For example, it has been suggested that a motor truck uses four times as much fuel as a train, a barge or ship uses more than five times as much, and an airplane requires 25 times the amount used by a train to move a ton-mile of freight." The question to be answered by researchers in the area of transportation in rural areas is: What is the impact of this potential modal shift on the users of that service, e.g., Are we to expect to see the exempt motor carrier industry competitively eliminated by a lack of fuel?


V. Environmental Considerations

Who, in today’s world, can write an article and not mention the environment? Seriously, environmental considerations will affect the use of transport as well as methods of approach of transportation economists in about the same manner as energy. Environmental considerations will certainly affect costs of transportation, availability of transportation, and will certainly affect the impact of any potential transportation changes. The most exciting hope, as we examine the environmental and energy problems relative to transportation functions, is that we can expect technological and systems innovation to be generated as a result of these constraints on the transportation system. These may come in the form of hovercraft, cleaner burning trucks and automobiles, but also in the form of increased efficiency of the total transport system.

VI. Grain Distribution System -- Where is it?

Two recent articles appeared in *Business Week*, one on June 24, 1972, another on August 26, 1972, approximately two months apart. The headlines on the first were the following: "No Railroad Car Shortage This Year -- Unlike Other Years, the Roads have Cars to Spare for the Peak Demand Harvest." Two months later, the headlines read: "Grain Exports Head for Traffic Jam -- Big Soviet Orders and a Lack of Controls are Leading to a Freight Car Shortage." I would like to submit that this is not the typical freight car shortage that economists and shippers have been lamenting and analyzing for the last 30 years. In June, in North Dakota, there was no market available for wheat even though there was a price; there was movement through the ports but no grain was to be purchased by the local elevators because they simply
could not move the grain out of their congested warehouses. This may sound like the normal freight car shortage, but the complexities and broadness of this foul-up in the total distribution system is now conventional wisdom.

As we seek to examine the traditional physical distribution system available for grain movements in the United States, it is becoming very apparent that these studies can combine rural America and commercial agriculture into the investigative effort. The problem of no markets available to a farmer is very similar to the fact that many local elevators are now in a crucial capital position because they have not been able to move their grain. Additionally, those shippers who have moved grain into the port facilities and have had to pay per diem on the grain as the box cars sat in somber silence, waiting to be unloaded, are also affected by this failure in the physical distribution system. The net effect is that a blockage or inefficiency in the physical distribution system has evidently been able to destroy the total marketing system in rural areas. It is in this context that the physical elements of a commercial agriculture and the social elements of rural areas are combined into an affected entity.

Transportation and Income Redistribution

Much of the present work in the area of transportation is heavily tinged, and probably rightfully so, with an efficiency criterion as an objective function. Yet, as the transportation function is taken from its typical commodity movement use and utilized as a developmental tool, it becomes necessary that the income distribution effects of this tool be examined. In the transportation literature, in rural development literature, in agricultural policy literature -- everywhere we find a desire to study the impacts on income distribution or redistribution
of various changes in mechanical means of economic activity. Transportation is basically a function that can aid or retard movement toward a desired goal or objective. But it does have the impact of affecting income distributions; as such, it becomes necessary and desirable to examine these impacts in conjunction with the typical efficiency evaluation process.

Summary

This paper has sought to identify research needed to improve transportation for agriculture and rural America. It has summarized the report of the National Committee convened to examine that specific subject, as well as suggest critical variables or topics that can affect that transportation and transportation research. A final thought should be that, as we examine the areas where research is needed, these areas can be couched in terms of needs for research, e.g., from the focal point of the rural inhabitant or commercial agricultural firm, but can also be couched in terms of opportunities for research, e.g., from the viewpoint of the aspiring transportation or agricultural economists in their respective or associated disciplines. The task of people working in this area is to see the needs as opportunities; and as we take advantage of opportunities, we fulfill needs.
Addendum

Members of the Ad Hoc Committee on Agricultural Transportation Research were the following:


William H. Thompson, Iowa State University of Science and Technology, Ames, Iowa, Co-chairman.


Edward S. Kotok, Forest Service, USDA, Washington, D.C.


David E. Moser, University of Missouri, Columbia, Mo.

Roland R. Robinson, Cooperative State Research Service USDA, Washington, D.C.

James V. Springrose, Transportation Consultant, Minneapolis, Minnesota.

Charles Taff, University of Maryland, College Park, Md.