



Ohio
and the Food System:
A Base for Planning

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Ohio and the Food System: A Base for Planning¹

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The task of projecting the future configuration of agriculture and the food system in Ohio and its attendant problems involves considerable risk. The risk is aptly illustrated by a straight line projection from the trend over the past two decades—a projection which shows the last farm disappearing from Ohio about 25 years hence. Yet the direction in which the Ohio food system is headed is, at least in part, a function of the direction from which it has come. Thus, this report starts with an evaluation of past changes and then considers some of the factors influencing the future direction of Ohio's food system.

The challenge is to set forth factual information and considered judgments that help conceptualize emerging issues and problems in Ohio's agriculture and food system for use by those people involved—farmers and farm organization leaders, businessmen, educators, governmental representatives, or others. This demands an overview of the economic and socio-political environment within which the food system in Ohio functions, as well as information specific to that system.

INTRODUCTION

In recent years the public has been subjected to large doses of "technological determinism," both within and without the food system. While some may dismiss the economic relevancy of this concept, it does evolve directly from the combination of two major phenomena of recent times: industrialization and science. This has been labeled scientific industrialization.³

Specialization of work roles and factory-like organization date from the beginning of the Industrial Revolution around 1730. Modern science can be dated from Sir Isaac Newton (born 1737) and its application to agriculture from Gregor Mendel (1822-1884). The combining of science to create techno-

logical change with industrialization to disperse it throughout the work force of society has institutionalized both specialization and change. The application of science to agriculture, greatly assisted by the Morrill and Hatch Acts, has been a gradual but cumulative process.

The transformation from an agrarian to an industrialized food system is now nearly complete. The results of the process are clear: technological innovations have replaced labor on farms and at the same time, specialization in work roles in the food system has increased dramatically. The farmer no longer raises his own power and fuel, prepares his own feed, or delivers his products to the general store in exchange for merchandise for his farm/family unit. The horse has been replaced by a tractor, oats by No. 2 middle distillate, the corn grinder by a large computer-controlled feed mill, and the general store by a sophisticated food merchandising complex. Each, in turn, is a function of highly specialized labor and technology.

In the late 19th century, the ratio of farm workers to total population was 1:4 and by 1976 it was 1:54. Total employment in farming has been cut in half in just the last 15 years. Today, less than 5% of total U. S. employment is in farming. But more than 20% of total employment is in the food system as a whole. Since the end of World War II, total employment in the farm supply industries is estimated to have increased by 25%.⁴ The value of deliveries of manufactured feed has more than tripled in current dollars since 1960.⁵ Thus, employment has been redistributed in the food system and restructured into more specialized jobs.

Because of these developments, the socio-economic-political relationships are changing. First, greater specialization means greater interdependence between people. Specialization and interdependence are two edges of the same sword. The grain producer is dependent upon the fertilizer distributor who is dependent upon a petro-chemical manufacturer. The livestock feeder is dependent upon the feed formulator who is dependent upon the grain farmer. The fast-food restaurant is dependent upon a purveyor who is

¹All statistical information is compiled in a separate Appendix to this circular. Copies are available from the authors, Dept. of Agricultural Economics and Rural Sociology, The Ohio State University, Columbus, Ohio 43210, or from the Mailing Room, Ohio Agricultural Research and Development Center, Wooster, Ohio 44691.

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³Shaffer, James Duncan. 1968. *The Scientific Industrialization of the U. S. Food and Fiber Sector: Background for Market Policy*. In *Agricultural Organization in the Modern Industrial Economy*, Dept. of Agri. Econ., The Ohio State Univ., NCR-20-68, pp. 1-14.

⁴Arthur, H., R. Goldberg, and K. Bird. 1967. *The United States Food and Fiber System in a Changing World Environment*. Vol. 14, Technical Papers, National Advisory Commission on Food and Fiber.

⁵Agricultural Statistics. 1975. USDA.

dependent upon a packer who is dependent upon the livestock feeder. The feedlot owner is dependent upon a manager who is dependent upon a foreman who is dependent upon a livestock procurement specialist. *Ad infinitum*. And not only are people and firms interdependent, so are nations. Witness the dependence of Japan on the U. S. for food and the U. S. on Japan for cameras and television sets.

With increased specialization comes increased complexity in organizing and coordinating economic activities. Individuals lose much of their sovereignty over what they do, because what they do is so highly interdependent with what others do. The market mechanism of individual negotiation becomes unwieldy. Increasingly centralized planning and control emerge. Thus, the size of a firm increases so administrative control can be used to harmonize these specialized and interdependent activities.

Increasing interdependence, less individualism, and greater administrative control make it difficult to determine the unique value of individuals to the economic process. Pure market-determined values disappear as markets become increasingly imperfect and more transactions occur outside of the competitive market altogether. What portion of the value of a tractor is due to the person installing gears in its transmission, or of a steak dinner to a livestock buyer? The result is conflict, alienation, and the search for ways to get a bigger share of the pie or a more forceful voice in determining how the economic spoils are shared.

Other impacts on people are equally evident. The quickening pace of technological change brings with it the threat of job displacement. Large increases in total production have not been equitably distributed, widening the differences in income levels among people. Commercial television teaches that the family which doesn't have all of the material things of society is inferior. Externalities, or the differences between social and private benefit-cost ratios, increase. Evidence includes the environmental impacts of agricultural chemicals and the social impacts of the displacement of southern black farm workers by the mechanical cotton picker. The old ground rules for determining the division of work and economic rewards are no longer accepted by large numbers in the community.

The payoff from industrialization throughout the economy is increased productivity, thus increased income and greater purchasing power. This results in greater demand for domestic services, which have been increasingly incorporated into food as exhibited through the increased importance of restaurants and more completely prepared foods in grocery stores. Merchandising characterizes the delivery system for

these foods; witness Kentucky Fried Chicken, Post Toasties, Gino's, and Holiday Inns. Merchandisers create strong consumer franchises through advertising and continued delivery of reliably consistent products. This requires large-scale organization of many specialized activities including, in many cases, on-farm production. This brings about new and different relationships among enterprises in the agriculture/food system and demands a system's perspective.

Increased productivity and its corollary, increased economic well-being, create greater demands against a finite complement of non-human resources. Clearly, income as an index of economic well-being misses much that creates quality in living, such as leisure, freedom of opportunity, cultural and intellectual development, and self contentment. New measures of well-being are badly needed. But nonetheless there will continue to be increasing competitive claims for the resources basic to food and agriculture. What are these resources in Ohio? How are they being used? How are they being influenced by scientific industrialization? These are the questions to be considered next.

RESOURCES

Rural Ohio is an integral part of a dynamic economy. The agriculture/food system is closely related to rural Ohio and is subject to the same forces impinging upon nonrural industries. The demarcation between rural and urban is rapidly disappearing. And Ohio is increasingly tied to those beyond its own boundaries. Therefore, prospects for rural Ohio and Ohio's food and agriculture system must be considered in the context of trends underway within the state, the United States, and the world.

This section focuses upon resources and trends helping shape the general environment for rural Ohio. It is important to know and understand these factors and trends, even though they are subject to only limited control by rural Ohio citizens. The intent is to provide a background for conceptualizing emerging issues, problems, opportunities, and challenges in the agricultural sector and the food system.

Population

Ohio is basically an urban state, with more than 75% of Ohio's nearly 11 million residents living in urban areas. This is above the U. S. average (Figure 1). At the same time, Ohio has a lot of people living in rural areas. The steady decline in farm residents in Ohio has been more than offset by an increase in rural nonfarm residents.

The population of Ohio increased more than 1 million people or nearly 11% in the period from 1960 to 1975 (Figure 2). The 10,759,000 people in Ohio

comprise 5.0% of the nation's population. The population growth in Ohio of 11% from 1960 to 1975 has been about one-half as fast as that of the U. S. With slow growth in the over-65-year age group, Ohio has a relatively big share of the 18-65 age or working group of people. This may be generating a net tax outflow when one considers the relative growth rates of Ohio vis-a-vis the U. S. Golden-agers migrating to the Sun Belt with Ohio-based pensions is one factor. The failure to attract federal investment in research and development in Ohio is another factor in the net tax outflow. This gives rise to a host of issues about economic growth, unemployment, community development, migration, aging, taxes, education, and the like.

Land Use

Ohio embraces 26,220,000 acres or only 1.2% of the total U. S. land area (Figure 3). Major changes have taken place in the use of land resources with the development of the state. Population increases and economic growth have brought new demands and practices which lead to ever-changing resource use.

Land in farms in Ohio has declined by nearly 3 million acres since 1960. Even so, Ohio's farmland still comprises 1.5% of the nation's total land in farms. More importantly, the cropland harvested in Ohio at 9.5 million acres is nearly 3% of the total U. S. acreage harvested for crops. Also, cropland harvested in Ohio is almost as large as it was 15 years ago. The maintenance of cropland acreage is due to clearing woodland, draining swamps, and bringing into cultivation former pasture land, while other land has disappeared from farming for urban and industrial development. Ohio is losing marginal farmland faster than cropland, but the relative decline in cropland is quite slow. An increase in both private and public forestland has occurred which more than offsets the loss of woodland in farms (Figure 4).

Land use policy issues have been, and will continue to be, of major concern to both rural and urban citizens of Ohio. Some of the recent issues include zoning and regulation, preservation of farmland around the urban fringe, and farmland taxation on market value or use value. Current and emerging issues include land and water use planning, park and recreation development, waste disposal, land reclamation, and environmental controls. Their solutions will impact upon Ohio communities, farming and/or the industries involved in Ohio's food system.

Farm Land Resources

Topographically, Ohio ranges from the nearly level Lake Plain area of northwestern Ohio to the hilly Allegheny Plateau and Kentucky Bluegrass

FIG. 1.—Population by residence in Ohio and U. S., 1960 and 1970.

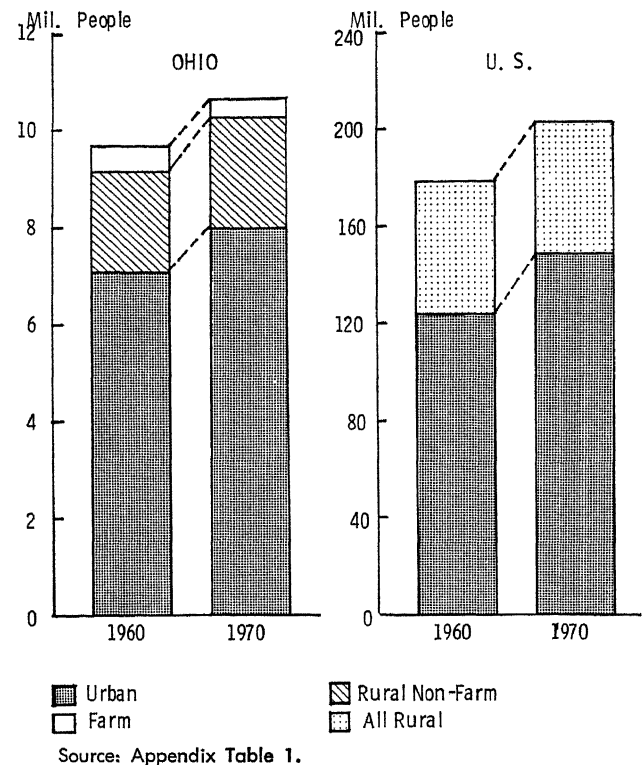


FIG. 2.—Age distribution of Ohio and U. S. population, 1960-1975.

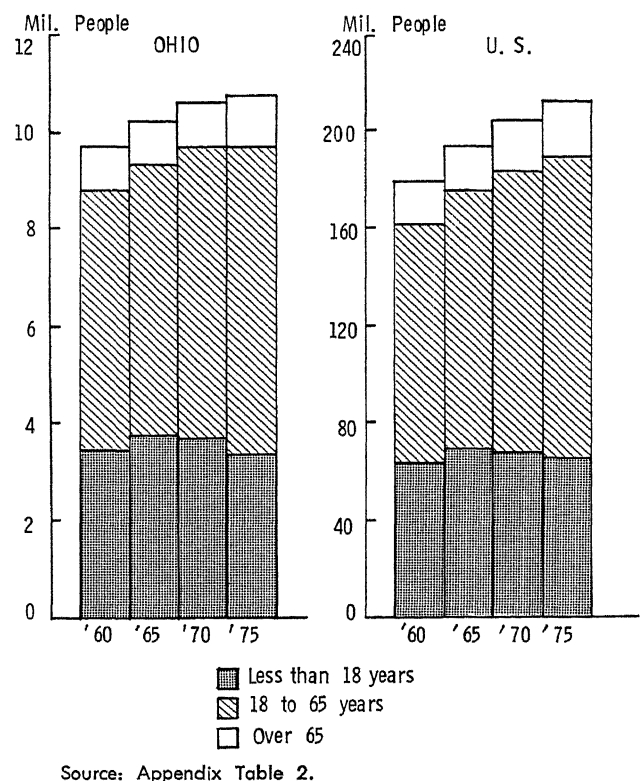
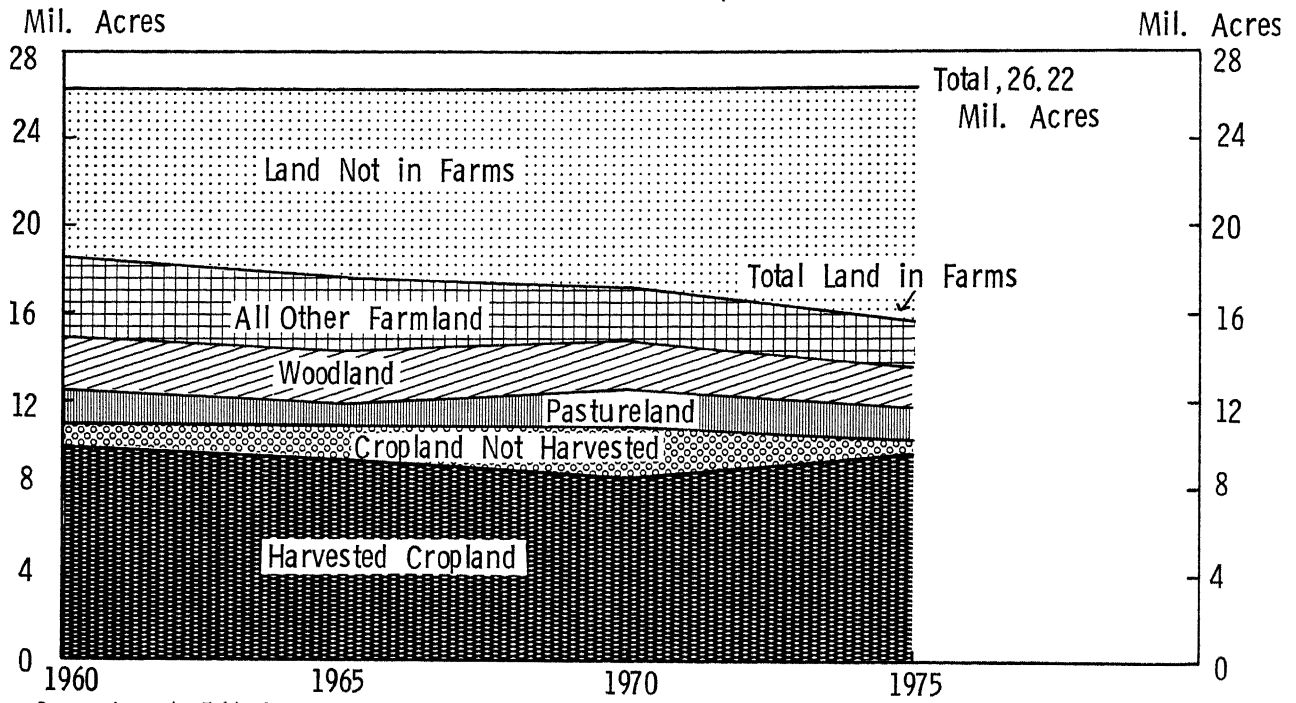
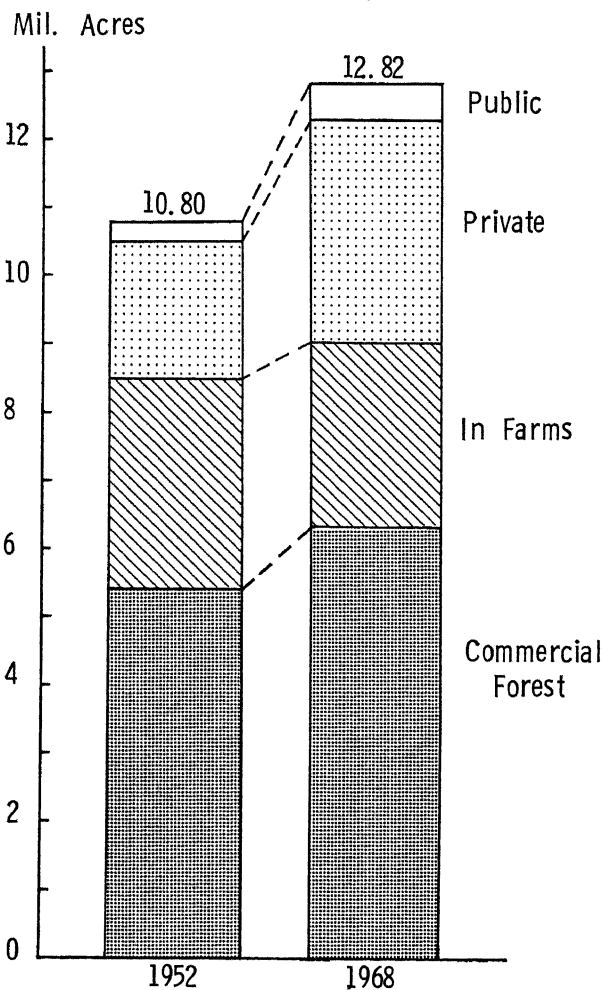


FIG. 3.—Land use in Ohio, 1960-1975.



Source: Appendix Table 3.

FIG. 4.—Forest land in Ohio, 1952 and 1968.



Source: Appendix Table 4.

FIG. 5.—Major land resource areas in Ohio.



- I. Lake Plain, calcareous lacustrine: cash grain and livestock farming.
- II. Ohio and Indiana Till Plains, glacial limestone: cash grain and livestock farming.
- III. Illinois Till Plain, silt over till material: livestock and grain farming.
- IV. Lake Erie Plain, acid lacustrine: specialized crops.
- V. Eastern Ohio Till Plain, glacial sandstone and shale: dairy, forage, and small grain.
- VI. Allegheny Plateau, residual sandstone and red shale: pasture and woodland.
- VII. Kentucky Bluegrass, residual limestone: livestock and tobacco farming.

Source: Ohio Soils and Water Needs Inventory, 1971.

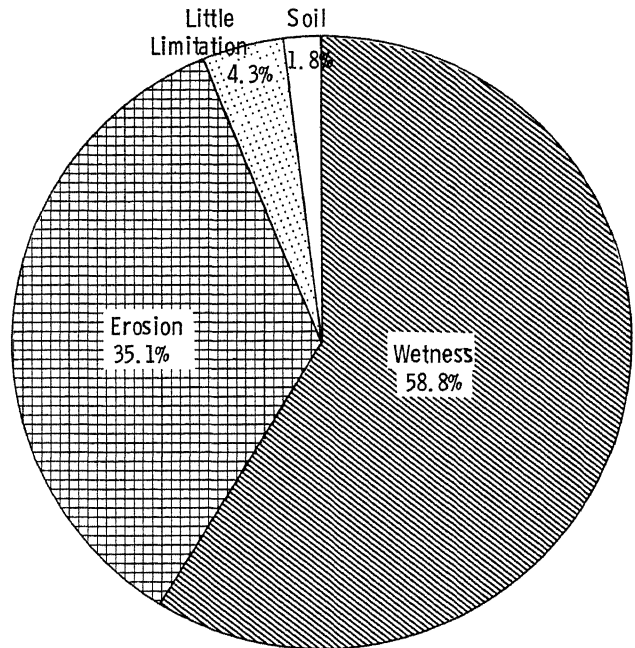
regions located in southern and southeastern Ohio (Figure 5). The latter two areas were unglaciated and are generally the least suitable for intensive row crop production, while the remainder of Ohio was glaciated. Eastern Ohio soils originated largely from sandstone and shale, while those in western Ohio are largely from a limestone source.

Most Ohio cropland is moderately to highly productive (Figure 6). Acreages of cropland capability classes show more than 97% of Ohio cropland is "cultivable" with appropriate practices. Less than 3% or the class V-VII land is considered "fragile", *i.e.*, subject to rapid and serious erosion if not farmed using conserving practices.

Excessive wetness occurs on nearly 60% of Ohio soils, making it the single most important impediment to crop production (Figure 7). Poor drainage occurs most frequently in the glaciated northern and

western portions of the state. Erosion problems are the principal hazard for more than one-third of the crop acreage and occur to varying degrees in most regions of Ohio.

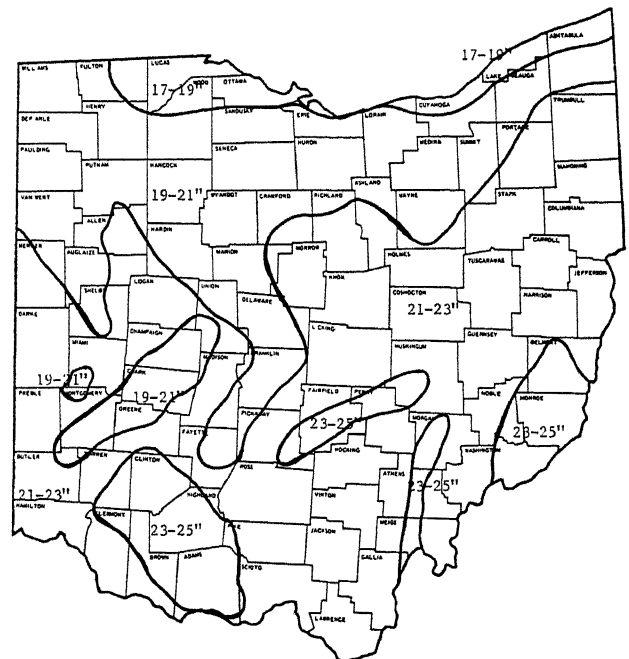
FIG. 7.—Principal hazards on Ohio cropland.



TOTAL CROPLAND = 12.74 MIL. ACRES

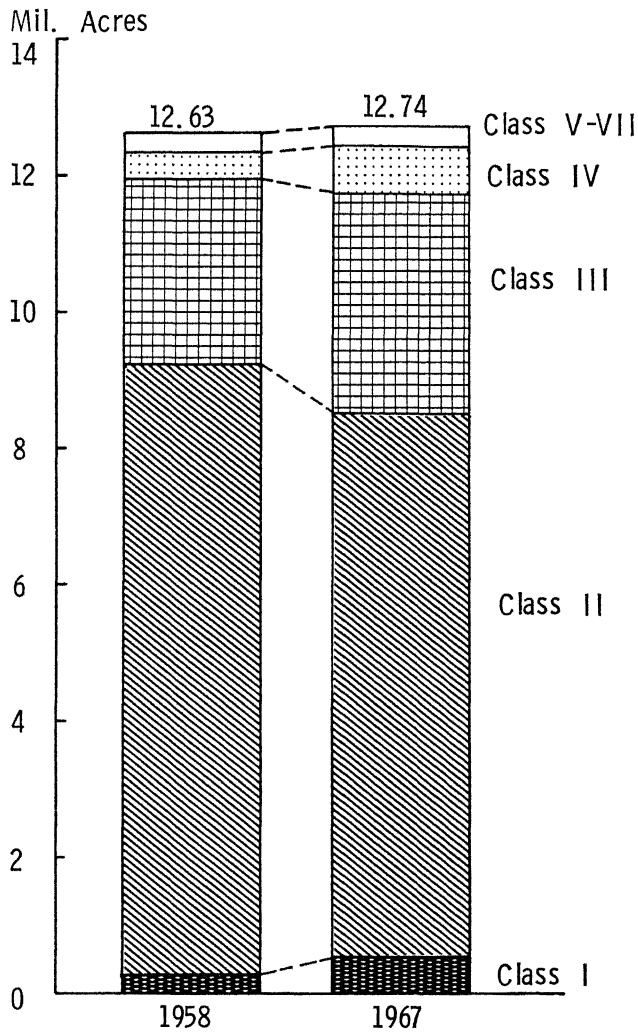
Source: Appendix Table 6.

FIG. 8.—Normal rainfall (inches) for growing season—May through September.



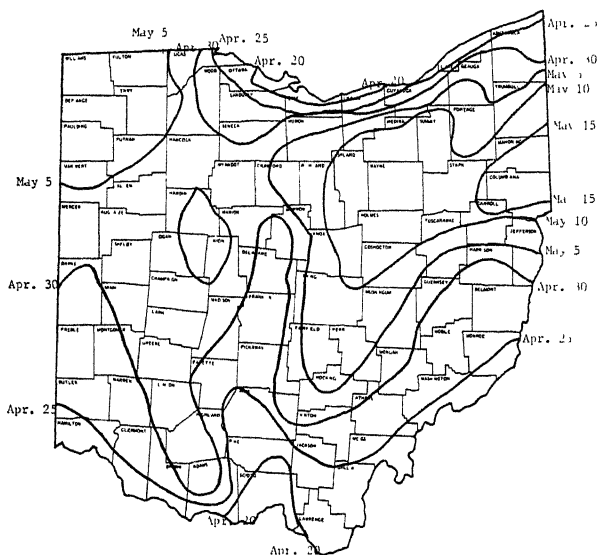
Source: 1976-77 Ohio Agronomy Guide, CES Bulletin 472, The Ohio State University, Jan. 1976.

FIG. 6.—Acreage of cropland by land capability classes in Ohio, 1958 and 1967.



Source: Appendix Table 5.

FIG. 9.—Dates in spring after which there is a 50% or less chance that temperatures will again fall to 32° F. or lower.

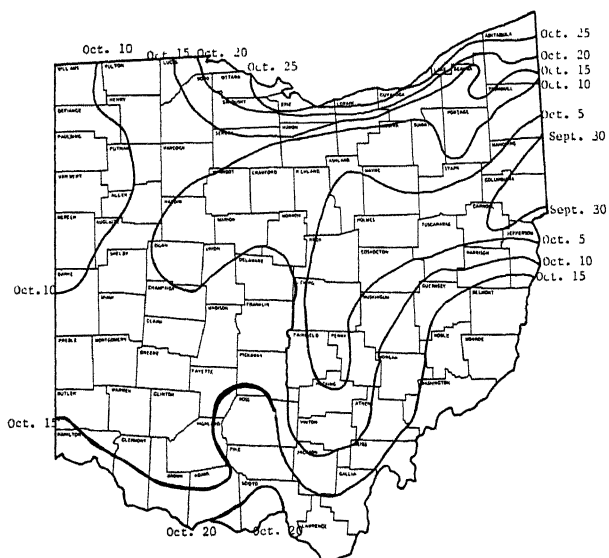


Source: 1976-77 Ohio Agronomy Guide, CES Bulletin 472, The Ohio State University, Jan. 1976.

Climate

Ohio has a wide diversity of climate. Mean annual temperatures range from 49° F in northeastern Ohio to 57° F in the southernmost tip. Normal annual rainfall ranges from a low of less than 30 inches on the Lake Erie Islands to a high of more than 44 inches in the southwestern part of Ohio near the cities of Wilmington and Hillsboro. Ohio's climate is

FIG. 10.—Dates in fall after which there is a 50% chance that the first 32° F. temperature will have occurred.



Source: 1976-77 Ohio Agronomy Guide, CES Bulletin 472, The Ohio State University, Jan. 1976.

typically continental—a wide range of temperatures, with higher rainfall in the spring and summer.

Growing season rainfall varies from a low of 17 inches along Lake Erie to a high of 25 inches in small areas of southwestern, east central, and eastern Ohio (Figure 8). This may not be adequate for maximum yields unless effective water management practices are utilized because by the end of August available soil moisture is usually reduced 80% or more. Most Ohio soils are saturated during March and early April.

The average length of the freeze-free period or growing season ranges from a high of 190 days along the Lake Erie shore to a low of 140 days in eastern Ohio. The earliest dates with a 50% chance of a freeze (32° F) range from April 20 adjacent to Lake Erie and the southern tip of Ohio to May 15 in eastern Ohio (Figure 9). The earliest freezing temperatures in the fall range from about Sept. 30 in eastern Ohio to Oct. 20 along Lake Erie and the southern tip of Ohio (Figure 10).

The combination of climate, rainfall, topography, soil formation, and soil properties plus other factors give rise to a great diversity in Ohio's agriculture. The Corn Belt region of western Ohio has developed into a major cash grain region emphasizing corn, soybeans, and wheat and has numerous livestock feeding operations. A major vegetable processing industry has developed in the northwestern Lake Plain region. Producers in glaciated northeastern Ohio concentrate on dairy operations with the associated forage and small grains production. In the unglaciated Allegheny Plateau, farmers specialize in pasture livestock production, especially beef cattle. The hilly Kentucky Bluegrass region is the center of tobacco production in Ohio and has numerous cow-calf operations. The band along Lake Erie has a wide variety of specialized crops ranging from fruits and vegetables to a thriving ornamental horticulture industry.

Energy

Ohio is characterized with an abundant endowment of bulky, low intensity energy resources, primarily high sulfur bituminous coal (Figure 11). Its endowment of high mobility, high intensity energy resources such as gas and oil is extremely limited. There are large supplies of natural gas under Lake Erie and locked in shale rock formations in the unglaciated areas of southeastern Ohio. However, these are not considered as potential energy resources because extraction of the former is prohibited by international treaty and the latter is currently technically infeasible to recover as more energy is required for fracturing shale formations than exists in the recoverable gas. Thus, Ohio is essentially totally de-

pendent upon outside sources for gas and oil resources, but has the potential to be a surplus producer of coal and/or coal-based electricity.

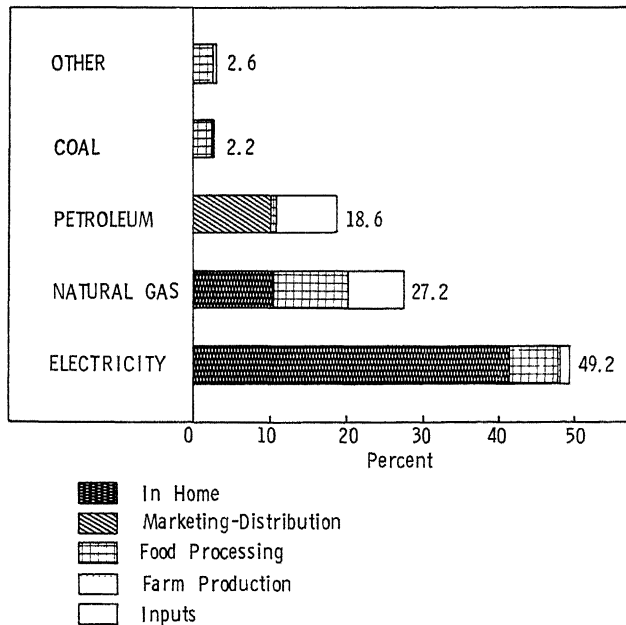
The agriculture/food system in Ohio is highly dependent upon gas and oil as energy sources, whereas household activities associated with food consumption are dependent primarily upon electricity (Figure 12). Almost three-fourths of all energy used in Ohio for producing and supplying farm inputs, on-farm production, and processing and distributing food to consumers is from gas and oil. Thus, Ohio's energy resource endowment has potentially negative implications for Ohio's food production and distribution system in favor of states with greater oil and gas supplies. This could prove to be a serious problem for Ohio's agriculture and food industries in the absence of policies to assure unrestrained interstate commerce in these products.

The household sector accounts for more than half of the total energy used in the food system in Ohio (Figure 13). The household sector appears to be relatively secure from potential disruptions in interstate energy flows due to its heavy dependence upon electricity and Ohio's abundant coal resources.

ORGANIZATION OF OHIO'S FOOD SYSTEM

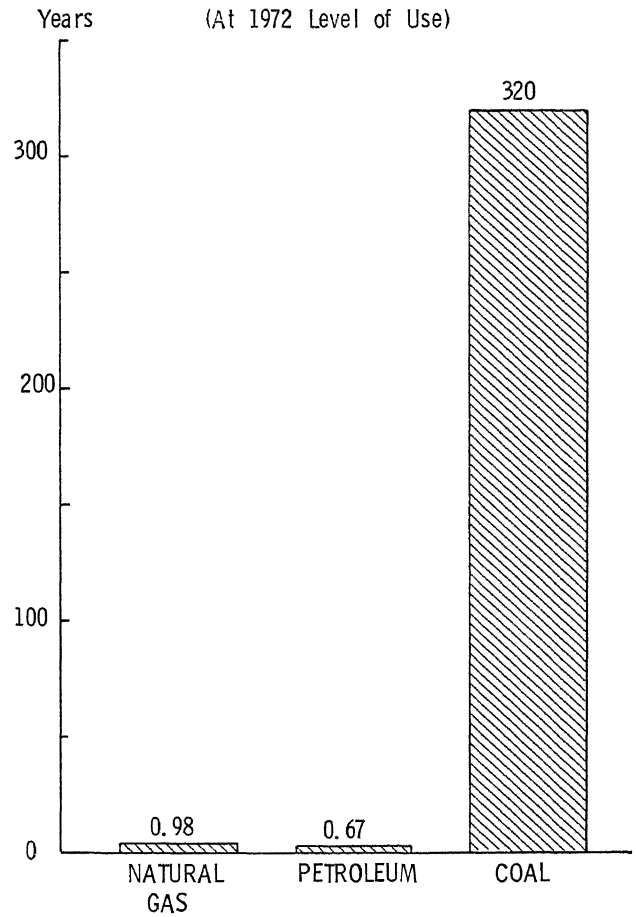
The agriculture/food system in Ohio, as it is nationally, is composed of several highly interdependent components. In addition to agricultural production, these include the manufacture and distribution of farming inputs and the processing, distribu-

FIG. 12.—Sources of energy used in Ohio's agricultural and food system, 1973.



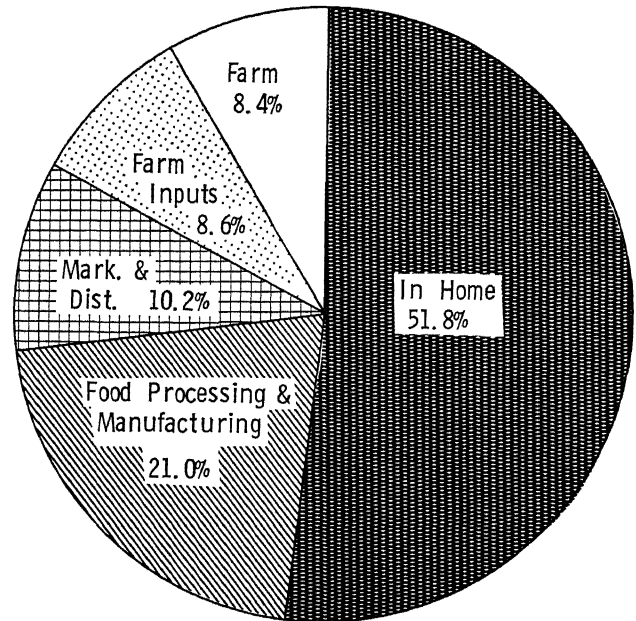
Source: Appendix Table 8.

FIG. 11.—Years of Ohio energy consumption from known Ohio reserves.



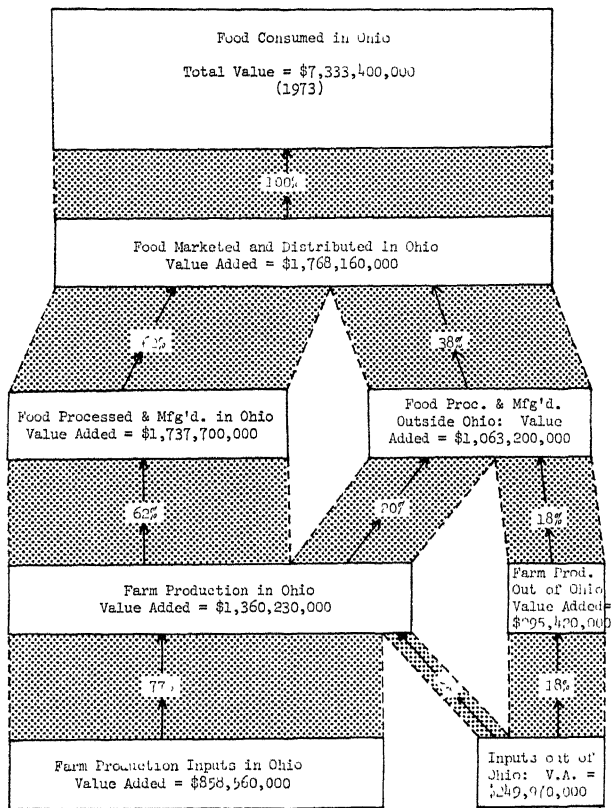
Source: Appendix Table 7.

FIG. 13.—Total energy use in Ohio food system, 1973.



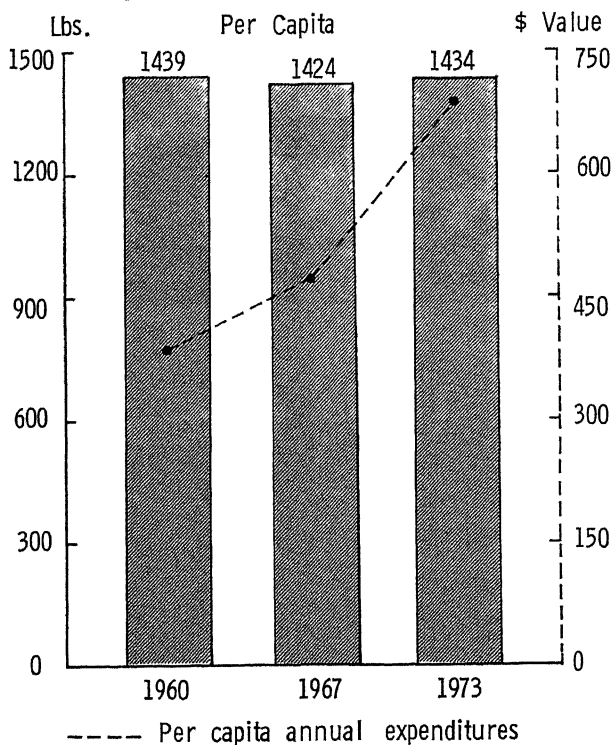
Source: Appendix Table 8.

FIG. 14.—Organization of Ohio's food and agriculture sector, with value added by components, net, 1973.



Source: Appendix Table 9.

FIG. 15.—Per capita pounds of food used and annual expenditures in Ohio, 1960, 1967, and 1973.



Source: Appendix Table 10.

tion, and retailing of food. Because of the high degree of interdependence among these segments, it's useful to understand the relative importance of each.

Organizational Overview

A pictorial representation of the value added by the components of the food chain provides an overview of the food and agriculture system in Ohio (Figure 14). This is net of inshipments and outshipments. That is, it represents the net value added by various components of the system in order to provide the food consumed by Ohio consumers in 1973, the latest year for which comparable data are available. For example, total farm production added about \$1.66 billion to the value of Ohio-consumed food. Of this total, the value added by Ohio farmers was about \$1.36 billion. Thus, Ohio had a net deficit of about \$300 million of value added to food by on-farm production. This deficit was made up by net inshipments of farm products from other states.

Ohio is basically a food consumption state. With the exception of food marketing activities, the state is in a net deficit position with regard to value added by each component of the food sector. In terms of absolute values, the two most important segments in Ohio are the marketing and distribution industries and the food manufacturing and processing industries. Each added more than \$1.7 billion in value. These two segments account for more than 47% of the total value of food consumed in Ohio. This compares to about 19% added by Ohio's farms and about 12% by Ohio's agricultural input industries.

Ohio-located enterprises account for 78% of the net value of Ohio-consumed food which totaled \$7.3 billion in 1973. The remaining 22% is the net value added by inshipments of foods, farm products, and agricultural inputs. The largest single deficit is in food processing and manufacturing, where net inshipments account for \$1.1 billion or more than 14% of the total value of Ohio's food supply. This combined with the large Ohio food manufacturing industry points out the dominance of processing and manufacturing in the total food and agriculture system.

Ohio has a rather significant outflow of farm products which return to the state as processed and manufactured foods. Subsequent data suggest that this reflects a significant net outflow of grains and oilseeds which are converted into feeds and livestock products elsewhere, then re-enter the state as foods of livestock origin.

Foods Consumed

The people of Ohio in the last 15 years have used from 1,425 to 1,440 lb of food per person each year (Figure 15). Food use per person varies only slightly. Expenditures per capita for the food purchased

have trended upward. This reflects, in addition to inflationary price rises, the shift to increased specialization and industrialization of Ohio's food system which in turn requires more processing, manufacturing, and modern food merchandising outlets.

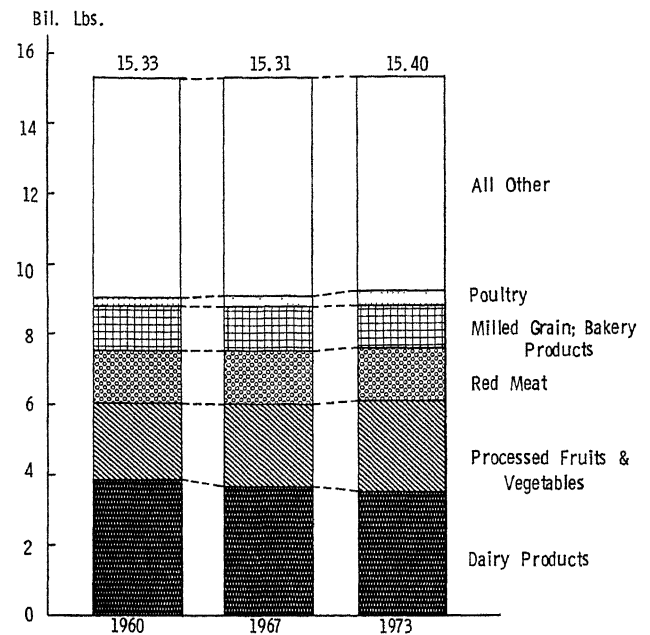
In terms of value, red meats are the most important food group to Ohio's consumers. However, much of the total quantity used in Ohio is accounted for by bulky, relatively low value, and sometimes perishable products (Figure 16). This places extra demands upon the transportation/distribution system. Furthermore, there are considerable dynamics in the consumption trends over time. Poultry meat and processed fruits and vegetables are expanding appreciably while dairy and grain products are declining, thus pointing to adjustments in the relative sizes of the industries producing and processing these products. However, the total quantity of food bought in Ohio has changed very little over the 15-year period.

Value Added by Industry

Figure 17 shows the value added to food in Ohio by the input, farming, and farm to consumer sectors. The relative importance of each sector is depicted by the sizes of the pies.

Growth in terms of value added in the food processing, manufacturing, and distribution industries in Ohio has averaged more than 7.5% annually over

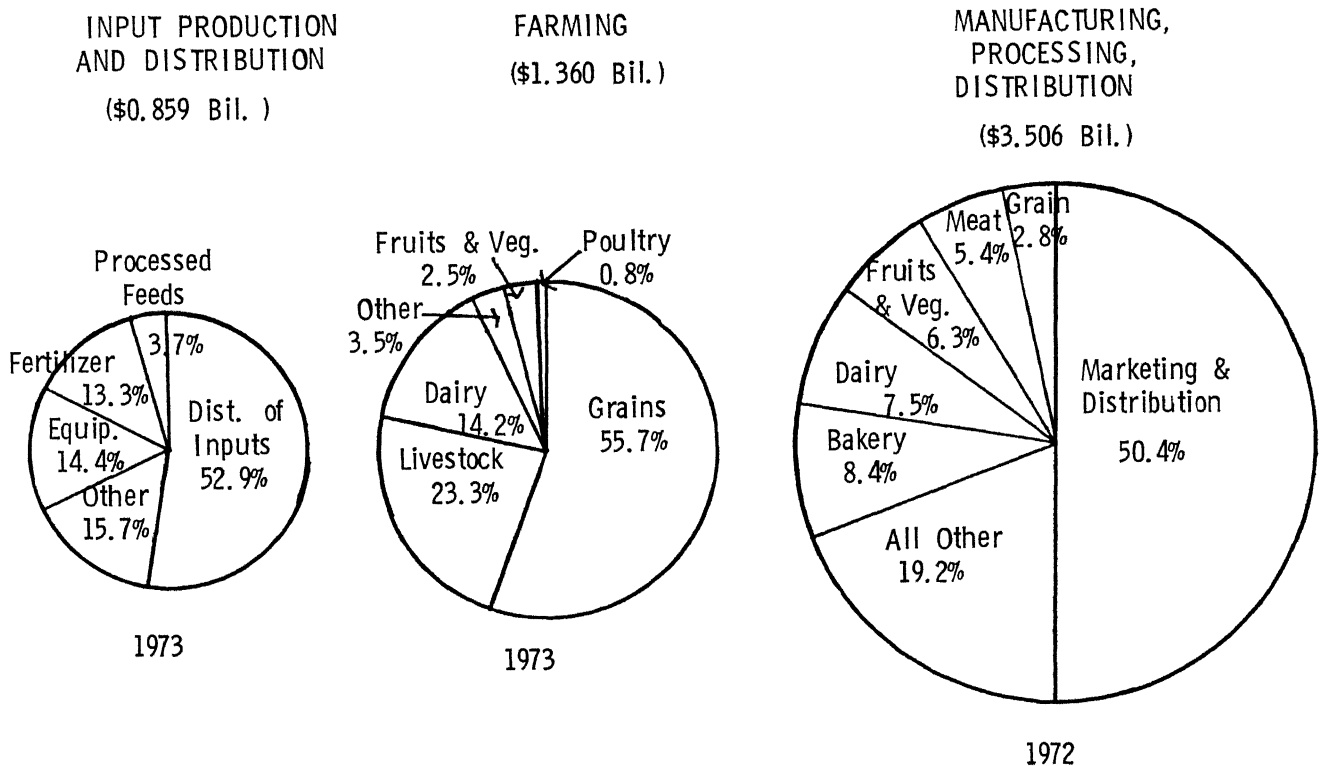
FIG. 16.—Quantity of food purchased in Ohio, 1960, 1967, and 1973.



Source: Appendix Table 10.

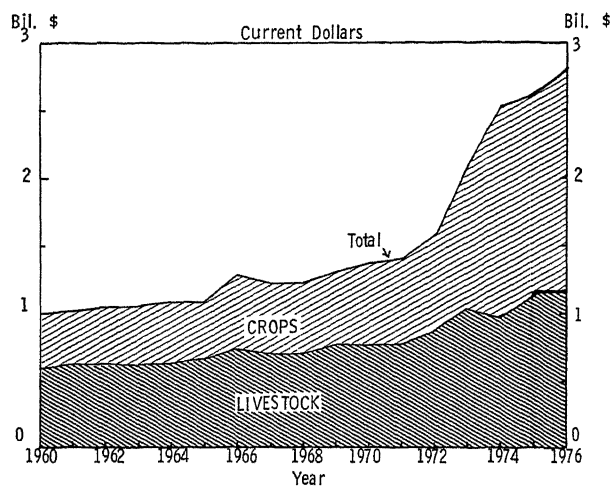
the past decade. This is about the same rate of growth as in the value of total food used. Growth in value added on Ohio farms has been somewhat faster, averaging 7.7% per year over the same period, while

FIG. 17.—Value added to food in Ohio.



Source: Appendix Tables 11, 12, and 13.

FIG. 18.—Cash receipts from farm marketings, Ohio, 1960-1975.



Source: Appendix Table 14.

the agricultural input sector has grown most rapidly—at an average annual rate exceeding 9%. Thus, while processing and distribution continue to dominate the agriculture/food system in Ohio, the input industries in particular and farming to a lesser extent have shown relative gains. Appendix Tables 11, 12, and 13 contain the relevant data from which the foregoing comparisons were made. (See footnote 1.)

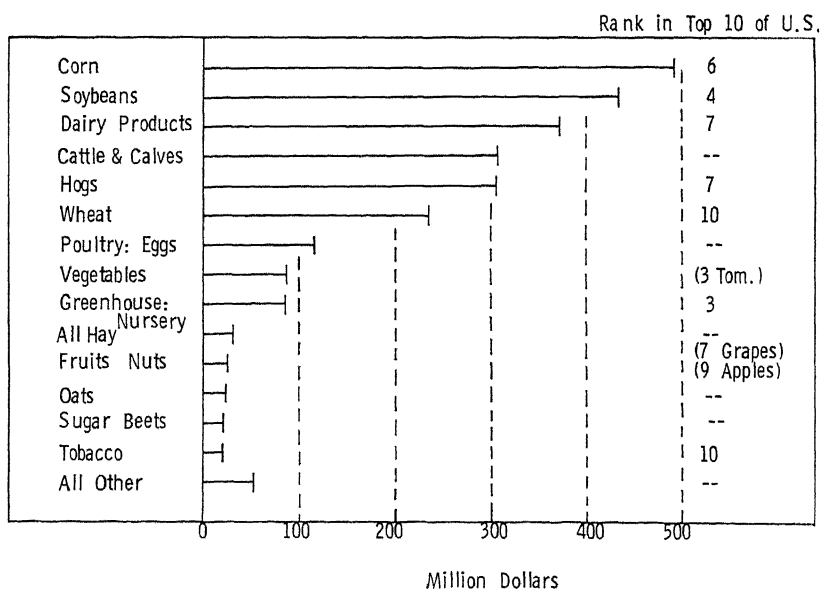
Among the food manufacturing and processing industries, bakery products, processed fruits and vegetables, dairy, and meat packing are the most important in Ohio (Figure 17). However, of these only the fruit and vegetable processing industry is growing

at an above average rate, 8.4% per year. The most rapid growth is in one of the smaller industries, milling of food grains, with an average annual growth rate of 8.8%. Overall, the manufacturing and processing segment appears to be reasonably balanced with no single industry dominating.

Less balance among farm production enterprises is noticeable. Grains, meat animals, and dairy clearly dominate and have been steadily increasing in relative importance. Several interesting phenomena are evident. First, grain has emerged in recent years as the single most important industry in terms of value added by Ohio farmers. While the 1973 data for grains may be biased upward because of unusually high grain prices that year which inflated profit levels included as a component of value added, it nonetheless is reflective of a general shift in Ohio's agriculture toward cash grain. Subsequent data in this report further document that shift.

Second, livestock and meat animal agriculture has moved sharply ahead of dairy production in recent years, with the former increasing in value added at an average annual rate of more than 11% since the mid-1960's while the latter has grown at about 4%. Third, fruit and vegetable production in Ohio continues to run a distant fourth in terms of overall importance to the farm sector, and shows the slowest rate of growth, despite the large size and rapid growth of the state's fruit and vegetable processing industry.

Among the agricultural input industries, growth has been most rapid in fertilizer and agricultural chemicals, where the value added in Ohio has increased by an average of more than 20% per year since 1967. The equipment and machinery industry



Source: Appendix Table 15.

FIG. 19.—Cash farm receipts by commodities in Ohio, 1975.

has shown moderate growth, while feed manufacturing has shown a substantial decline. The latter may be reflective of the shifting balance in Ohio's agriculture away from livestock and toward cash grains, and further supports the notion of increasing grain shipments and livestock and poultry product shipments. The rapid increase in the importance of the fertilizer industry also appears consistent with grain production trends. However, this is an energy intensive industry, dependent upon natural gas as a key input. With Ohio in a precarious gas supply situation, continued growth in this industry seems doubtful. The implications of this upon crop production in the state bear watching.

MAJOR OHIO FARM ENTERPRISES

Ohio's farming sector has been undergoing steady and profound changes in the last 15 years. Changing economic conditions plus technological and cultural practices have contributed to a shift in the comparative advantages of Ohio's farming enterprises.

Farm Marketings

The value of farm marketings (in current dollars) from Ohio farms has increased from \$1 billion in 1960 to \$2.8 billion in 1976 (Figure 18). Sales by Ohio producers accounted for 2.9% of the total U. S. marketings in 1976 and ranked ninth among the 50 states.

Looking back to 1960, the value of livestock and livestock products marketed from Ohio farms totaled about \$600 million or 60% of the total. The leading sources of cash receipts at that time, in order, were dairy, hogs, cattle, poultry, soybeans, corn, and wheat.

In 1976, livestock and livestock products marketed were valued at \$1.2 billion or 99% greater than in 1960. But crops have increased in relative importance to livestock and the value of crop marketings now accounts for about \$1.6 billion or slightly less than 60% of the 1976 total. Soybeans, corn, and wheat dominate (Figure 19). Combined, these three crops generated 47% of all the cash receipts received from farm marketings by Ohio producers in 1975. This is a dramatic shift in Ohio farming.

Corn as a source of cash receipts, at more than \$491 million in 1975, gave Ohio sixth place in the U. S.; sales of soybeans at \$434 million were fourth largest; and farm receipts from wheat ranked tenth. Dairy products and hog sales from Ohio farms were seventh largest in the U. S. Sales of specialty crops are sufficiently important to make Ohio the third largest producer in the country of tomatoes and greenhouse and nursery stock, seventh in grapes, ninth in apples, and tenth in tobacco.

Exports

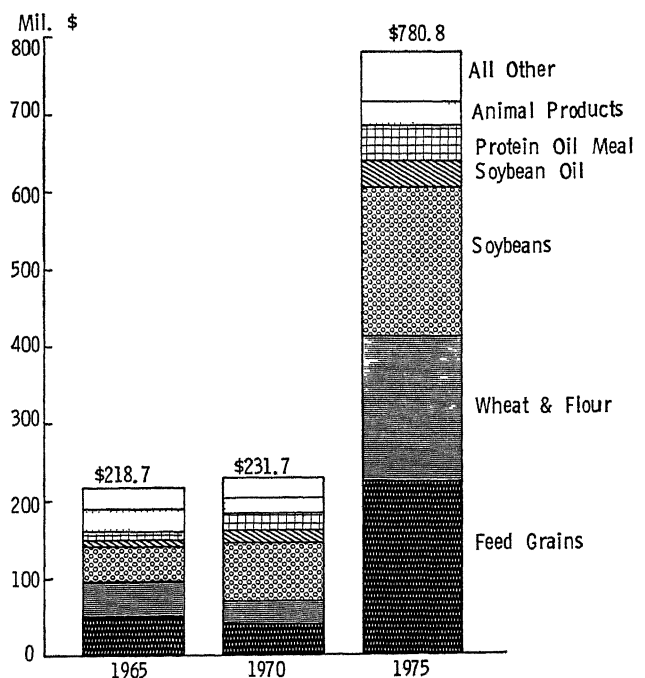
Many countries in the world look to the U. S. for part of their food needs. The principal reason is to lower food costs and to permit specialization in those products they have a comparative advantage in producing. Many countries have become increasingly dependent upon U. S. farm products. The U. S. supplies nearly one-half of all the grain moving in world markets.

Overseas markets are important not only to farmers but also to the other sectors in the food system and to society in general. The magnitude of the foreign market can be demonstrated by the fact that the U. S. now exports the output of nearly 1 out of each 3 acres of all cropland harvested. This compares to 1 out of 5 in 1960. The foreign exchange earnings of farm exports have been an important factor in the ability of the U. S. to purchase increasing quantities of petroleum and other imported products.

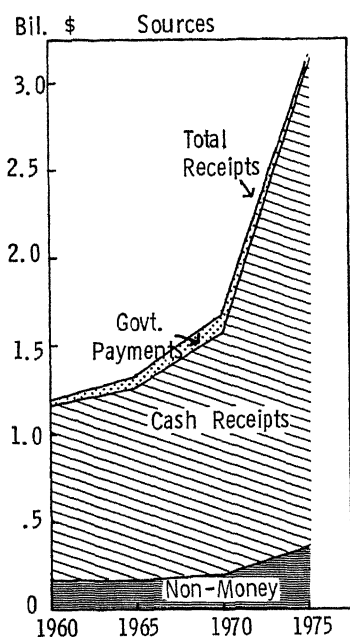
Ohio shares in this market as \$780 million worth of farm products were sold in export markets in 1975 (Figure 20). Exports accounted for 28% of total cash receipts of Ohio farmers in 1975. Feed grains, wheat, and soybeans accounted for three-fourths of the total export value.

Substantial growth in the proportion of the total U. S. output of feed grains and whole soybeans exported has occurred in the last 15 years. Wheat and wheat flour exports generally exceed 50% of total

FIG. 20.—Value of Ohio agricultural exports, 1965, 1970, and 1975.



Source: Appendix Table 16.



Source: Appendix Table 17.

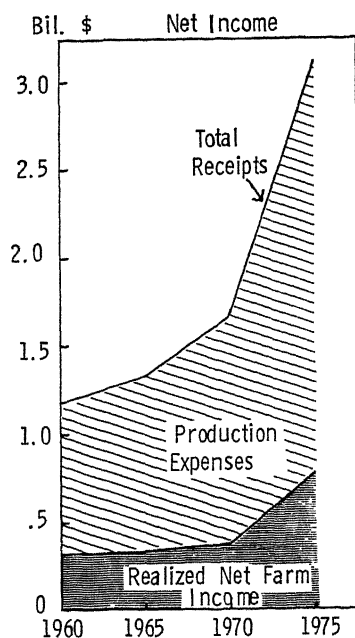


FIG. 21.—Farm income components for Ohio, 1960-1975.

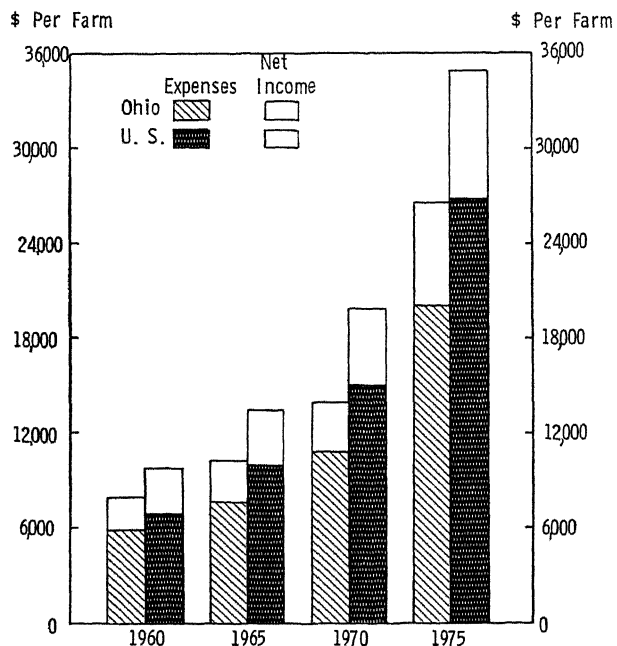
production. On a value basis, steady growth in soybean oil, protein meal, and animal products has occurred since 1960. Ohio's share of each of the major export commodities is relatively large. Thus, trade policies and programs have great meaning to farmers, the input sector, marketing firms, the food distribution system, and consumers in Ohio. Trade in farm

products not only affects food prices to the urban resident but may also influence his employment and income.

FARM AND NONFARM INCOME

Farmers, much the same as other businessmen, are continually affected by their competitive position. Obviously their future prospects for survival with satisfactory earnings depend to a large degree on their ability to maintain their position. The location of Ohio farms close to large and growing metropolitan markets, ready access to foreign outlets through the St. Lawrence Seaway and the Ohio-Mississippi River waterway, and proximity to off-farm employment weigh heavily on Ohio's farm and nonfarm economies. These are reflected in farmers' incomes, expenses, and earnings and indicate their general competitive position vis-a-vis farmers in other states.

FIG. 22.—Average realized net income per farm, U. S. and Ohio, 1960-1975.



Source: Appendix Table 18.

Gross Receipts and Realized Net Farm Income

Cash receipts and net farm income of Ohio farmers both have been increasing rapidly (Figure 21). Cash receipts from Ohio farm marketings at \$2.76 billion in 1975 contributed 3.1% of the nation's total—an increase from 2.9% in 1960. The net farm income of Ohio farmers increased to 3.4% of the nation's total in 1975. This compares to 2.8% in 1960.

Per Capita Income

Gross income per U. S. farm in 1975 at nearly \$35,000 exceeded the \$26,600 of Ohio farmers (Figure 22). Average realized net income per Ohio farm at nearly \$6,600 during 1975 lags behind the \$8,080 U. S. average. However, net income per farm has

increased more rapidly in Ohio than in the U. S. recently.

Nonfarm per capita personal income for U. S. farmers has grown much more rapidly than has income from farming, thus further strengthening the interdependence between the farm and nonfarm sectors. In fact, the farm and nonfarm sources of income were nearly equal in 1975, resulting in an average of \$5,128 per person (Figure 23). Ohio per farm personal income from all sources may not differ greatly from this national average. But the composition of Ohio's farm population suggests that per capita personal income may be less from farming and more from nonfarm sources due to greater off-farm employment opportunities.

The disposable income of farm people from all sources at \$4,550 per person in 1975 was 90% of the nonfarm population's income from all sources (Figure 24). More importantly, great strides have been made in closing the gap between the incomes of the farm and nonfarm population in recent years.

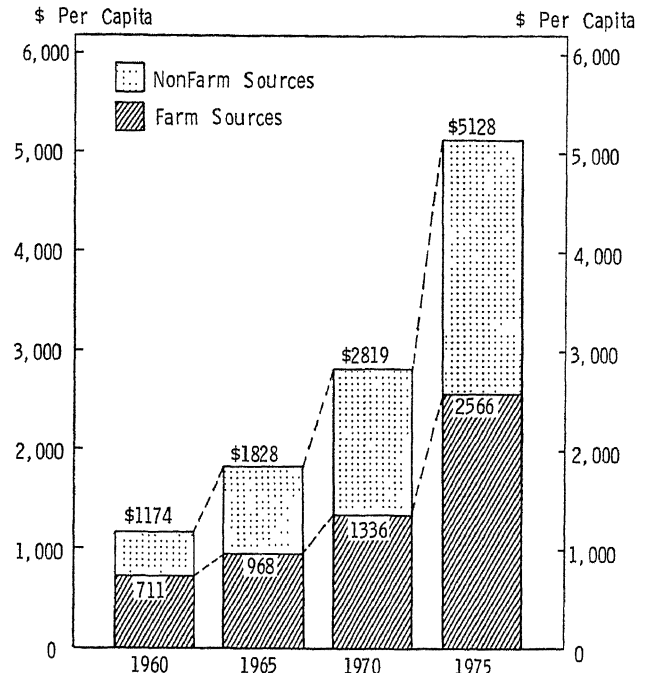
FARMS BY SIZE, TYPE, AND PRODUCTIVITY

The type of farming, size of farming operations and productivity all affect the income of farm people. These factors influencing the competitive position of Ohio farmers and the well-being of rural Ohio will be considered in this section.

Size of Farms

The number of farms by level of income from gross sales of farm products per farm can provide useful insights into the competitiveness of Ohio farmers vis-a-vis other producers. Ohio has a larger share of farms selling \$40,000 or more of farm products than has the U. S. (Figure 25). By the same token, Ohio has a larger share of the farms selling less than \$20,000 per farm per year. The latter reflects the

FIG. 23.—Per capita personal income of the farm population by sources, U. S., 1960-1975.

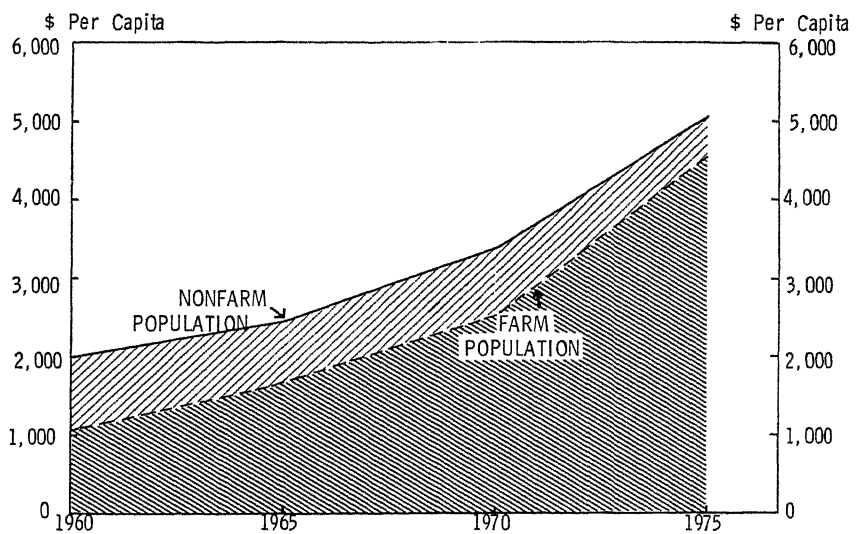


Source: Appendix Table 19.

smaller average size of Ohio farms and the greater opportunity for part-time farming in Ohio than the less urbanized states. Overall, Ohio has a greater share of the total number of farms in the U. S. than is its share of farm income.

In terms of acres, Ohio farms average 160 acres and are substantially smaller than the U. S. average of 417 acres (Figure 26). Furthermore, the growth in the average size farm in the last 15 years in Ohio has failed to keep pace with the U. S. This probably

FIG. 24.—Per capita disposable personal income from all sources, U. S., 1960-1975.



Source: Appendix Table 19.

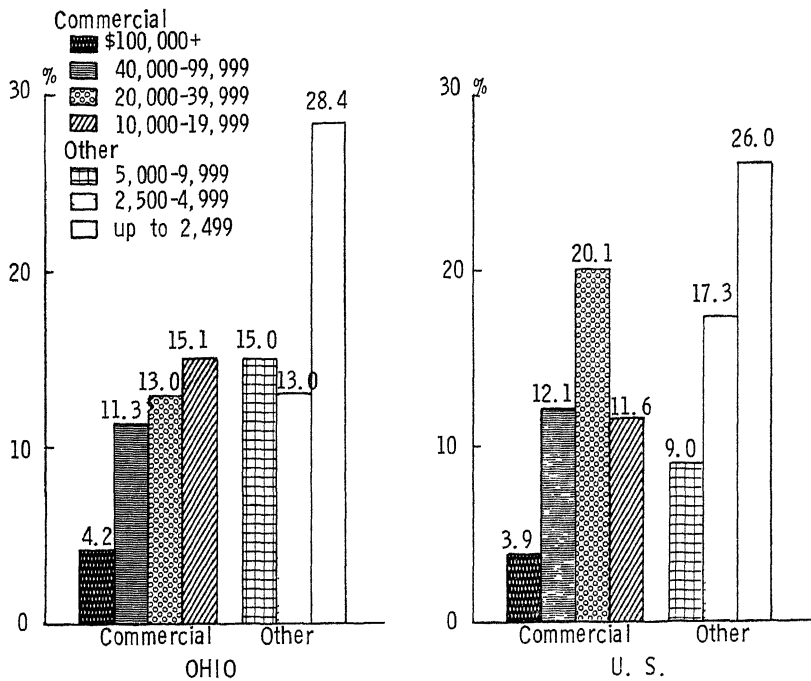


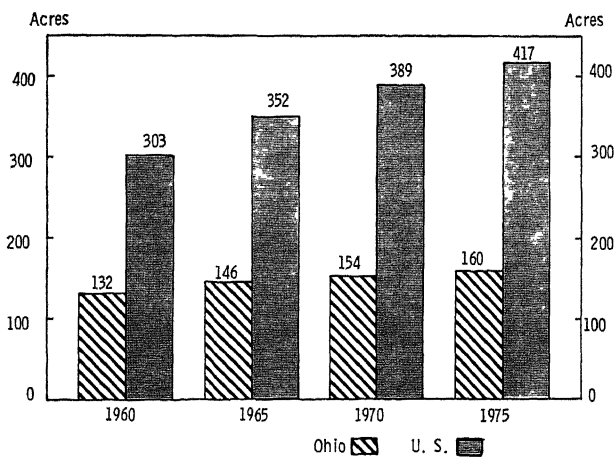
FIG. 25.—Percent of farms by economic class, Ohio and U. S., 1975.

Source: Appendix Table 20.

reflects the continued pressure from urban encroachment on farmland and the opportunity for part-time farming, which allows many farmers to earn satisfactory family incomes on smaller farms.

The growth rate of the larger Ohio farms, or those with 500 acres or more, has been faster than in the U. S. This indicates many commercial farmers in Ohio are making the kind of adjustments necessary to remain competitive in farming. At the same time, the farms with less than 500 acres are declining in number in both the U. S. and Ohio.

FIG. 26.—Average size of farm in Ohio and U. S., 1960-1975.



Source: Appendix Table 21.

Type of Farming

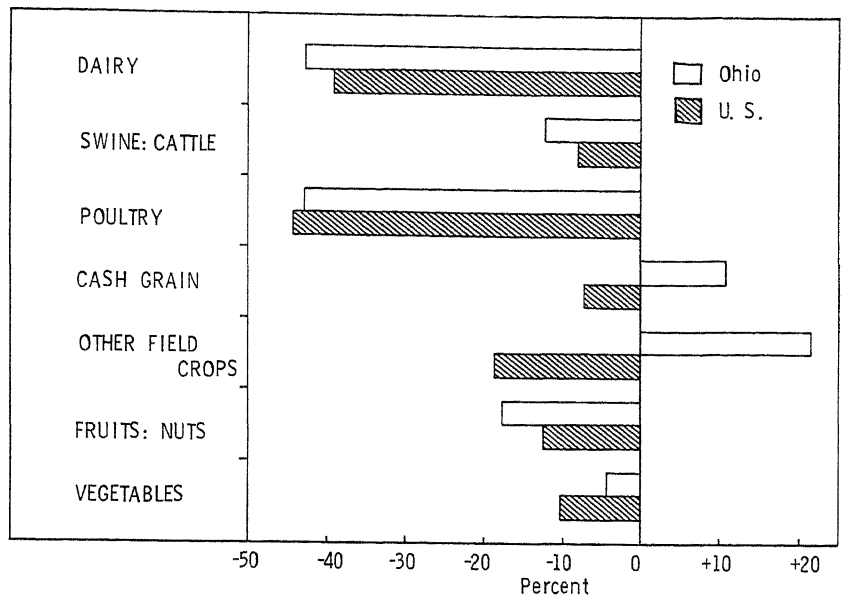
Ohio is following rather closely the national trends of declining numbers of swine and cattle, dairy, poultry, fruit and nut, and vegetable farms (Figure 27). But Ohio has an increasing number of farms specializing in cash grain and other field crops such as popcorn and sugar beets, which is counter to the U. S. trend. Many Ohio livestock farmers are switching to cash grain crops.

Changes in Grain and Livestock Production

Changes in crop acreages from 1960 through 1975 in Ohio show an increase in either the absolute acreage or the relative share of corn for grain and silage, wheat, soybeans, sugar beets, and tomatoes (Figure 28). This has been accomplished despite Ohio's declining share of total U. S. cropland. The most dramatic shift in both the U. S. and Ohio was the nearly 120% increase in soybean acreage. Ohio and U. S. trends in acreage, up or down, have been relatively consistent for most crops. Changing farm programs and expanding export markets meant more variation recently in the amount of cropland used for wheat, corn, and total cropland harvested.

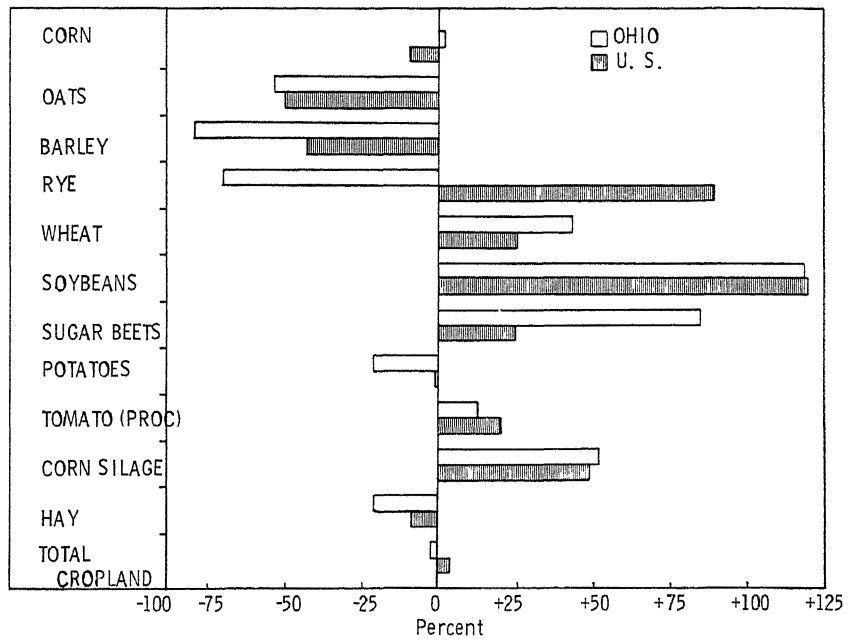
The major U. S. crops and those for which Ohio has realized an increasing share—corn, soybeans, and wheat—are those for which Ohio realizes above average yields (Figure 29). Sugar beet yields in Ohio exceed the nation's and tomato yields are nearly equal to the U. S. (meaning California) average. Combining good yields of these crops with usually higher

FIG. 27.—Percentage change in number of commercial farms by type in Ohio and U. S., 1960-1970.



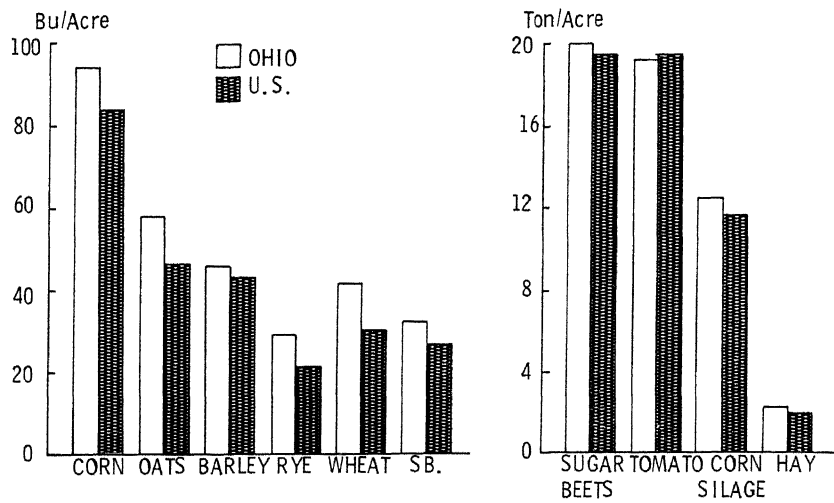
Source: Appendix Table 22.

FIG. 28.—Percentage change in crop acreages, Ohio and U. S., 1960-1975.



Source: Appendix Table 23.

FIG. 29.—Two-year average yields of major crops in Ohio and U. S., 1975-1976.



Source: Appendix Table 24.

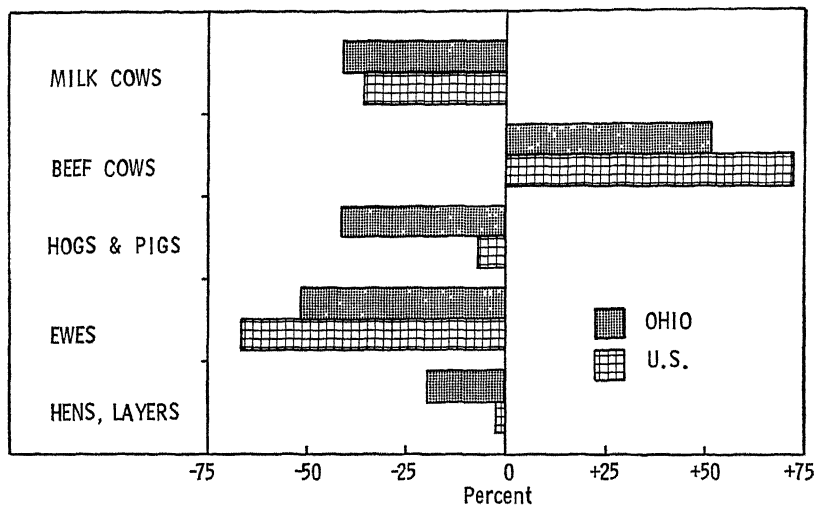


FIG. 30.—Percentage change in breeding livestock in Ohio and U. S., 1960-1975.

Source: Appendix Table 25.

than average U. S. farm prices, Ohio farmers have a comparative advantage in the production of some crops.

In the animal-poultry sector, Ohio is falling behind in the relative shares of most types of livestock (Figure 30). The only area of significant gain in absolute numbers is in beef cows. This gain is concentrated in the Appalachian or Allegheny Plateau region of Ohio.

When the value of livestock-poultry products sold from Ohio and U. S. farms is examined, the declining relative position of Ohio is very evident (Figure 31). Steady declines in the volume of all species of meat animals, milk, and eggs marketed occurred from 1960 to 1975. However, a gain was made for

the number of turkeys and broilers marketed, although the increase was less than in the U. S.

STRUCTURE AND COORDINATION IN OHIO'S FOOD SYSTEM

Farming is an integral part of a total food and agriculture system. As such, farmers both influence and are influenced by others in the system. How do farmers interface with the decisions made by others, such as manufacturers of farm inputs, those in the capital markets, and food processors and retailers? How are the output decisions of one industry coordinated with the input needs of another? Who are the decision-makers in the food system? Where are the loci of control and power? These and related ques-

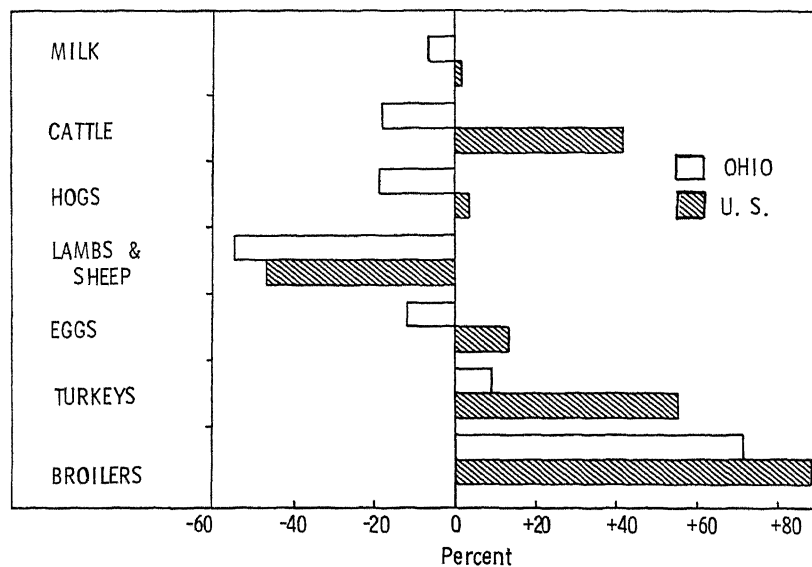


FIG. 31.—Percentage change in quantity of livestock and products sold from Ohio and U. S. farms, 1960-1975.

Source: Appendix Table 26.

tions prompt an examination of the organization of the farm and food system in Ohio.

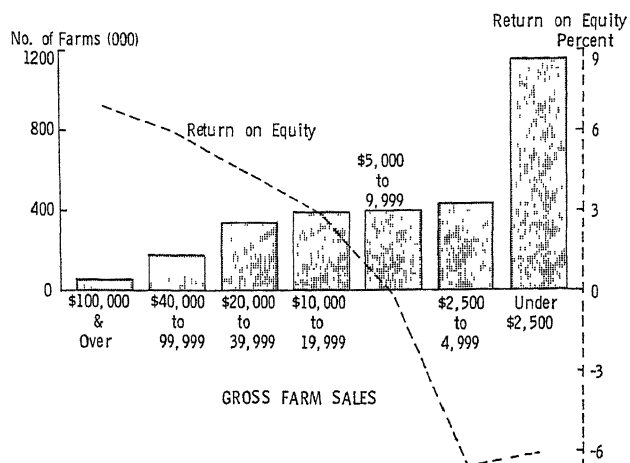
Income by Economic Class of Farm

The largest economic classes of farms (sales of \$100,000 or more) in the U. S. are the fewest in number and have the highest rate of return to equity (Figure 32). These same farms have the highest net farm income (Figure 33). They have off-farm incomes equal to many other farmers, but are less dependent upon the off-farm sources of income. For example, those U. S. farms in 1970 with sales of \$40,000 to \$99,999 or more per farm had average total incomes of \$23,516, a net farm income of \$19,568 and a return on equity of 5.9%. This compares to the average for all farms of \$10,875 in total income, \$5,001 of net farm income, and a return on equity of 2.1%.

The importance of off-farm income to the well-being of a very large proportion of farm people is substantial. For example, off-farm income exceeded net farm income on nearly 2 million farms or two-thirds of all the farms in the U. S. in 1970. This includes those farms selling less than \$10,000 worth of farm products per year. These are the same farms which experienced a loss in farming and in which off-farm income is supporting the farm enterprise.

The data suggest that the farms selling \$40,000 or more of farm products per year are the farmers best able to adopt modern, large-scale farming technology. Thus, they are able to make a full-time enterprise out of farming. Many farmers selling \$10,000 to \$39,999 of farm products annually, particularly those earning above average returns, should

FIG. 32.—Farm numbers and average rate of return to equity by economic class of farm, U. S., 1970.



Source: Appendix Table 27.

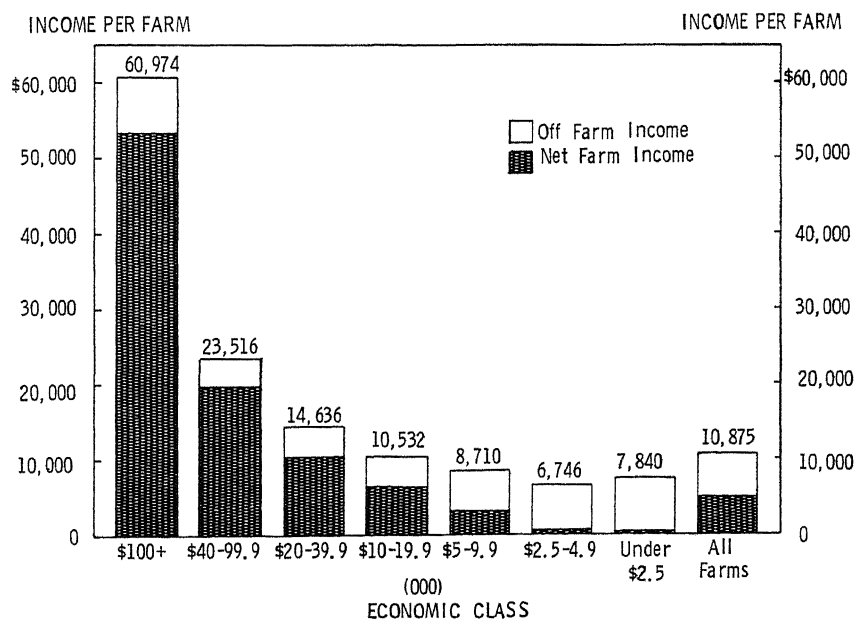
be able to acquire the resources or make adjustments in their farming enterprise to attain sufficient size to become viable full-time farming enterprises.

Prior data indicated Ohio does not differ from the U. S. in the proportion of farms selling \$40,000 or more of farm products per farm. But Ohio has a higher proportion in the very small sales classes.

Farm Expenditures and Credit

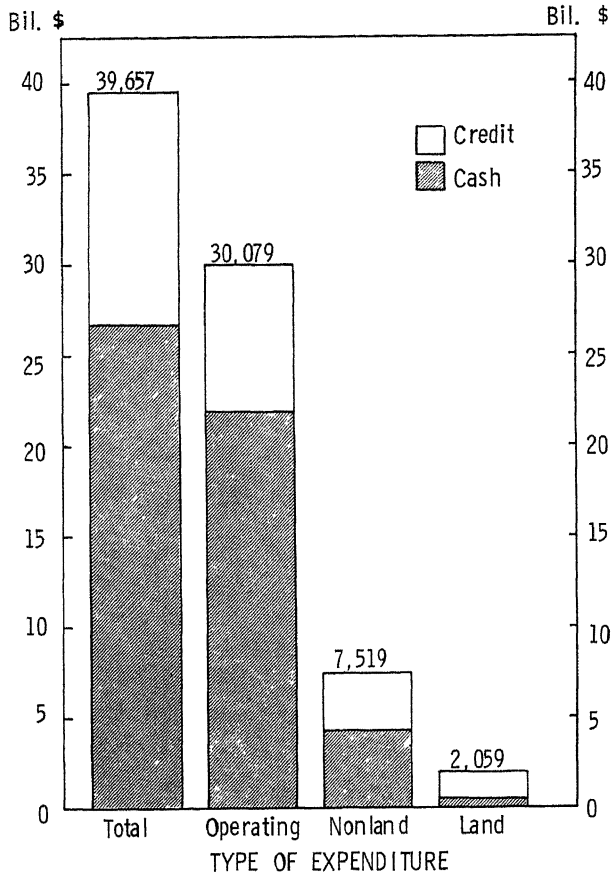
Farmers in 1970 paid cash for two-thirds of their total farm operating expenses and capital purchases of nearly \$40 million (Figure 34). Of the \$30 million spent for operating expenditures, about one-fourth was acquired through financial institutions and the

FIG. 33.—Total net farm and off-farm income per farm by economic class, U. S., 1970.



Source: Appendix Table 28.

FIG. 34.—Total farm expenditures and their financing by major type of expenditure, U. S., 1970.



Source: Appendix Table 29.

remainder was paid in cash. Of the capital expenditures for land and nonland improvements, nearly 50% were cash expenditures. But 75% of the value of land was financed with credit. Overall, the high

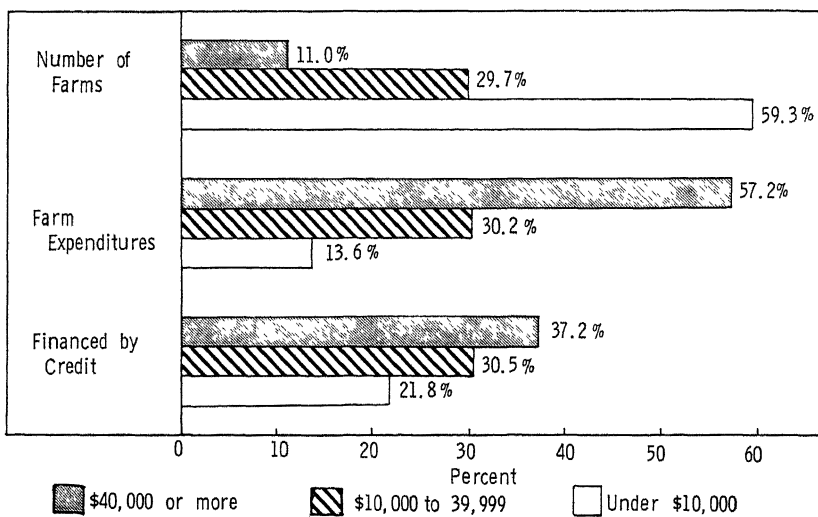
level of equity financing in farming suggests relatively little potential for outside control through financial markets.

The largest farms are more dependent upon both purchased farm production inputs and borrowed financing for those inputs than are smaller enterprises (Figure 35). The largest 11% of the U. S. farm operators, or those selling more than \$40,000 in farm products annually, accounted for 57% of all the purchased inputs. These operators used credit to finance 37% of their purchases, a substantially higher proportion than did operators of smaller farms. The greater use of credit by large farmers probably reflects their increased use of purchased inputs, which in turn suggests that these are the more specialized farm production enterprises.

Tenure and Farm Organization

The ownership and operation of farms has been a societal concern ever since the founding of the nation (Figure 36). It remains so today. Ohio and the U. S. are trending toward part-owner and owner-operated farms and away from tenant farms. This reflects increased specialization as more small, former farmers are becoming landlords. Ohio has an above average number of part-time farms relative to the U. S. This will probably remain so due to the great dispersion of off-farm employment opportunities in Ohio.

The individual proprietorship type of business organization dominates Ohio farming (Figure 37). About 10% of the farms are some form of partnership arrangement. Corporate forms of organization, including both family incorporated and nonfarm corporates, are relatively small. But it may be that the partnerships and corporate forms of business organization are expanding.



Source: Appendix Table 30.

FIG. 35.—Percent of total farm expenditures and their financing by sales class, U. S., 1970.

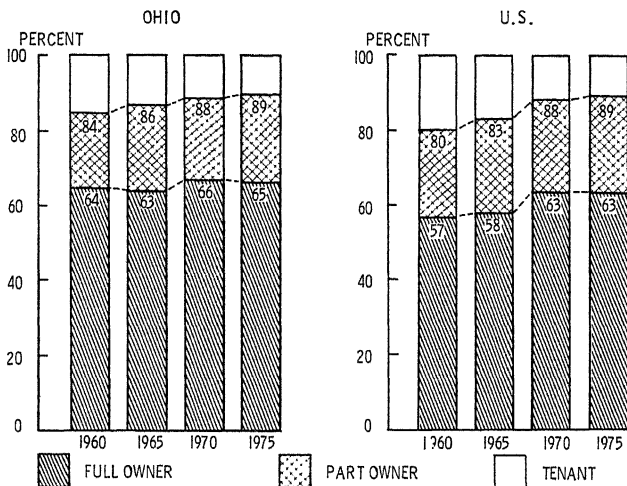
Structure of the Food System

The food system in Ohio is characterized by high levels of market concentration at the food retailing and farm input levels, with moderate concentration in food processing and manufacturing (Figure 38).

While concentration is only one measure of the structure of an industry, it is useful for delineating points of relative market power and thus control. Imbalanced market power is a predominant feature of the system, with food retailers and farm input suppliers generally enjoying the most and farmers the least.

Food retailing is slightly less concentrated on a market-by-market basis in Ohio than in the U. S. as

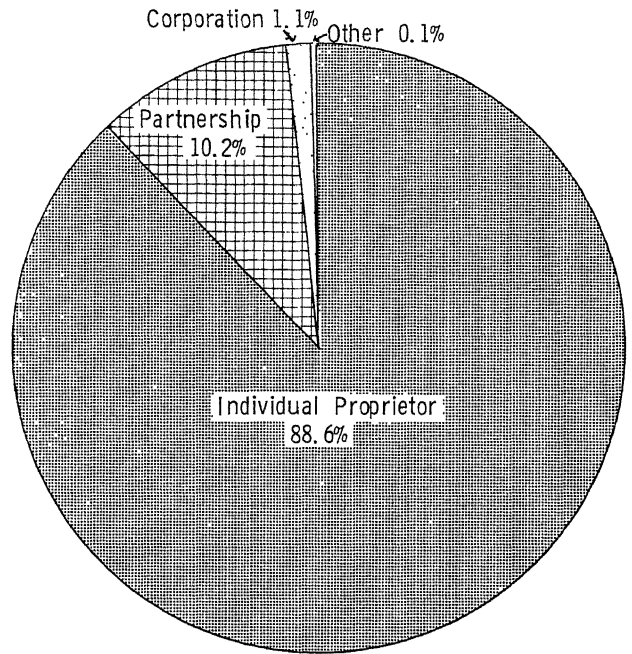
FIG. 36.—Farm tenure in Ohio and U. S., 1960-1975.



Source: Appendix Table 31.

a whole (data in Appendix Table 33). Nevertheless, with the four largest firms accounting for an average of more than 60% of total supermarket sales and the eight largest with more than 80% in Ohio's major

FIG. 37.—Ohio farms by type of organization, 1975.

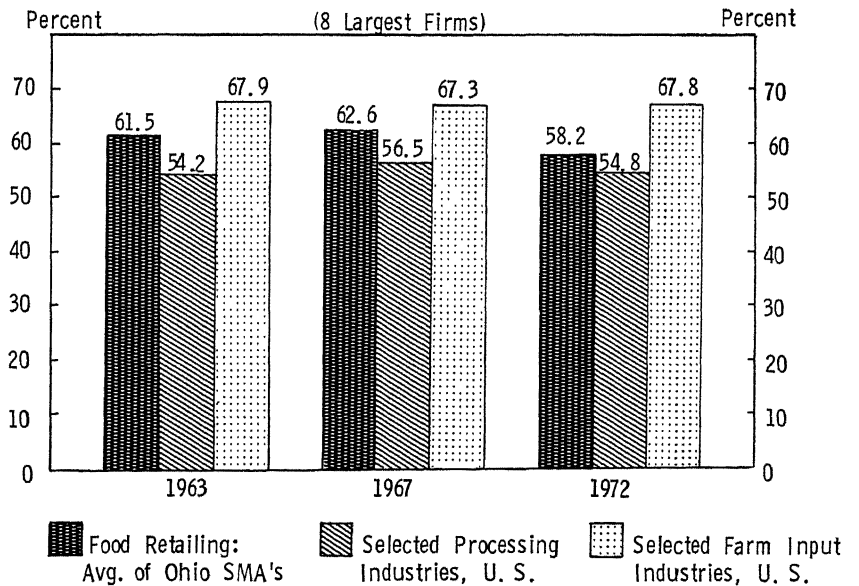


Total Farms Reporting: 69,977

Farms Not Reporting: 27,820

Source: Appendix Table 32.

FIG. 38.—Firm concentration in food retailing, processing, and farm input industries, 1963, 1967, and 1972.



Source: Appendix Tables 33, 34, and 35.

metropolitan areas, significant market power exists in this industry. While cursory examination of retail concentration ratios appears to reveal a slight downward trend since 1967, closer examination suggests that the declining average concentration ratio in Ohio may be largely due to redefinition of Standard Metropolitan Statistical Areas (SMSA's) which has increased their total market size. For example, of the seven markets showing a decline in eight-firm concentration levels between 1967 and 1972, three were redefined and expanded in that period.

The data on the structure of Ohio's food retailing industry further dramatize the relative importance of consumption and thus food distribution in the state. In total, Ohio contains 17 of the nation's 263 SMSA's. Thus, Ohio accounts for about 6.5% of the nation's metropolitan areas compared to 5% of its population, about 3% of its commercial farms, and 1.2% of the total land area.

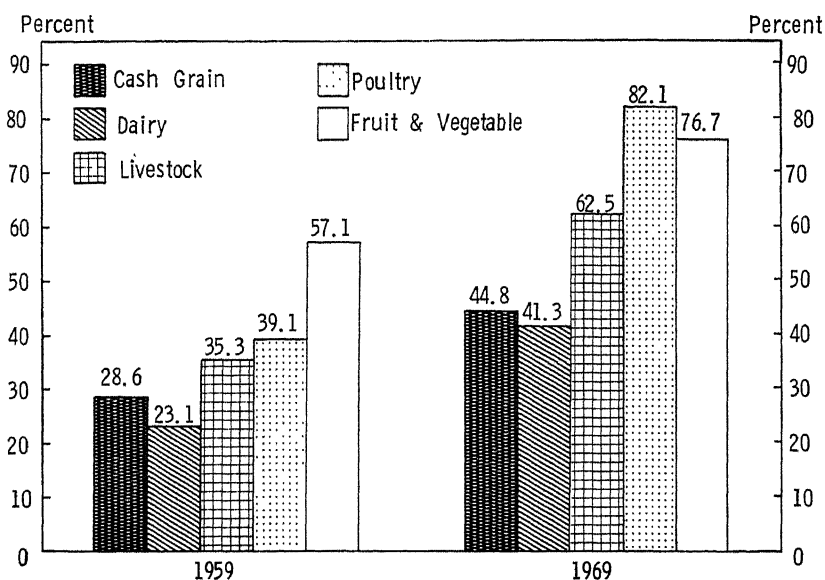
Only national concentration data are available for the food processing and farm input industries (Tables 34 and 35). These probably understate the extent to which these industries are concentrated in Ohio, as typically concentration ratios increase as the size of the relevant market decreases. This is because all of the largest national firms do not operate in all regions or states. This allows the others to garner a larger market share in those areas. As a result, concentration in an individual state such as Ohio is usually greater than that indicated by national data.

Food processing is moderately concentrated. However, with the exceptions of the meat packing and dairy industries, an upward trend is evident, particularly at the eight-firm level. The two major in-

dustries with declining concentration, meats and dairy, are precisely those which have been subjected most intensively to federal "trust busting" activities in the past. Concentration might well be significantly higher if it had not been for explicit public policy aimed at moderating such a trend. The result is a processing segment of the food sector that is somewhat less concentrated, on the average, than is food retailing and distribution. The concentration levels in both food processing and distribution suggest that there are relatively few market options for suppliers to firms in these industries.

The farm input industries, on average, show about the same degree of market concentration as do food retailers, making these the two most heavily concentrated segments of the food system. These approximate the 4-firm: 50 percent, 8-firm: 70 percent concentration levels that have generally been shown in industrial organization literature as corollaries with oligopolistic/oligopsonistic market behavior. Among the input industries, tractors and machinery stand out as highly concentrated. Local markets for tractors and machinery could be somewhat more competitive than suggested by these concentration data, to the extent that dealers of like-branded products compete with one another. However, no local or state data are available to support or refute such a supposition.

No measures of concentration in farming comparable to the 4-firm and 8-firm ratios used for other segments of the food system are available. Census of Agriculture data give some insight into concentration levels, however (Figure 39). While these data show that concentration has been increasing among



Source: Appendix Table 36.

FIG. 39.—Share of total farm sales by Class I farms by type of farm, U. S., 1959 and 1969. Class I farm = farm product sales of \$40,000 or more.

major farm enterprises, the absolute level of concentration is substantially below that for other segments of the food system. For example, whereas the four largest wheat flour millers in the U. S. account for about 40% of that business, it takes more than 30,000 cash grain farmers to account for a similar share at the farm level. Likewise, where the four largest producers of tractors account for more than 80% of the sales in that market, the largest 1,000 farmers in Ohio account for less than 17% of total sales by Ohio farmers. The disparity in concentration, thus market power and control, is obvious. Food distributor/retailers and farm input manufacturers have the most; farmers the least.

First Handlers

Two trends are evident relative to handlers of farm-produced products in Ohio: they are becoming fewer in number and larger in size (Figure 40). Nonetheless, there remains a fairly large number of such establishments, suggesting that an adequate network of outlets for farm products exists. Actually there may be too many of some types of facilities to achieve the most efficient assembly and processing of Ohio's agricultural products. For example, recent studies indicate that, to achieve maximum assembly, processing, and distribution efficiencies, the number of fluid milk plants in Ohio should be reduced to one-third the current number⁶ and the number of livestock markets could be reduced from the current 120 to about 33.⁷ This suggests that there is likely to be a continuation of the decline in numbers of first handlers of farm products in Ohio which may have important implications for market access by farmers and thus opportunities for entry into various farm enterprises. This concern is furthered by concentrated control by relatively few processing firms. Thus, while there appears to be a more than adequate number of first handler outlets for Ohio farm products, effective control at this level of the food system appears to be rather concentrated.

Farm and Off-farm Coordination

The methods used to coordinate the production-output decisions of farmers with the input needs of others in the food system have changed in recent years (Figures 41 and 42). Open markets have declined in relative importance for most commodities. While there are few data available specific to Ohio, there is

FIG. 40.—Number of firms handling farm products in Ohio, 1963 and 1972.

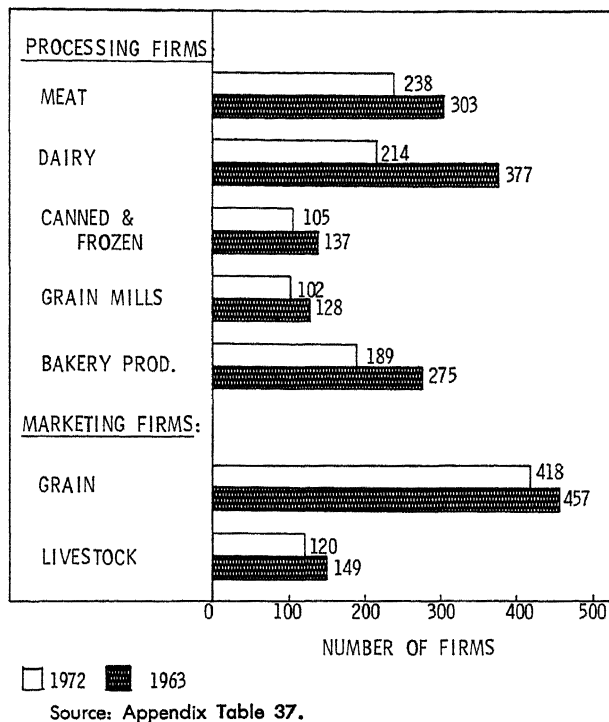
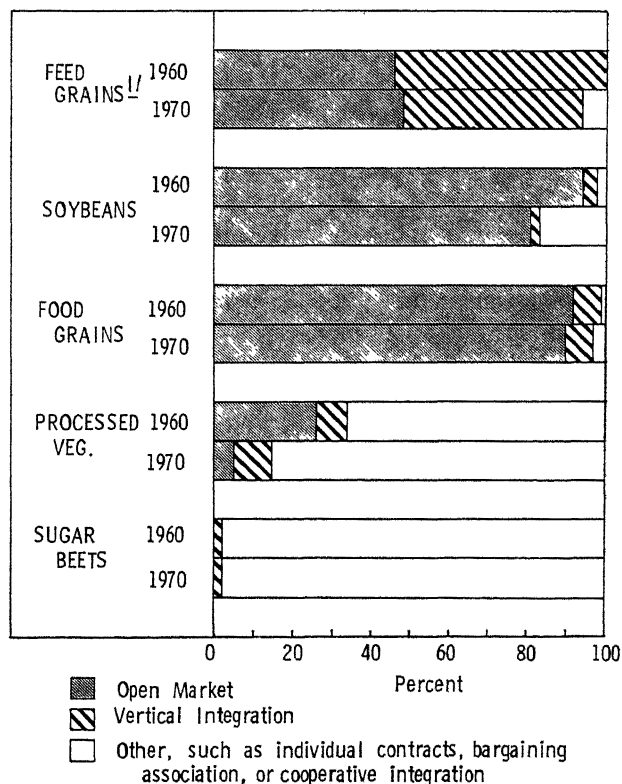


FIG. 41.—Methods of coordinating production of selected crops, U. S., 1960 and 1970.

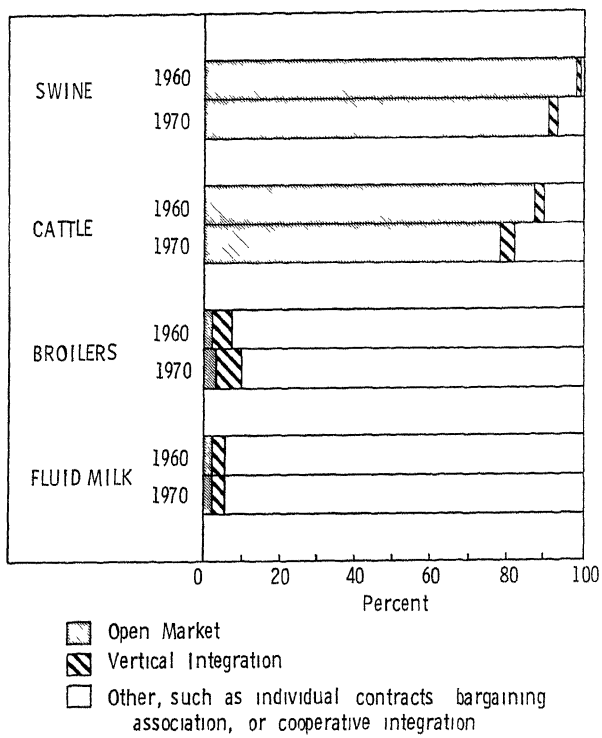


⁶Kilmer, Richard L. and David E. Hahn. 1976. The Effect of Government Policy Instruments on the Market Structure of the Ohio Fluid Milk Processing Industry. Research report presented at Annual Meeting, Amer. Agri. Econ. Assoc.

⁷Miller, Edgar A. and George F. Henning. 1966. Suggested Location of Ohio Livestock Markets to Reduce Total Marketing Costs. Ohio Agri. Res. and Dev. Center, Res. Bull. 981.

^{1/}Includes corn fed on farm where grown
Source: Appendix Table 38.

FIG. 42.—Methods of coordinating production of selected livestock and poultry industries, U. S., 1960 and 1970.



nothing to suggest that Ohio differs appreciably from general trends in the U. S

There is a great amount of variability in coordinating methods among commodities. Even so, the same trend seems evident. Open markets in general, and organized markets in particular, are giving way to more tightly controlled exchange and coordination arrangements such as contract integration, cooperative integration, and vertical integration through common ownership of two or more hierarchially arranged stages of the food system. This trend is a clear phenomenon of the trend toward fewer, larger, and more specialized enterprises in the system and the greater interdependence that results. No longer are the individual decisions of each participant protected by the existence of large numbers of enterprises—suppliers or buyers—on the other side of their markets. Thus, to reduce the risks associated with the potential loss of a market, participants tend to seek some type of: 1) resource-providing agreement, or 2) market-assuring contract with other participants in the system. This is evident in sugar beets, processing vegetables, broilers, and milk.

Most seller-buyer arrangements are formed for the duration of a production cycle and the participants may seek new partners when the cycle is completed. Such short-term arrangements are charac-

terized by contracts and bargaining associations, and perhaps to a lesser extent by cooperative integration. However, cooperative integration, along with vertical integration through ownership, implies a long term inter-enterprise linkage. And these methods of coordination are showing slow but steady increases.

In total, these trends mean that inter-enterprise coordination in the food system is becoming increasingly administered with advance commitments of one participant to another, and decreasingly a phenomenon of arms-length market exchange. And the administered-type agreements are slowly becoming longer term commitments. With control clearly concentrated most heavily in the nonfarm enterprises, important questions concerning the fair and equitable treatment of all participants arise, along with questions concerning the overall performance of the system.

SUMMARY

The challenge of this publication is to provide factual information that helps conceptualize emerging issues and problems in Ohio's agriculture/food system to which researchers can productively direct their attention and to assist policy makers and leaders of farm/business groups to identify opportunities and challenges. The focus has been upon the resources and trends helping shape the general environment in which the agriculture/food system functions.

Looking to the future of Ohio's agriculture and food system, several implications of the information become apparent. Attention will need to be directed toward urbanization and various land use policies affecting the competitive position of Ohio's farmers and food industry vis-a-vis the U. S. The impacts on rural communities from changing farm enterprises, population migration to rural areas, decentralization of industry, and expansion of off-farm employment opportunities are forces of paramount importance. The scarcity of petroleum/gas resources has great implications to the Ohio food system. The attitudes toward farming and the food industry and the climate provided by the political system at the federal/state/local level will heavily influence the future configuration of Ohio's food system.

It is believed the basic data presented here can help in assessing the direction Ohio's agriculture and food system may take and be useful to many people—businessmen, farm leaders, educators, and policy makers—in their decision making. The intent has been to provide information which will assist people in agriculture and the food system in adapting to these changes. The position of Ohio's agriculture and food system two or three decades from now will be heavily influenced by both individual and societal decisions in the next few years.