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AGRICULTURAL ECONOMICS BEYOND THE FARM GATE*

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Introduction

The industrialization of American agriculture during the past three decades has diminished farm numbers and the farm population. While total agricultural production has increased, the input, finance, service, processing, transportation, and distribution industries surrounding production agriculture have now become the dominant economic components of the food and agriculture system. The transformation of production agriculture from a major economic sector of the United States economy to minor status has been in progress since the founding days of the Republic, but has received impetus in the post-World War II era via the technological revolution involving mechanical, chemical, biological, and managerial innovations on the farm. What has emerged from this process is a highly interdependent subsystem of the United States economy for providing food and fiber for consumers at home and abroad.

Agricultural scientists, including agricultural economists, have tended to place undue emphasis upon the technological, economic, and social aspects of production agriculture as the food and fiber system changed over time. While public investments in research and education for the production side of agriculture are admittedly inadequate, the lack of attention to the technological and economic problems of the balance of the food and fiber system is deplorable. In terms of value added, employment, or other measures of economic importance, the food and fiber system beyond the farm gate is roughly twice that of production agriculture. More significantly, productivity and inflation problems beyond the farm gate have affected national economic performance more persistently than gyrations in the farm economy per se.

The overall purpose of this paper is to challenge agricultural economists and policy makers to think about some important issues facing our contemporry economic system. This emphasis does not mean that farm production economics is unimportant or unnecessary. It is argued, however, that changes are needed within the agricultural economics profession to deal with a large number of significant economic problems and concerns beyond the farm gate.

The Setting

Proposition

Society will receive significant net benefits from increased public and private investments in research and education of the food system beyond the farm gate.

Situation

-Increases in food marketing and distribution costs have contributed substantially to the inflationary spiral in the United States since 1972:

-Productivity of the food marketing and distribution sector of the United States economy has performed poorly relative to on-farm productivity;

-While the total food marketing bill is twice the value of farm level production, public investments for marketing and distribution research and education in the U.S. Department of Agriculture and Land Grant Universities are quite meager when compared with agricultural production research and education;

-Private sector research and development in the food system beyond the farm gate has become increasingly oriented toward product

proliferation and market promotions as opposed to productivity and efficiency considerations.

Potential Beneficiaries

-Farm producers would benefit from improved marketing and distribution efficiency by increasing derived farm level profits for given consumer demand levels. Also, improved efficiency of marketing and distribution could enhance competitive position of farmers so as to maintain or expand their markets at home and abroad;

-Marketers and distributors of food could benefit from improved technologies and management systems that stimulated firm level productivity, lowered unit costs, and improved profit margins at least in the short run;

-Consumers would benefit from marketing system efficiencies that lowered real food costs in the longer run.

Action Needed

It is proposed that The Congress of the United States promote the general welfare, reduce inflation, and improve productivity of its agricultural and food resources by enacting special funding for food systems research and education. The aim of the legislation would be to develop new technologies and management efficiencies beyond the farm gate via a coordinated effort among the Land Grant Universities, the United States Department of Agriculture, and other appropriate agencies and institutions.

Response to Supply Siders

Public expenditures on research and education for an improved food marketing system will likely induce investments within the private economy which will deal directly with the following national economic concerns as expressed in the President's 1982 Economic Report to the Congress (Reagan):

-Laggard productivity (via technical change in the food system)

-The inflation problem (via lower real food prices at consumer level).

The public investments in research and development on the food system, along with private investments for technological change, will not add to the regulatory burden of federal government, a serious concern of both government and industry.

Impact of Food Marketing Upon Inflation

There has been a dramatic increase in consumer food prices in recent years. The index of consumer food prices increased an annual average of 13.6 percent in the last decade, 1972-1981 (Table 1). This double digit inflation rate in consumer food prices is in sharp contrast to annual average increases of less than 5 percent for retail food prices in the previous 20 year period beginning in 1953, except for 1969 (Reagan, p. 295). Also, retail or consumer food prices increased at a somewhat greater rate than the increases in non-food prices in the recent decade of 1972-1981.

In aggregate dollar terms the price tag on marketing domestic farm foods increased from $82.4 billion in 1972 to $183 billion in 1980 or an increase of 12.6 percent per year.

Table 1. Increases in the Index of Consumer Prices, 1972-1981

Item	Index of Consumer Prices 1972	1981	Average Annual Increase 1972-1981
	1967=100		%
Food At Home	121.6	269.9	13.6
Food Away From Home	131.1	291.0	13.6
All Food 123.5	274.6		13.6
All Less Food	125.8	270.6	12.8
Total CPI	125.3	272.4	13.0

Source: USDA, ESCS. Data provided by Paul Westcott

Another measure of the enlarged economic importance of food marketing is illustrated with the farm retail spread. The farm retail spread measures the difference between the price paid by consumers for food products and the farm value. In 1973, 56 cents of each food dollar expended by consumers was for marketing services. By 1981 this had increased to 65 cents of each consumer food dollar. Stated another way the farmers' share of the retail food dollar has dropped from 44 cents in 1973 to 35 cents in 1981 (U.S.D.A.; U.S.D.A., ERS).

The inflationary impact of the food marketing system can be demonstrated more clearly with what happened in 1981. Last year, farm prices increased only one percent, while marketing costs increased over 10 percent. Overall, retail food prices increased 8 percent. In some years farm prices actually decline, while consumer food prices increase because of the inflationary forces within the marketing-distribution sector.

Food marketing costs tend to be inflexible while farm prices are quite often volatile. Labor costs, for example, account for almost one-half of food marketing costs. Collective bargaining agreements have a direct influence on the food marketing wage bill. A lower overall inflation rate translates into lower cost-of-living wage adjustments and hence reduced food marketing costs. Also contributing to the inflationary situation has been increased prices for packaging materials and containers, transportation costs, and energy costs for food manufacturing and marketing.

In terms of commodity groups, the inflationary impact of food marketing costs has been most pronounced for cereals and bakery products, red meats, fresh fruits, and fresh vegetables. For these

Table 2. Retail Costs and Farm Value Comparisons, United States, 1972-1981

	Retail Cost Index 1967=100			Farm Value Index 1967=100			Ratio of Retail Cost Increase to Farm Value Increase
	1972	1981	Increase	1972	1981	Increase	
Red Meat	129.3	257.8	128.5	133.2	235.1	101.9	1.26
Poultry	109.5	198.6	89.1	108.2	212.7	104.5	0.85
Eggs	107.6	183.8	76.2	104.1	212.1	108.0	0.71
Cereal and Bakery Products	115.9	271.1	155.2	112.4	217.7	105.3	1.47
Fresh Fruit	126.3	286.1	159.8	121.3	251.6	130.3	1.23
Fresh Vegetables	130.7	287.4	156.7	130.4	279.9	149.5	1.05
Produce, Fruit, Vegetables	122.7	271.5	148.8	127.5	288.7	161.2	0.92
Fats and Oils	114.9	267.1	152.8	110.0	261.3	151.3	1.01
Misc. Produce	114.3	264.0	149.7	117.9	272.9	155.0	0.97
Total	121.3	257.1	135.8	125.1	248.1	123.0	1.10

Source: USDA, ESCS. Data provided by Dennis Dunham.

commodity groups, the increase in the index of retail costs has been greater than the increase in farm value over the 1972-1981 period (Table 2). However, for eggs, poultry, processed fruits and vegetables, and dairy products, the increase in farm value indexes exceeded the increase in the indexes of retail costs for the 1972-1981 period. Thus, there are considerable differences among commodity groups in terms of the source of food price inflation.

Productivity of the Food Marketing System

Historically, productivity gains in food marketing have not been as pronounced as those in farming. As is well known worldwide, the growth of farm level productivity in the United States has been based upon the application of science and technology generated largely by public research investments. The role of the cooperative extension service has been a vital part of the delivery of technical information to the farmer. While variations in farm level productivity have occurred by geographic location, commodity, and whether the innovation adopted was biological, chemical, mechanical or managerial, the record of productivity growth of U.S. agriculture in terms of output per man hour or output per unit of aggregate input is undeniable. Overall, farm productivity in terms of output per man hour grew at an annual rate of 5.5 percent during the 1970's.

The story is quite different in the food marketing-distribution system. Most components of the system are afflicted with laggard or declining productivity growth, particularly for food transportation, food retailing, food service, and some food processing industries (Eddleman, Teigen, and Purcell). For example, productivity growth has declined significantly in the rail and truck transportation sector since

1973. The decline for truck transportation has been caused at least in part from reduced speed limits and higher energy costs.

Labor productivity in the food manufacturing sector varies considerably in industry group. In wet corn milling and soft drink manufacturing, increases in labor productivity have occurred since 1973. No significant growth in labor productivity has occurred in the meat packing, sugar, candy, and breakfast cereal industries. Output per employee in the blended flour industry actually declined more than four percent per year since 1973.

For retail food stores, as well as eating and drinking establishments, output per hour of labor is now significantly below 1973 levels. Longer shopping hours for essentially the same volume of sales is a major factor.

Documentation of the laggard and negative productivity performance of the food manufacturing and distribution sectors is available from the work of Eddleman, Teigen, and Purcell and summarized in Table 3.

Problems of Measuring Productivity in the Marketing Sector

It should be pointed out that labor productivity measures are neither reliable indicators of short run changes in efficiency nor long run changes in technology (Ruttan, 1959). What is ideally needed is an index which expresses output in relation to all inputs, not simply the labor input. For the food distribution sector particularly there is a problem of dealing with the variable and generally low quality of labor services. The measurement of productivity of the food system is a topic worthy of attention by agricultural economists and not addressed adequately in this paper.

Causes of Laggard Productivity Growth

There is a large number of factors contributing to the relatively poor productivity performance of the food marketing-distribution sector. Some of the more important factors include reduced or deferred investment in capital goods due to high interest rates, reduced investment in research and development in the private sector, a low level of public research and development investments, high energy costs, government regulations, rising administered and negotiated wages in excess of labor productivity growth, and labor restrictions caused from collective bargaining agreements. With the national unemployment rate approaching 10 percent and corporate profits plunging, there are signs that wage demands of organized labor will become nullified by larger concerns for the economic viability of the corporate entity.

The downward trend in productivity growth is also related to the market orientation of the food industry. As noted in the Report of the National Commission on Food Marketing in 1966, and still applicable today, the industry's market orientation "helps to explain why farm retail spreads for numerous foods are wide and increasing; why firms grow, often by merger and acquisition, beyond the size necessary to produce efficiently; the relative market power of various groups in the industry; the high rate of product innovation; and the survival of distribution methods that use labor and equipment wastefully" (U.S. National Commission on Food Marketing, p. 92).

The consequence of slower productivity growth in food processing and distribution sectors has been increased rates of food price inflation. Even if food price inflation is dampened from market forces, there is an obvious need for more efficiency and productivity growth in

Table 3. Productivity Growth Rates for the United States Food Marketing and Distribution Sectors, 1958-72 Compared with 1973-79

	Annual Productivity Growth Rate (Output per Man Hour) 1958-72	1973-79	Direction of Change
	%	%	
Food Manufacturing			
Fluid Milk	3.8	3.5	Reduction
Preserved fruits and vegetables	2.7[a]	1.9[d]	Reduction
Flour and other grain products	4.1[a]	4.9	Increase
Cereal and Breakfast foods	2.2[c]	0.8[d]	Reduction
Rice Milling	3.6[c]	2.5[d]	Reduction
Blended and Prepared flour	2.9	-4.0[d]	Negative
Wet corn milling	4.0[c]	9.8[d]	Increase
Prepared feed	4.4[c]	2.2[d]	Reduction
Raw and Refined Cane Sugar	3.5	1.5[d]	Reduction
Beet sugar	3.4	0.6[d]	Reduction
Candy and Confectionery Products	3.6[a]	0.2[d]	Reduction
Malt beverages	5.9[a]	5.3	Reduction
Distribution			
Intercity trucking[e]	2.6[c]	1.1[d]	Reduction
Intercity trucking[e] (Gen. frt.)	2.1[c]	1.4[d]	Reduction
Railroad (car miles)	3.8[a]	0.8	Reduction
Bakery products	2.7[b]	1.0	Reduction
Retil food stores	3.0	-1.0	Negative
Eating & Drinking Places	1.2	-2.4	Negative

[a]1954-72; [b]1957-72; [c]1963-72; [d]1973-78; [e]Output per employee

Source: B.R. Eddleman, Lloyd Teigen, and Joseph C. Purcell, "Productivity in U.S. Food and Agriculture: Implications for Research and Education," paper presented at the Southern Agricultural Economics Association meetings, Orlando, Florida, February, 1982, page 6a.

the food system beyond the farm gate. These objectives could be accomplished with public research and development investments for the food marketing system of the order presently expended for agricultural production science and technology.

Selected Examples

There are numerous opportunities to improve productivity and achieve lower real out costs for the food system in the longer run. Most of the opportunities, however, involve or require close coordination between different economic interests in the farm to consumer linkage. Often, changes in one segment of this system cause economic looses to another segment of the food system in the short run. Also, productivity gains will require better cooperation with government, as local, state, and federal regulations contribute substantially to laggard productivity performance.

Food Transportation Services There is a great need to improve energy and labor productivity in food transportation, particularly for perishable foods and hopefully with increased use of a revitalized national railroad system.

Standardization and Unitization. There are wasteful inefficiencies and a lack of adequate standards for packaging and handling food products, particularly fresh fruits and vegetables. Through improved unitization, we can improve the efficiency of intermodal shipments of food products, i.e., shipments that move across truck, rail, barge, and ocean freighter mode.

Energy Efficiency Through New Food Products. Basic research can lead us to new foods which provide a nutritious diet at lower food cost, plus reduced national energy consumption. Ultra high temperature milk

is a promising new product example along this line.

Market Information Technologies. Recent advances in computer technology and communication systems provide an almost unlimited number of alternatives for improving market information for buyers and sellers. Applications of electronic marketing and farm, wholesale, and retail levels are already beyond experimental stages.

While there are many other useful examples of opportunities for improving the productivity and efficiency of the food system, the main point is that agricultural economists have an important role to play in analyzing the economic feasibility of alternative systems, developing industry and national policy guidelines, and evaluating prospective and realized economic performance.

The Public Initiative In Food Systems Research and Education

Total investment in public sector agricultural research and development (R & D) was estimated to be $1.2 billion in 1979 (Ruttan, 1982). Somewhat surprisingly, R & D investments in the private sector of agricultural inputs, food processing, and distribution are over $2 billion or almost twice the public agricultural research level. Also, private sector R & D has grown more rapidly over time than public sector agricultural research. The bulk of private sector R & D activity, however, is focussed upon the development of new products as opposed to efficiency or productivity considerations. The social sciences receive only 5 percent of private sector R & D expenditures, as most of the R & D resources are utilized by engineers and physical scientists (Ruttan, 1982). Thus, there does not appear to be an adequate level of interest and/or incentive for the private sector to invest in technologies which improve the efficiency or productivity of the food system.

Given the national public policy objectives of productivity growth and slower rates of inflation, it would appear obvious that the United States government would provide at least adequate "seed money" to develop a program of food systems research and development. Such a visible or coordinated program is lacking.

While the food marketing sector accounts for two-thirds of the total agribusiness economy and it continues to grow over time relative to the farm production sector, federal investments for R & D in the more limited area of post harvest technology have actually declined in real dollars. Federal post harvest technology expenditures decreased from $75 million in 1966 to $64 million in 1979, adjusted to 1967 dollars. Offsetting the real decline in federal funding for post harvest technology research in the Agricultural Research Service and the Agricultural Experiment Stations has been a real increase in state support from $14.7 million in 1966 to $23.8 million in 1979, adjusted to 1967 dollars (Phillips).

What meager post harvest technology research that is executed at the U.S. Department of Agriculture and the state Experiment Stations is concentrated on farm level or first handler problems. Generally ignored in the post harvest R & D effort are the productivity and efficiency problems of the transportation, wholesaling, storage, retailing, and food service establishments. Moreover, the role of economics and management science is relatively minor to the total public investment in post harvest technology when compared with the biological and physical sciences.

A recent survey of agricultural economics departments in the United States revealed that on a national basis, marketing has received fewer

research resources over the past decade compared with farm management/production economics, land use, rural development, and natural resources (Stanton and Farrell). Within a declining total market effort, the ag econ marketing research agenda is weighted heavily towards farm gate marketing, price analysis, and supply and demand studies.

Implications for the Profession

As professional agricultural economists, we need to pay attention to the present day relevance of our discipline, as well as provide effective guidelines for future sustenance and growth. Despite increasing diversity of subject matter and clientele, we have increased our numbers and strengthened our professional ties over time. Past AAEA President R.J. Hildreth attributes the common bond of our breed to three elements: (1) focus on problems of the food system, rural communities, and natural resources; (2) use of economic logic; and (3) empirical emphasis (Hildreth). One of the greatest tributes to the professional agricultural economist came from Wassily Leontief in his Presidential Address to the American Economic Association. Professor Leontief acknowledged the close collaboration of agricultural economists with agronomists, home economists, and sociologists:

> "While centering their interests on only one part of the economic system, agricultural economists demonstrated the effectiveness of a systematic combination of theoretical approach with detailed factual analysis" (Leontief).

In my view agricultural economics beyond the farm gate requires the application of our unique methodology as defined by both Hildreth and

Leontief. There is a special need to reaquaint ourselves with firm level problems beyond the farm gate. For historical reasons we have tended to think of the post farm gate food system as solely the field of marketing. In fact, however, the subdisciplines of finance, management, and accounting, among others are also crucial to the solution of firm and industry problems beyond the farm gate.

Methodological Framework

Part of the challenge of a broader role beyond the farm gate is the need to develop a useful theoretical framework for empirical analysis at firm, industry, and sector levels when perfect competition is not an appropriate model. Even for farm firms, the changing structure of agriculture is rendering our atomistically competitive model less useful as the days go by. Unless we adapt to the reality of changing market and institutional environments, we will find our tool kit for problem solving increasingly sterile.

In view of the unique problems of productivity and efficiency in the food system beyond the farm gate, there is a special need for the further development of the relatively new field of systems economics. Systems economics attempts to summarize the vast micro and macro universes of the complex, socio-economic-ecologic world (Miles). Hopefully, the application of systems economics could provide alternative recommendations for improving the food system in terms of national economic objectives of a reduced inflation rate and increased labor and energy productivity.

International Relevance

The problem of productivity and efficiency of the food system

beyond the farm gate exists in virtually all countries of the world. The need for increased research and development expenditures is particularly acute for developing countries with rampant domestic food price inflaton and inefficient methods of food assembly, transportating, storage, processing, pricing, and retailing.

Teaching Programs

In terms of future demand for professional agricultural economists, the corporate agribusiness world offers tremendous employment potential. On the other hand, it is my view that the domestic market for research oriented Ph.D. recipients has entered a zero growth phase, particularly from the point of view of academic and government employment. What is lacking in most Masters and Ph.D. programs of agricultural economics is a set of courses on managerial economics of firms beyond the farm gate. We need to take a serious look at what employers need and what special expertise we have to offer. If we fail to alter our graduate programs accordingly, agribusiness firms will increasingly shun traditional ag econ Masters and Ph.D. holders in favor of business school products. The MBA in Agribusiness programs at the University of Santa Clara and Harvard Business School are successful examples of training programs geared to the needs of corporate agribusiness firms.

Labor Relations and Labor Management

With labor accounting for almost one half of the food marketing bill, one of the major areas of concern of the profession should be personnel management and labor relations. Labor economics is noticeably absent from most teaching programs and it is virtually nonexistent in

research and extension programs. The exceptions involve research and/or extension programs on farm labor in the major farm labor demand states of California, Texas, and Florida, plus some isolated labor management programs associated with food distribution.

Multidisciplinary Emphasis

Given the locus of national concerns involving productivity growth of the food system and retail food price inflation, a new combination of collaborators is needed. Food scientists, engineers of several types, post harvest technologists, management specialists, and computer scientists could become the nucleus of new research and extension teams with agricultural economists. Certainly, what is needed is a strengthened relationship with scientists in other disciplines who operate regularly with problems of society beyond the farm gate.

Forming new alliances with scientists outside traditional colleges of agriculture present formidable budgetary and political problems for well intended agricultural economists. This problem would be solved if the American Agricultural Economics Association, plus a cast of supporting agencies, firms and individuals, could convince The Congress of the need for special grants for improving food system productivity and lessening inflation. If legislatively charged, the Experiment Station Directors could then be required to allocate funds and provide general administration for agricultural economists, food scientists, engineers, computer scientists, plus other specialists not normally asociated with colleges of agriculture, e.g., accountants, industrial psychologists, labor economists, and attorneys.

Regional and National Institutes

As noted by three previous Presidents of this Association, our Land Grant College system does not permit the maximum use of professional skills across state lines (Castle; Stanton and Farrell). Unfortunately, even though most agricultural commodities and associated products are marketed across state and international boundaries, agricultural economists generally have difficulty in obtaining funds and authority to conduct research outside the home state.

What is obviously needed is a set of specialized regional research and education centers located strategically in producing and consuming regions of the country. Some centers could specialize in food system oriented problems of commodity groups, e.g., dairy meats, grain, fruits and vegetables, while other centers could specialize on specific subject matter areas, e.g., transportation, wholesaling, retailing, post harvest technology, interregional and international trade, and consumer behavior. A national institute of food systems in the U.S. Department of Agriculture or a new independent agency could be charged with integrating, coordinating, and conducting national studies. The primary purposes of the regional centers and the national institute would be to seek improvements in food systems technology and management for the benefit of participants of the system--farmers, marketers-distributors, and consumers.

Concluding Remarks

A program of increased public investments in the food system beyond the farm gate is not without a cast of critics. The Office of Management and Budget (OMB) and the Office of Technical Assessment (OTA)

are particularly negative to increased effort in post harvest R & D at public institutions. At the nub of the criticism is the argument that public institutions are not appropriate vehicles for product development. Admittedly, there has been a low rate of commercial adoption of new products developed at Land Grant Universities and in U.S.D.A. Utilization Laboratories, primarily because of the lack of exclusivity to patents and market franchises. This problem does require some innovative thinking to permit fundamental research and development in truly new food products, while still providing incentives for ultimate commercial adoption through exclusive franchises and royalty arrangements which satisfy both public and private interests.

The overall thrust of my proposed initiative in food systems R & D beyond the farm gate, however, is not to proliferate food products, but to provide impetus toward lowered real costs in food marketing and distribution through technology and management. Productivity growth and marketing efficiency require increased attention in such areas as post harvest handling, processing, raw product assembly, transporttion at various stages, wholesaling, storage, retailing, food service, exporting, importing, and pricing at all levels. The new age of computer technologies also provides unlimited opportunities for improving product and input market information and thereby pricing and marketing efficencies. Recent developments in demand theory and household economics are quite relevant to an overall evaluation of alternative food systems from the consumer perspective.

Modified food systems will likely alter market and industry structural patterns and the nature of competitive forces. Hopefully, the end result will be the reduction or elimination of laggard

productivity and inefficiency of the food system beyond the farm gate as important factors in the persistant price inflation of the U.S. economy.

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