There are few major areas of economic and industrial management inquiry in which we are more limited in solid research results than in the field of transportation. In amount of effort, and to some extent in direction of inquiry and quality of results, our transportation research leaves much to be desired. This is perhaps partly explained by the administered price characteristics of the common carrier segment of the industry. In this segment pricing has been only loosely related to costs, and both management and government agencies have been much preoccupied with regulatory considerations.

This is an industry in which typically the allocation of resources to research activities of all types has been dangerously low. U. S. Department of Commerce estimates suggest that transportation research expenditures by all agencies, both private and public, in 1960 represented only seven tenths of 1 percent of net sales. This includes efforts devoted to technological, marketing and economic problems—the entire range of research and development activity.

According to the same source, 1960 research expenditures for industry generally represented 4.2% of net sales, or six times the percentage allocation in transportation. The real growth industries were spending as much as 7 to 10 percent of net sales on research and development, or 10 to 14 times the percentage devoted in transportation.

Against this background, it is not surprising that physical distribution has been described as "the last great frontier of industrial waste and inefficiency." Nor is this a matter of small consequence. Estimates of the U. S. Department of Agriculture place the nation's annual transportation bill for agricultural products alone at more than 4 billion dollars.

A recent study reported by Distribution Age indicates that for the entire food and food products industry, transportation costs are equal to 17.5% of total net sales. If we include, as we should, all physical distribution costs (including warehousing, materials handling, shipping room and loss and damage expense, but not including sales and merchandising costs), the percentage jumps to 34.4%.

This is a segment of costs which we can no longer afford to pass over lightly, a segment in which, according to one specialist, no more than 15% of the possible economies are now being realized.

Here are some of the reasons why all of us who are concerned with decision-making in agricultural industry need to take a close look at this rapidly changing

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function of physical distribution:

1. There are encouraging signs of the possible introduction of new transportation pricing methods more closely related to costs. Increased use of proprietary trucking fleets has provided a yardstick for judging cost-price relationships not previously available to shippers. The President's recent transportation message favored legislation to extend to all modes of transportation the present agricultural and bulk commodity exemptions from rate regulation. This would have the effect of making transportation rates more sensitive to supply and demand factors. Increasingly economists have criticized time-honored value-of-service and fully-allocated-cost principles of rate making as inappropriate to transportation pricing needs. The possibilities for greater flexibility in transportation pricing make it especially important for us to concern ourselves with the determination of true costs and their relationship to pricing in a freer transportation market.

2. There are more choices open to the shipper among competing modes of transportation and systems of physical distribution than ever before. Not only are services more varied, but there are multiple combinations of cost service relationships which may not be apparent or seem significant to the shipper accustomed to simpler rate relationships. To make intelligent choices among services of varying efficiency and value in terms of his need the shipper needs to be better informed and more discriminating than ever before.

3. Technological innovations and the development of more integrated and closely coordinated physical distribution systems have increased the cost spread between operators of high and average efficiency, and this trend seems to be continuing. This development has increased the incentive toward improvement in transportation and ancillary services; at the same time it has increased the threat from competitors who might undertake similar improvements.

At the University of Missouri, we are currently engaged in a two and one-half year study, under contract with the U. S. Department of Agriculture. This study deals with the educational needs of agricultural transportation and the possible role of Extension programs in meeting these needs. In this connection we recently undertook a survey of the research completed and currently under way in agricultural transportation.

To date, the preponderance of such research has been conducted by the Transportation and Facilities Division and the Market Quality Division of the Agricultural Marketing Service, USDA, and has dealt with physical and biological aspects of transportation and handling.

Some economic research dealing with transportation has been undertaken in the Marketing Economics Division of the Economics Research Service and in the Management Services Division of the Farmer Cooperative Service, USDA State experiment stations have undertaken some work, dealing primarily with problems of more limited
geographical scope.

Significant regional livestock transportation studies are currently under way in the Southern, Western and North Central regions. These research projects represent integrated and coordinated state contributions to regional undertakings. Seven states are participating in an analysis of livestock and meat movement in the Southern region. This analysis involves a study of meat and livestock movements and takes into consideration the volume, direction, seasonal variations and inefficiencies in such movements, as well as the role of transportation costs and their implications for the location of production and processing facilities.

In the West, eight states are participating in a regional project titled, "Economics of Transportation of Livestock and Meats in the Western Region." This study is concerned with an examination of the structure of rail and truck rates which prevail in the movement of livestock and meats, the equity of rates on inter- and intra-state movements, the costs and efficiency of shipping livestock and meats by truck and rail, and the effect of transportation costs on location of production areas and processing centers. The North Central region is undertaking a similar study under the title "Adjustments in Livestock Marketing in the North Central States to Changing Patterns of Production and Consumption." An effort will be made toward combining forthcoming results of the research in the South and West with the North Central region research, with some Northeastern states cooperating.

These regional research efforts certainly represent a stride forward in investigating the economic impact of transportation upon the structure of the livestock and livestock products industry. The results of these studies are being awaited with a great deal of interest.

Most of the economic research by the transportation industry or by the various segments of the livestock and livestock products industry appears to be related to particular problems of individual companies. For the most part, the results are confidential and do not become a part of the general body of research findings. The agricultural community has relied mainly on USDA economic research, and secondarily on that of the state experiment stations and their regional committees for information and recommendations concerning transportation.

While progress is being made in applying research to the problem areas in agricultural transportation, a review of past work indicates that we need to exercise especial care to avoid the following deficiencies and weaknesses in future research activities:

1. The segmented character of the research often limits its application and usefulness. Traffic flow patterns and economic interrelationships of origin and destination points do not recognize the artificial geographic boundaries often set up for data collection and analysis in studies conducted by state, and even by regional agencies. Such studies may also be complicated by
divided responsibility for research design and execution. This may result in conflicting or divergent objectives and methods, thus weakening the results achieved.

Certainly, some research objectives may be satisfactorily achieved in state and regional studies. But projected studies should be carefully scrutinized to determine whether they can properly be fitted within the artificial geographic limits imposed by state and regional boundaries.

Conversely, the temptation is great to impute broader applicability to results achieved from a limited sample. In a recent review of certain transportation studies conducted in the New England and Middle Atlantic states, we noted that the researchers apparently assumed equal applicability of their findings in the Midwest and Far Western sections of the country, where operating conditions and problems are in some respects significantly different.

2. Research results are sometimes questionable because they are based upon unrealistic and inappropriate assumptions. Researchers may err because of lack of first-hand knowledge of the transportation industry and inadequate homework. For example, I have noted researchers have assumed freight rates are directly related to the distances commodities are hauled in instances where such a relationship did not, in fact, exist.

An elaborate study may be built around published rail rates (presumably because they are easy to obtain and remain relatively constant) while the researcher ignores the fact that, in the area studied, the product in question generally may not move by rail but by exempt truckers, at rates which have a considerable seasonal range of fluctuation, depending upon equipment supply and demand.

Researchers sometimes err in assuming that decision-makers are motivated solely by economic considerations and on the basis of full and accurate information. I am reminded of one study of two terminal markets with overlapping territories. A review of comparative trucking rates and ancillary charges drew the researcher to the conclusion that a shipper in that territory would incur significantly lower costs by shipping to the smaller and nearer market. Share-of-market projections were made based upon the assumption that price being equal the shipper would serve his own economic interest by selecting the lower-cost destination. But the projections did not prove out; independent investigation revealed that while the shipper paid the transportation bill, it was, in fact, the truckers' preference that often proved the deciding factor as to where the load would be delivered. The truckers in this area almost uniformly preferred the larger market because of better access roads, more expeditious handling and greater possibilities for back-haul.

There can be little doubt that in real-life situations intangible, non-cost factors often have a determining influence upon shippers' choices among competing
services and markets. But such influences are sometimes discounted or ignored, either through ignorance of their importance, or perhaps because they are difficult to translate into figures that can be fed into the computers.

3. Essential data often are not available to researchers or are supplied in a haphazard manner.

Great reliance is placed upon electronic data processing in current research practices. Truly these computers are marvelous machines, making possible research feats which would have been out of the question only a few years ago. But our computers can only make use of what is fed to them, and they are not very discriminating in sorting the good data from the bad. The training people for one of our leading computer manufacturers have a coined word that aptly points up the problem. The word is GIGO, which stands for Garbage In -- Garbage Out.

You people in industry have available to you in the land-grant universities and colleges a research resource of great value and potential. But to make the most effective use of this resource you must concern yourselves with the research which is to be undertaken and cooperate in obtaining adequate and accurate data. Without such data acceptable and useful research results are hardly to be expected.

4. Strict commodity orientation of transportation studies may sometimes be a limiting factor in achieving acceptable results. For example, exempt agricultural and bulk commodities are widely used in the trucking industry as back-haul to help defray the cost of moving equipment back into position for head-haul loads. Under these conditions, the interplay of seasonal supply and demand for the various commodities which might be used for this purpose have an important effect upon the availability and utilization of equipment at a given location and point of time. Consequently such interplay has an effect upon the freight rates which may be secured by shippers of the various exempt commodities involved. Under such conditions, a study devoted to shipping costs for a single isolated product, without reference to the interplay of other commodities and shippers competing for available equipment, can bring about research results which are partial and misleading.

5. The tendency to look at transportation costs "in a vacuum," without reference to the other related costs of physical distribution, can be misleading.

Changes in transportation methods and services may have important effects upon inventory levels, and upon warehousing, packaging and handling costs. In a recent case the introduction of new specialized transportation equipment and services resulted in a 7 percent increase in transportation costs but greatly reduced packing and handling costs at origin and destination. The net over-all physical distribution saving to the shipper was 12 percent.
We researchers recognize that physical distribution is a single integrated and coordinated whole; that the activities of transportation, warehouse operations, inventory control, order processing, customer service, material handling and special packing are interrelated and must be considered in terms of the interaction of one function with another. This explains why we sometimes request information which does not seem closely related to the immediate problem under review.

6. Greater efforts should be made toward application and utilization of research results.

Despite any impression to the contrary which I might have given earlier, a considerable amount of useful research has been done in the field of agricultural transportation, and more is in the mill. During my years of service in the transportation industry, I had occasion to note over and over again our failures to make intelligent application of research results which were available for the asking from USDA and land-grant college sources, covering a wide range of traffic and transportation problems. My primary reason for returning to college extension work was to do what I could to help correct the deficiencies in communication which have given rise to this unhappy condition. The pilot study of extension educational needs and opportunities in the field of agricultural transportation now under way at the University of Missouri is an approach toward improving communications between the agricultural transportation sector and the researchers. We hope this will ultimately bear fruit in directing research resources more unerringly to the critical and continuing problems of transportation and in bringing about a fuller utilization of these research results. This is an objective to which we all need to apply ourselves with energy.

We have a multitude of problems involving physical distribution in the livestock and livestock products industries and a variety of research resources which may be applied to these problems, but as a team we are not too well coordinated in applying these tools to get the answers we need. Both researchers and the industry share responsibility for this condition, and I am sure there is a disposition in both groups to move toward correcting it. Here are some suggestions of how industry representatives can be especially helpful in bringing about a more effective team relationship:

1. Keep state experiment station researchers, regional committees, and USDA personnel informed as to problems on which the industry could use research help.

2. Work cooperatively with researchers in shaping the research design of studies undertaken to assure practicality in terms of data to be collected, methodology and usability of results.

I understand that North Central packers and researchers have recently moved in the direction of setting up machinery for closer coordination. At a terminal livestock market forum recently on the University of Missouri campus attended by terminal market, extension and research personnel from 22 states, consider-
able attention was given to ways of getting better communication between the markets and the colleges in the interest of more needed research and extension programs. These are certainly steps in the right direction, and it is to be hoped that we will see more of this kind of cooperative effort.

3. Assist in obtaining funds from both public and industry sources for more effective basic research.

4. Take care to assure accuracy and adequacy of data provided by industry to meet requirements of jointly-approved research objectives.

5. Work with land-grant college and USDA research and extension groups to achieve the fullest possible utilization of research results.

It would be helpful to have a similar list of suggestions from industry, spelling out what researchers could do to improve the climate for cooperative effort between the two groups.

A highly competent transportation researcher recently said to me, "Business men think we are hard to talk to. But they have much to gain from really competent research, and we must learn to communicate if we are to turn out an acceptable and useful research product. It will take repeated contact to break down the communications barriers between us and to develop the kind of team relationship that is needed."

Here is an undertaking to which we should all apply ourselves in the interest of providing the physical distribution research findings so sorely needed as an undergirding for sound management decisions in the livestock industry.