IMPLICATIONS FOR CHANGES IN AGRICULTURAL PRODUCT MARKETS
FOR FARM MANAGEMENT AND MARKETING RESEARCH

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The marketing system for agricultural products is large, complex, and highly dynamic. Despite continuous efforts of universities, research consultants, and market analysts, the marketing system has never quite reached a state of equilibrium with its environment. The pursuit of an equilibrium price by the forces of supply and demand is rather like the pursuit of a rabbit by a beagle. The position of the rabbit at any moment is the equilibrium position of the dog. By the time our beagle reaches the rabbit's original position, the rabbit is no longer there and the dog moves off in a new direction toward a new equilibrium position. If we were to watch only the dog, his movements would seem very erratic and unpredictable. If we gain sufficient perspective to see both the dog and the rabbit, the causality behind their actions becomes obvious and we discover the motivation that keeps them going. Our task as researchers is to study the behavior of this "rabbit" and plan strategies which will help our "economic beagle" to come closer to being in the right place at the right time. One of the problems is that the researchers are often far behind in this race. Not only have they lost sight of the rabbit, they can't even see the dog. They have on occasion devoted too many resources to the finding of an equilibrium position which even the dog has long since passed—solving problems already resolved by industry. I interpret the task of this activity to be the examination of some of the changes that are occurring and that might occur, and to suggest research areas that could provide answers to the problems of real concern to individuals, firms, industry groups, and society.

The scope and magnitude of recent changes in the product markets could be illustrated in many ways. One could look, for example, at the number of new products coming on the market. General Foods introduced over 50 new food items in a single year. Campbell Soup marketed only 44 items in 1955 but over 300 in 1965. Of the 72 new products which Borden & Co. placed on the market during a recent two-year period, 83 percent were considered successful and thus influenced the distribution of the consumer's dollar.\(^1\) Many of these developments result in a

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different allocation of resources for producers of raw materials and a different organization of the market, as well as a different pattern of consumer expenditures.

Alternatively one could identify the changes, and implications of changes, in the concentration ratios and other structural variables of the various industries processing and marketing food. In 1937, the four largest firms accounted for 24 percent of total shipments of canned peas. By 1958, this share had increased to 53 percent of the total. The 40 largest chain stores accounted for 24.7 percent of total sales in 1948. By 1963, this share had increased to 36.1 percent of total sales.2/

A third alternative would be to examine the changes in buying practices and pricing policies of various firms in the market channels for food products. Under this heading one could examine integration in the livestock industry, or the use of private label products in food retailing, or recent anti-trust action against agricultural firms including 25 suits against the dairy industry and 12 against fruit and vegetable processors in the last 15 years. Without developing these examples in detail, I would like to start by describing change under four general headings, discuss some important examples of each category, and finally discuss the implications of these changes for researchers in farm management and marketing. The four classes of changes are:

1. Changes in buyer-seller relationships
2. Changes in consumer tastes and income
3. Changes in governmental policy
4. Changes in technology of production and processing

Changes in Buyer-Seller Relationships

During the past 100 years the development of mass distribution techniques and greater specialization have moved the final consumer farther and farther from the point of production in terms of time, form, and space. More recently, the increased size of producing units and horizontal growth of food marketing firms has made it more economical to purchase direct from producers or at least from the point of first assembly. All national, most regional, and many local chain store organizations today operate on an integrated warehousing and distribution system. Each retail store is serviced by the wholesale plant of the

parent firm. There has been a subsequent decline in the need for whole-salers in the industry and an increase in direct purchases. With increasing horizontal mergers, direct purchase is also increasing among restaurants and cafeterias. Associated with this change in the market channel has been an increase in specification purchases or the so-called prescription buying, where variety, grade, size, and pack of a commodity are specified in the purchase order prior to loading. In many instances the product is graded, packaged, and crated before it ever leaves the producer.

Contracting of many of the specialty crops is another approach to specification buying in which the processor or marketing agency is able to control the quality characteristics of the product. Tomatoes are a good example. Many processors obtain all their raw product under producer contracts which specify variety, size, maturity, and quality. Since acid content is important in catsup and juice, these processors control acidity of their product in different geographical areas through their contracts by specification of the variety to be grown.

Buyer-seller relationships also include changes in the power structure between processors, distributors, and retailers. Changes in size and specialization of these firms have altered the marketing channel and the relative bargaining position of processor and retailer. The milk industry provides an excellent example of this change. In 1931, only 14 percent of all ice cream was sold through food stores;\(^3\) by 1965, 54 percent was sold through food stores.\(^4\) A similar change has occurred in fluid milk. In 1930, 94 percent of the fluid milk was delivered direct from plant to the consumer; by 1944, this had dropped to 36 percent \(^5\) and in 1965, only 28 percent was home-delivered. The other 72 percent was delivered wholesale—primarily to food stores.\(^6\) This change has provided food chain stores with increased power in the market. Most national chain stores obtain dairy products for a large number of their retail stores from a single supplier. The threat of losing a sale of this magnitude exerts a significant influence upon the practices and policies of the supplier. Smaller dairies are either unable to provide sufficient volume, do not carry a full line of dairy products, or are reluctant to commit their entire

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\(^{3}\) Robert E. Jacobson, Roland W. Bartlett, The Ice Cream and Frozen Dessert Industry—Changes and Challenges, University of Illinois Agriculture Experiment Station, No. 694, p. 19.


\(^{5}\) Roland Bartlett, "Chicago People are Drinking More Milk," Illinois Farm Economics, CXCIV (July, 1951), p. 1192, Table 2.

supply to a single customer. A shift from one dairy processing plant to another for the regional needs of A & P could have a serious effect not only upon the processing firm but on the producers supplying milk for the plant. This power relationship in ice cream has encouraged many small processors to open retail ice cream stores as they seek a stable outlet for their product which will not jeopardize their economic position through dependence upon a single customer.

Vertical integration and contract production will be discussed in several of the other papers in this series, so I shall describe only one such change that has particular significance for product markets. This is the introduction of live cattle futures contracts in November 1964 and the live hog contracts in February of 1966. Both of these represent an innovation in marketing and pricing distinct from the traditional futures trading in products such as grain or pork bellies. Futures trading in livestock is a new concept in the sense that its function is the shifting of price risks on goods in the process of production rather than on a given inventory of storable goods. When used by producers, the live cattle futures contract is a system of forward contracting stabilizing the selling price to the producer prior to putting the cattle on feed. This futures market is not a means of allocating a given inventory over time but a means of reducing uncertainty for individual producers in the allocation of resources among various production alternatives. Unlike the traditional futures contract, a production futures contract is written for a commodity which cannot be stored. These contracts have gained acceptance and apparently will be a factor in future production and marketing. The volume of trading during the first full month of operation of the live cattle futures was 1,386 (December 1964); one year later, December volume was 14,086 and in December 1966, total volume traded was 17,082. Open interest reached a high of 665 in the first contract (April 1965 delivery) and a high of 5,173 in the April 1967 contract. Hog futures are operating on a much smaller volume and have not yet shown any strong upward trend.

No information is available on the users of these contracts—whether producers, packers, or speculators. There is some indication that producers are in the minority. This may be partly explained by the number of cattle feeders (especially smaller ones) who cannot justify the time required to learn to use the futures market successfully. This suggests a need for a program in which the futures market can be translated into a simple, guaranteed, cash price at a given point in time. A national meat packer has introduced such a contract under which the cattle or hog feeder is quoted a specific price for livestock delivered to the plant at an agreed-upon future date. The packer then hedges this sale in the option month corresponding most closely to the time of expected delivery. The palatability of the contract to producers is increased by an advance of $25 per head of cattle and $5 per head for hogs at the
time the contract is signed. The primary objective of the packer is to guarantee and stabilize his supply of slaughter stock. While the offer has been accepted by relatively few feeders at this time, interest is increasing and the goal is to have 20 percent of the total kill delivered on contract. The advantages and disadvantages of such a contract to producing and processing firms, and the ultimate effect upon the market system, is an important area of concern.

Changes in Consumer Tastes and Income

Let me define consumer tastes and income broadly enough to include the export market as well as the domestic market. For many commodities the changes in foreign demand far exceed the significance of changes in the domestic market. As the volume and value of exports have increased, the tone of foreign trade has changed. Formerly, foreign markets were the residual claimant for excess production of any commodity, grade, or quality that was found to be surplus. Present emphasis is shifting to production specifically undertaken to meet foreign requirements. Changes in quantity and quality demanded for export have been passed directly back to the producer and are influencing production decisions. One and one-fourth million bushels of an edible soybean called Kanrich were exported through Mitsui Grain Company to Japanese markets in 1966. These were purchased from producers, through local and sub-terminal elevators in central Illinois under a contract guaranteeing a 20¢ per bushel premium over the market price for soybeans. This market has developed in only the last three years to meet the increased demand and declining supply of edible beans used for production of miso in Japan.

A similar market exists for Hawkeye soybeans for producing tofu for sale in Japanese stores. A premium of 5¢ per bushel is paid for soybeans of this variety meeting quality and purity standards. Most of these beans are assembled, inspected, and cleaned on an in-transit rail rate to New Orleans or Baltimore. Barge transportation is not used since it would involve additional handling and subsequent breakage. This market is not a residual claimant for soybeans but is a demanding market which commands a resource allocation completely different from the domestic demand. More and more of the foreign markets are being based upon such requirements and are thus influencing production and marketing.

Even the increased volume of exports is a change of importance for research. Total agricultural exports which were only $2.9 billion in fiscal year 1953-54 reached $6.7 billion in fiscal 1965-66. One-fourth of the nation's harvested acreage produced for the export market in 1965-66 compared with 9 percent in 1953-54. The increase includes considerable shift in relative importance of various products. Soybean exports have increased from 57.3 million bushels to 252 million bushels.
during the last 12 years, mostly to Japanese markets. Fruit and vegetable exports are increasing rapidly due in part to the feasibility of air shipments to northern Europe. Exports of meat have risen by 84 percent accompanied by an increase of 71 percent in numbers of breeding cattle since 1959.

The trend for most products has been toward development of foreign markets at competitive price levels. Much of this has been a result of private company promotion abroad. Some 45 U.S. trade and farm groups operating in 70 different countries are actively cultivating the consumers of U.S. products in other nations. In-store promotional activities are having a significant effect upon consumer attitudes in western European countries. One hundred twenty-nine firms exhibiting at trade fairs in Belgium and Germany reported over $4 million in actual and expected sales in 1965.\[7\] Another factor explaining changes in volume and kinds of exports has been the rapidly rising levels of living in the land-scarce, high-income countries of western Europe and Japan. Higher per capita incomes enable these people to increase their purchases of meats, feed grains, fruits, and vegetable oils. More and More U.S. production is allocated toward satisfying the desires of foreign consumers. As the export market increases relative to the domestic, it will have even greater impact upon varieties and cultural practices of producers, and upon merchandising, packaging, transportation, processing, and pricing practices of the marketing firms.

Without taking time to develop them in detail, I would like to mention two other areas of change whose importance warrants more space than I shall devote to them. The increased leisure time of rural and urban residents has resulted in a rapid growth in the demand for recreation facilities. Current expenditures for leisure are estimated as high as $35 billion and are expected to more than triple within 15 years. The kind and quantity of this demand cannot be adequately met by the National Park System. Private lands must assume an important role in providing facilities for camping, fishing, hunting, etc. The land best suited for such uses is in the hands of farmers.

Changes in the food consumption patterns in the United States have also exerted an influence upon marketing channels and the allocation of production resources. Shifts among products as indicated by per capita food consumption are indications of changes in tastes and preferences as well as responses to changes in prices and consumer income. The effects upon various products and product forms have varied widely. Per capita consumption of frozen vegetables increased by 43 percent in the last 10 years, while fresh vegetable consumption declined by 6 percent. Per capita consumption of broilers increased

by 70 percent in the last 10 years while consumption of eggs has declined by 16 percent.$^8$

With domestic consumption becoming less a function of "needs" and more a function of "wants," and given the impact which merchandising and promotion exerts upon consumer desires, the future changes in consumption patterns may be even greater.

Changes in Governmental Policy

I shall mention only briefly the changes in governmental policies and programs. To cover the numerous changes and their broad implications would require all three days of the conference. I also anticipate that other papers in this series will discuss some of the changes in government action and policy and their implication. I will suggest only two examples to illustrate the importance of policy to agricultural product markets.

Government policies of the United States and other countries largely determine the "rules of the game" under which agricultural products are exchanged in the domestic and foreign markets. As these rules are changed, adjustments are required of the firms in the industry. Most of these adjustments are non-Pareto better. When CCC stocks were drastically reduced in 1964 and 1965 the income for grain storage firms reached such low levels that many firms were forced out of business. Adjustments in storage rates and capacities are still in a state of flux as a result of the distortion of storage charges under the government storage program.

Many changes have occurred in trade barriers within and between countries which have altered the available markets for agricultural products. The European Common Market activities and negotiations, Public Law 480, bi-lateral trade agreements, and export subsidies on wheat are a few examples of these changes. They have had an impact upon all phases of the marketing and production of agricultural products.

Changes in Technology of Production and Marketing

The impact of technology has been a problem of economic importance throughout most of the history of economic thought. With technology increasing at an increasing rate it becomes ever more difficult to evaluate

requirements of future adjustments. It is difficult to separate technological changes from the institutional and structural counterparts required to utilize the technology. Therefore, the examples discussed under this heading could logically be called changes in market organization or put under any of several other appropriate subtitles. Professor Dahl has already referred to one of these changes which is revolutionizing the grain industry. Field shelling of corn has created a serious imbalance between the marketing resources for drying, handling, and storing grain on the one hand and the demand for services on the other. The percent of corn field shelled in Illinois rose from 6 percent in 1960 to 57 percent in 1966. The resulting changes in the marketing channel and in the services required have had diverse effects upon the returns to resources. Changes in returns to scale, locational advantage, and transportation rates, have left many elevators with excess resources receiving low or negative marginal returns while similar resources of other firms are receiving short-run economic rents. Some facilities are expanding rapidly while other elevators in the same geographical area are closing due to low returns to labor and capital. Yet the chaos in the grain trade is not entirely attributable to field shelling of corn. The trend toward increased off-farm marketings was under way before field shelling, and greater demands were already being placed upon elevator and transportation facilities. The rapid increase in grain exports would have created handling, storing, and transportation problems even if there had been no field shelling. These changes have placed tremendous pressures upon a marketing system unable to adopt new technology rapidly enough to accommodate demands of producers on the one hand and the demands of the domestic and foreign markets on the other hand.

Technological changes in processing and marketing have also had an impact upon agriculture. Freeze-drying, instant foods, and new products by the thousands are all part of the technological changes which have occurred in agriculture and agricultural industries. I would like to select only one of these changes for detailed discussion. It has already been mentioned, but I would like to carry its implication a little further. The development of spun protein fibers from soybeans has opened new vistas for edible products from grains. Although originally introduced on the market with the characteristics of meat, the form, shape, texture, and flavor of many other foods can be duplicated. With proper additives it may become pecans or walnuts, apples or oranges, beef or bacon. Adequate supplies of synthetic amino acids, vitamins, etc. are available to permit duplication of the nutritive value on nearly any food. While soybeans are deficient in the sulphur-containing amino acids, the addition of albumin and some synthetic products gives Bontrae (one of General Mills' new spun soy products) a protein efficiency ratio nearly equivalent to that of casein. Although current prices of many of these
products are relatively high, the economics of production are such that the cooked, ready-to-eat product could be delivered in quantity to manufacturers of pot pies, T.V. dinners, etc. at a cost of 35¢ to 50¢ per pound compared to cooked, boneless chicken at a cost of 85 cents to $1.05 per pound. The efficiency with which animals convert vegetable protein to meat protein is estimated at about 15 percent. The protein yield of the spun soy process is about 85 percent.\(^9\) Stated another way, one acre used to produce meat will provide protein requirements for one man for less than 250 days. One acre of land in soybeans will provide protein for one man for 2200 days. The limiting factor is not cost nor nutritive value but consumer acceptance.

Another technological change is the development of high lysine corn. The discovery in 1963 that a mutant gene increased the lysine content of corn, opened the door to the development of genetic strains with protein levels and a balance of amino acids tailored to particular species of livestock. Preliminary feeding trials indicate that high lysine corn is equivalent to a corn-soybean meal ration for hogs. Another mutant gene produces a different balance of amino acids more nearly meeting the requirements of poultry. In field tests at Illinois in 1966, in 17 paired comparisons the high lysine plots produced an average of 85 percent of the yield of normal corn. A few hybrids reached 90 percent of the yield of normal corn. Agronomists anticipate pilot production on farms in the early 1970's. Some seed corn companies are on a crash program to obtain stabilized strains of high-yielding, high-lysine corn to meet the anticipated demand. The impact on the corn, soybean, and livestock industries may be felt within a very few years and pressure is already building for research to help improve the adjustments. Technologically, we have barely scratched the surface of nature's secrets and have a very limited concept of their implications for the future.

Implications for Research

The examples that I have discussed include only a very small segment of the total picture of change in the market for agricultural products. However, these examples will serve to illustrate the kinds of research needed to facilitate adjustment to this changing economic environment. I shall not attempt to specify projects but only to describe some general problem areas suggested by the various kinds of changes.

Implications of Changes in Buyer-Seller Relationships

The increase in prescription buying and forward contracting by chain stores and restaurants has altered the traditional market channel and provides an opportunity for decreased marketing costs as physical movement and handling of the product is decreased. The magnitude of potential cost reductions and the effect upon over-all efficiency of marketing has little empirical substantiation. The contribution of additional market performance studies in this area would be enhanced by relating the changes in efficiency and costs to the distribution of income and the level of consumer prices. Producers need additional information on the relative costs and returns from such an organization of the market and on the implications for the location of decision making in the integrated production-marketing structure.

While retail firms have been integrating back through wholesale and processor stages of marketing, many processors have integrated forward into retail distribution. The effect upon both costs and efficiency and the research needs are similar in both cases. However, the impact upon consumer prices, the changes in income distribution, and the effect of market regulation may be quite different. In 1964, a study of 131 milk markets scattered over the United States showed gross margins varying from 5.1 cents to 14.9 cents per quart. Many of these differences were attributed to the introduction of small, low-cost, cash-and-carry dairy stores. The growth of these high-volume, low-margin stores is restricted to markets where retail prices are not regulated by state marketing orders. Where state law establishes minimum retail prices, there is no opportunity for such market innovation. Research is needed not only to determine the optimum "rules of the game" under which innovation and efficiency are encouraged, but to determine the effects upon producers and consumers of alternative organization of the market.

One of the most intriguing areas for research of recent years is the development of the futures market for live cattle and hogs. Until 1964, it was generally accepted that one criterion for a successful futures contract was that the commodity be storable. The relatively stable return to storage derived from hedging grain in the futures market helped establish order in these markets. Now a contract has been written for a non-storable commodity enabling hedging of a product not yet produced. The purpose or function of the contract for live cattle is very different from that of the contract for grain.

What will be the effect of this market innovation on the livestock industries? Research needs to begin with a serious gap in our factual information. There is no data on who uses the cattle and hog contracts, who are the longs and shorts, what is the volume of trading by producers,
processors, and speculators, or how the gains and losses from this zero sum game will be distributed. These additional data are necessary for adequate performance of the speculative function. Once some data are available, the research potential is unlimited. At the producer level: What is the effect upon optimum size of enterprise? How can the futures market be used to maximize producer returns? Does this alter the relative profitability among grades of cattle? Should the contracts cover a longer period of time to carry the price back to a basic production decision period? How will calf producers be affected? Similar questions are relevant for packers.

Looking at the market at an aggregate level, there are questions of effects upon price stability, seasonal and cyclical fluctuations in production, and the determination of daily prices. Price stability in livestock marketing may be achieved by government regulation, by vertical integration where a few firms may dominate production and sale, or by forward contracts formalized into a futures market. Policy research is needed to help agriculture evaluate these alternatives.

A starting point for such research would be a survey in cooperation with the board of trade, of the users of the live cattle futures. This would identify hedgers and speculators, the positions they have taken in the market, the size of their open interest, their profession, and the profit or losses associated with their use of the futures market. Risk models have often been discussed in the literature but have seldom been employed in empirical studies. A supply response estimate based upon risk differences when cattle production is hedged could be tested by following the cattle production records of hedgers and non-hedgers over time.

The use of the futures market as a means of contracting between packers and feeders raises additional questions. There is already some evidence that this will affect lending practices and limits. The cash advance will certainly affect the capital position of the producer. There is a need to identify the characteristics of producers using the futures markets directly, relative to the characteristics of producers selling on contract to a third party who then uses the futures market to hedge his advance purchase. How will these alternatives affect the individual producer and his production and marketing decisions? How will the rate of technological adoption be affected? What is the new equilibrium size of producing units?

Meat packers using contracts based upon the futures market for live cattle and hogs could provide the data necessary to estimate the effect of this market change upon their total supply of livestock, upon the variability of their daily slaughter, and upon the costs and returns for marketing and processing.
The development of direct buying, contract production, and vertical integration increases the difficulty in obtaining price and quantity information for the product market. A smaller volume moving in regular market channels results in less reliance upon market forces to establish prices. The usefulness of statistical records of market transactions is diminished since they may cover a small proportion of total sales. The ability to evaluate price and quantity movements is hampered by a lack of data on transactions that take place internally within a single firm. Additional research is needed to determine better ways of obtaining data for these products and of evaluating the market forces which establish prices on products moving through an integrated market channel.

Implications of Changes in Consumer Tastes and Income

A change in consumer tastes is another way of saying a shift in the demand curve for a given product or product group. This shift in the demand curve in the export market is the result of many factors. Most of them have been rather poorly identified and seldom quantified. A few studies have been initiated but many more are needed in the area of price and income elasticities as well as potential supply response. There has been some research by commercial firms on developing advertising and merchandising techniques oriented specifically toward foreign markets but there are many unanswered questions. There is even opportunity for some analysis of governmental policies and actions which alter the effective demand of various countries and for an analysis of the results of such actions upon the demand curve of different products.

Many spatial equilibrium models have taken export as a fixed quantity since it has been such a small proportion of the total. When volume of trading increases as it has in soybeans, for example, the solution to these models cannot be realistic unless the foreign demand is included as one of the trans-shipment points. At the micro level, the increasing demand for a specific quality and quantity for export markets—particularly where price premiums are offered—will result in a different optimum combination of enterprises. Continued research on new products may identify additional opportunities for exporting U.S. agricultural resources. Orientation of production toward specific export markets means a shift in resource allocation with implications for producers and consumers.

Shifts in the demand curves of U.S. consumers have also had an impact upon prices and quantities of many products. Conceptually,

For example see, Nixar Osman, W. R. Morrison, and L. D. Bender, Factors Affecting the Estimated Future Foreign Demand for Soybeans, Agriculture Experiment Station, No. 712, University of Arkansas, May, 1966.
the problem is to differentiate empirically between movement along the demand curve and a shift of the curve. Blaich has used a strength-of-demand concept to estimate the direction and magnitude of the shifts in demand curves for 120 different food commodities. This is a comparison between two points in time. There is a need for additional refinements to identify some trends in these shifts and also to identify the changes in price elasticity over time for certain categories of foods. Spatial equilibrium and production feasibility studies are in general suffering from a lack of information on elasticities and trends in elasticities in their estimates of optimum resource allocation and trade among regions.

The increased leisure time of society provides a booming recreation market with a very hazy set of demands. Farmers have little experience in selling this vague service to a fickle public and most agricultural technicians are no better prepared than the farmers to deal with these problems. There are very serious management deficiencies and little research available as guides. An ERS study indicated that only 60 percent of the recreation enterprises surveyed received any returns to management and family labor if a 5 percent return on capital was assumed. Most farm record systems now in use are inadequate for evaluating the returns from the recreation enterprises. At the aggregate level, research is also needed to project the impact of increased farm recreation upon the demand for land resources.

Implications of Changes in Governmental Policy

Export markets for our products are a function of our domestic agriculture and trade policies, policies of importing nations, and the policies of exporting countries competing with the U.S. It is imperative that researchers in the area of foreign trade be familiar with the past, present, and future of price support programs, tariff barriers and nontariff barriers of all countries involved in the export and import of any given commodity. Additional research is needed to analyze the implications of these policies with respect to the U.S. markets abroad. The research should be a two-way street—looking, on one hand, at the effects of various policies upon U.S. agricultural trade, and on the other hand at the implication of our trade for changes in our domestic and foreign policies. Some good work has been done on tariff barriers and there is adequate economic theory available with which to study various tariff models. Of equal importance however is the field of nontariff barriers such as marketing monopolies, quotas, restricted importing periods, bilateral agreements, health regulations, compulsory mixing of domestic with imported products, and special import taxes.

A good illustration of policies affecting exports may be found in the U.S. Maritime regulations. Public Law 664 requires that 50 percent of the goods sold by U.S. for export must be carried on American ships. As a result, the price of American wheat delivered to the Black Sea ports in 1963-64 was increased an estimated $3.00 per ton. We have not sold any significant volume of wheat to Russia since. This shipping policy has certainly affected the markets for our agricultural products.

Institutional or nontariff barriers of the trading nations must be considered in any evaluation of change in product markets. Although consumer demand and income levels in other countries may suggest a market for U.S. products this demand is severely restrained by institutional restrictions such as the requirement by the West German government that margarine manufacturers buy rapeseed oil equivalent to 5 percent of the total oil used. Similar mix requirements are found for tobacco in Australia (40-43% of the leaf must be domestic), New Zealand, and West Germany. In Belgium, imported wheat is restricted to 30 percent of the total wheat used in the milling industries. Health regulations have been effective in controlling European imports of live poultry and breeding stock from the United States. The effects of these and similar regulations on exports, imports, and income of trading countries can be readily hypothesized with the available economic models. However, the empirical work has been very inadequate for testing these models. Marketing and policy research must be coordinated for the goals are interdependent. Neither governmental policy nor allocation of products among markets can be taken as given in any realistic evaluation of future trade among countries.

Implications of Technological Changes

Technology and innovation are continually shifting the balance of power among firms and redistributing incomes and market shares. These wheels of change grind one firm out of existence while carrying another to new heights of power and profit. Innovation and incidence of technological change is therefore an area of considerable importance in the research efforts of land grant universities as they seek to improve adjustment in various industries.

Production, harvesting and transportation technology in the grain industry in the past ten years have resulted in a rather drastic reallocation of resources. The adjustments are still a long way from equilibrium as evidenced by the high rate of expansion of facilities and the mortality rate of firms. High priority research areas include the optimum distribution of drying and storage facilities among farms, country elevators, terminal elevators, and processors. Related to this, and perhaps drawing upon these results, are studies which will
answer the question of the optimum number, size, and location of grain facilities. For the individual elevator firm there is a need for information on costs, returns to scale, and market opportunities. In many cases an integrated approach by farm management and marketing would greatly enhance the value of the results.

In the area of transportation there is only limited information of fixed and variable costs, alternative modes of transport, optimum combinations of truck, rail, and water, services desired, and competitive rate structure. Box cars have given way to open hopper cars, Big John hoppers and even a Whopper Hopper. Data and research on these changes and their costs are basic to a study of grains and most other agricultural commodities involving transportation.

New products are difficult to research for we cannot foresee clearly the future events, and the data are very limited on recently introduced products. Research can be initiated on consumer acceptance, range of substitutability, price and income elasticity and cross elasticity of demand for new products introduced on the market. At the producer level there is a need for an inter-industry study of the effects of new products such as the spun soy protein on resource allocation, prices, volume of production, supply response, and alternative resource use.

While U.S. consumers are adverse to diets based upon nutrient requirements, there may be some opportunity for looking at the demand for food in terms of nutrients, subject to certain minimum restrictions on diet, tastes, and availability. For example, a linear programming model is already in use at the Sara Mayo Hospital in New Orleans which takes into account nutritional requirements, popularity of individual items, frequency of their request, and total cost of the diet. This model could be expanded to include intermediate products and competing industrial demand for agricultural production. Basic resource requirements within the model would include land, labor, and associated factors of production such as fertilizer, livestock feeds, chemicals, and equipment. Nutrients would be obtainable from high lysine corn, spun soy proteins, and other developing products. Data are available for many of the coefficients of this model although resource requirements and nutritional contribution of some new products may require additional research. The primary limitation is the size of such a model although recent expansion and changes in computers and programs could handle the data. Appropriate restrictions would include consumer preferences, demand elasticities, and rate of new product development and acceptance. The information

obtained from shadow prices and opportunity costs would probably have more direct application than the resource allocation of any particular solution to the model.

One change of importance to researchers has been implicit throughout all the examples I have used. We can no longer be satisfied with restricted pieces of research pursued independent of the rest of the industry or economy. The various segments of our marketing and production systems have become so interdependent that any meaningful economic research must be done in the context of the total environment. Improved tools and techniques facilitate a systems approach and we must accept this challenge.

The research needs which I have discussed have been given no priority. Their relative importance depends in part upon the researcher's frame of reference. Rather, I have tried to indicate the magnitude and diversity of the problems that do exist--real problems, whose solutions are anxiously awaited by industry; specific problems, whose solutions can be directly applied; methodological problems, whose solutions will provide tools with which to tackle more difficult problems in the future.

In closing I would like to refer back to the analogy with which I introduced the search for equilibrium. Some economists in their zealous attempt to help the beagle, are quite willing to shoot the rabbit. This may be effective in reaching equilibrium but it will also end the chase. The fallacy of such an approach to problems of adjustment is that economic growth depends upon the chasing, not upon the catching. A dead rabbit is also a stagnant economy.