

Agribusiness in the Machine Age

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MODERN AGRICULTURE is much broader than the narrow dictionary definition—"the art or science of cultivating the ground." It is the whole business of supplying food and fiber for a growing population at home and abroad.

The art or science of cultivating the ground is but one link in the long chain of feeding and clothing people. The chain begins many jobs before we reach the farm and continues several processes after our newly produced food and fiber leave the farm gate. For this whole complex of agricultural production and distribution functions some persons use the term "agribusiness."

The United States has shifted in the past century from a predominantly agricultural economy to an industrial and commercial economy. The industrial sector is now beginning to give way, at least relatively, to a growing variety of personal services. That is possible primarily because we have been able to specialize in our production and processing of food and fiber by the increased use of science, technology, and mechanization and an increasing output per worker in farming and in agribusiness. We have transferred many farm jobs off the farm, such as the shift of farm power from horses and oats to tractors and gasoline, but we do the entire job with much less manpower than formerly.

AGRICULTURE is now in the middle of its third great revolution. Agricultural engineers have had a big part in all three revolutions.

The first revolution came in the middle of the 19th century, when we began to substitute animal energy for human energy. The invention of the reaper is the best known event associated with it. This and other developments called for considerable retooling in agriculture. They increased output per worker on farms and started us on the path of feeding our growing Nation with a constantly shrinking proportion of our total population in the field. Agriculture began to take on some characteristics of a commercial enterprise, although sometimes the change was almost imperceptible.

The second great revolution began in the 1920's, with the substitution of mechanical energy for animal energy. It likewise increased the commercialization of agriculture, shifted a number of production functions off the farm, increased output per worker substantially, and resulted in a further reduction in the proportion of our total working population on farms.

The third revolution is the undergirding of agricultural production and marketing with vast amounts of science, technology, and business management. This revolution has been in progress for a decade or two, but at an accelerated pace during the past few years. This revolution is transferring still additional production and marketing functions off the farm and continues to underscore the importance of specialization at all levels of the agribusiness complex.

Agricultural historians a generation hence may characterize the decade of the 1950's as the decade of the scientific breakthrough. In this decade we experienced an unprecedented number of discoveries, which have changed agriculture from stem to stern.

The decade of the 1960's opens with the march of agricultural science in full stride. Agriculture is changing from a way of living to a way of making a living. It is changing from a business of arts and crafts to a business undergirded with large amounts of science and technology.

IT IS WRONG to think of agriculture as a declining industry.

American agriculture is an expanding industry in every important respect except one—the number of people required to run our farms. Our agricultural plant each year uses more capital, more science and technology, more managerial capacity, more purchased production inputs, more specialized marketing facilities, and more research than the year before.

We do not think of air transportation as a declining industry just because a pilot in a jet airliner can now take 100 passengers from coast to coast in half a day, compared with 20 passengers in a day and half two decades ago. This, like agriculture, is a strong and growing industry.

Although a smaller share of our total population is engaged directly in farming, the agricultural industry is big, broad, and basic. Of 68 million persons employed in America in 1960, about 26 million worked somewhere in agriculture—8 million worked on farms, 7 million produced goods and services purchased by farmers, and 11 million processed and distributed farm products. Hence, almost two-fifths of all our employed people are engaged in work related to agriculture.

The declining trend in farm population is itself a sign of a strong agriculture. Brainpower has replaced horsepower as the essential ingredient on our farms. The total United States agricultural output increased by two-thirds in the past two decades, while the number of farmworkers declined some 3 million. This means that production per worker on our farms has doubled in the past 20 years. This remarkable increase in production efficiency can be matched by no other major sector of the American economy.

Progress of this kind can be continued only if we have capable and well-informed men on our farms. We will need fewer farmers in the future, but they must be better. They will be operating on a fast track, and the race will go to the swift.

WE MUST broaden our thinking about agriculture to include the businesses that supply our farmers with items used in production, as well as the processing and distributing concerns that handle the food and fiber produced on farms.

When the total agribusiness is taken into consideration, approximately one-third of the workers are on farms and two-thirds are off farms. Approximately two-thirds of the capital is on farms and one-third off. Approximately one-sixth of the value added is on farms and roughly five-sixths off the farm.

The farm plant in America purchases each year approximately 17 billion dollars worth of goods and services used in farm production. To this it adds a value of about 17 billion dollars on farms, which means that the total farm produce leaves the farm gates at about 34 billion dollars. Processing and distribution add another 45 billion dollars to this, which makes a total value of output in agribusiness of approximately 80 billion dollars in 1960.

These figures point out the growing importance of agriculture as a market. Industry depends on agriculture as a customer to a greater extent than most persons realize.

A generation ago, farmers were producing most of their own fuel, power, and fertilizer, but now industry is furnishing farmers each year:

6.5 million tons of finished steel—more than is used for a year's output for passenger cars;

45 million tons of chemical materials—about 5 times the amount they used in 1935;

18 billion gallons of crude petroleum—more than is used by any other industry;

285 million pounds of raw rubber—enough to make tires for 6 million automobiles;

22 billion kilowatt hours of electricity—more than enough to serve the cities of Chicago, Detroit, Baltimore, and Houston for a year.

We could go on citing other evidences of the tremendous importance of agriculture in our national life, but the

point has been made. Whatever happens to agriculture has a direct and major impact upon industry. And industry, by the same token, has a very great interest in the welfare of agriculture.

The agricultural world and the industrial world are not two separate communities with merely a buyer-seller relationship. They are so bound together and so interrelated that we must think of them jointly if we are to reach sound conclusions about either one.

THE MODERN commercial farm resembles a manufacturing plant in many respects. The large amount of equipment in use on the farm represents a substitution of capital and machinery for labor.

Many family commercial farms today have total capital investment exceeding 100 thousand dollars. It is not uncommon to have capital investment approaching or exceeding 200 thousand dollars on family commercial farms in the Corn Belt. Many Midwest farms have total capital investment per worker in excess of 50 thousand dollars. This is three times the average investment per worker in American industry.

The modern farm operator is much less self-sufficient than his father was. He buys many goods and services needed in his production that father produced on the farm. In a very real sense, he assembles "packages of technology" that have been put together by others on a custom basis. For example, he buys his tractors and petroleum, whereas his father produced horses and oats. Think for a moment of the technology that goes into the modern feedbag, with its careful blending of proteins, antibiotics, minerals, and hormones, as contrasted with the ear corn and a little tankage put out for the hogs in his grandfather's day.

This development obviously calls for a high level of managerial capacity. It is more difficult to manage the modern commercial farm successfully than it is to manage the family-sized manufacturing concern, grocery store, or foundry shop in the city.

The manager of the modern commercial family farm must make more managerial decisions each week covering a much wider range of subject matter than does his counterpart in the city. He has more capital invested, takes greater risks, faces stiffer competition, and has more opportunity for reward if he does a good job.

This kind of "manufacturing operation" means rather narrow operating margins for farmers. In recent years farmers, as a group, have spent some 65 cents of every dollar they take in for operating expense. That is the average. Specialized commercial farmers spend a higher ratio than that for operating expense. They operate on a much narrower margin than their fathers did, but make greater net incomes because of increased volume. A large share of their operating expenses goes for items that their grandfathers produced on the farm himself, but that modern farmers "hire" someone else to produce for them.

TODAY'S farm production is a synthesis of several scientific disciplines.

The earning capacity of the average farmer used to be limited primarily by his physical strength and the amount of work he could do. He substituted some animal muscle for human muscle, but not a great deal. He substituted very little mechanical energy for muscle power. Agriculture was primarily a means of converting muscle energy into farm produce.

Human energy is much less important in today's farm operation. Energy can be purchased so much more cheaply than it can be provided by man. Today's farm operator is a combination manager-applicator of the life sciences, the physical sciences, and the social sciences. The research undergirding modern agriculture ranges all the way from physics to physiology, from biology to business. It is just as complex and just as far on the periphery of knowledge as is the research done in the laboratories of the nuclear scientist, for example.

The first claim of any society upon its total production resources is to get enough food to keep the population alive and well. This is true in primitive societies, in semi-developed societies, and in highly developed societies. We do this so efficiently in this country that almost nine-tenths of our population is available to produce the wide variety of goods and services that make up the American standard of living.

A tremendous amount of research lies behind the production and distribution of those 17 billion dollars' worth of production items farmers bought in 1960. That research must be carefully integrated into the farm operation itself. Indeed, it must go beyond that, to the processing and distribution of the farm product after it leaves the farmers' gates. Increasingly, this kind of research calls for a research team representing various disciplines, and requires careful coordination through the entire process of production, processing, and distribution.

THE TECHNOLOGICAL revolution in the processing and distribution of food and fiber has been perhaps even more spectacular than the technological revolution on the farm. Countless steps in the processing of food and fiber that once were done on the farm have long since moved to the city.

The textile industry was one of the leaders in this field. In the early 1800's, when the mechanical production of textiles began, weaving in the home first declined and then disappeared. A little later, as the migration of population to industrial centers got under way, it was necessary to move food from the farm to urban areas. Inasmuch as the typical food production cycle is annual, and the human hunger cycle is daily, it became necessary to devise means of preserving and storing an annual food supply to meet daily food needs in locations far removed from areas of production. The result was the development of a commercial food processing and distributing industry which today feeds our vast urban population much

better than their farmer ancestors fared. The national diet has improved materially in terms of quality and variety.

The interdependence of the various segments of the agribusiness chain is obvious. When these functions were mostly performed on the farm, there was a high degree of integration among them. The individual farm family saw to this, for failure to do so would mean loss of income and perhaps hunger.

In recent times, especially in some kinds of commodities, there has been a pronounced tendency to integrate the various functions of production and marketing through contractual arrangements of one kind or another.

This process has come to be known as vertical integration. Although contractual integration arrangements are controversial and are viewed with suspicion by some people, they are a manifest effort on the part of the industry to seek such economies as can be attained by careful coordination of the entire chain of production, processing, and marketing.

Vertical integration is essentially an attempt to combine the advantages of specialization in modern society with the good features of a system in which all the steps were fully coordinated, as they had to be on grandfather's farm. A certain amount of vertical integration is inevitable—and beneficial—in the kind of agribusiness we have today.

Capital requirements per farm and per worker have increased to the extent that it is becoming increasingly difficult for an individual, during his productive years, to accumulate a sufficient amount to finance an economically sized operating unit. This will be still more true in the decades ahead. Moreover, in view of the inheritance tax structure, it is becoming increasingly difficult for a parent to transfer such a unit to his son without substantial operating or financial disruption. This means, perforce, that an increasing share of total farm capital will be supplied by nonoperators. Part of this will be accomplished through some form of vertical integration.

With such large amounts of capital and technology involved, management has become the key factor in successful farm operation. This is in sharp contrast to a generation or two ago, when the farm unit was much more self-sufficient than now, with much less capital involved, with much less science applied, and with many fewer critical managerial decisions to be made.

The movement of population off the farms will continue. They will not necessarily leave the rural community, particularly if urban employment is available within commuting distance. Many of them will find gainful employment in some phase of agribusiness in the city, and will therefore really remain in agriculture.

The question of whether every farm-reared youngster should remain on the farm is no longer a sociological problem. That the opportunity for gainful employment on the farm is not present for all farm-reared boys is simply an arithmetic fact. Fortunately, agribusiness offers a challenging opportunity.

Surveys have shown that in many typical rural areas in the Corn Belt approximately one farm per township per year will become available for new operators in the next generation. In these same townships, the number of farm youth ready for new employment each year ranges from four to eight. Obviously, if they all try to remain on the farm, operating units will necessarily be so small as seriously to limit income opportunities.

The process of "rurbanization" is altering community life in vast areas of our country. Rural and urban cultures are intermingling in countless communities within commuting distance of industrial centers. City folk are moving to the country, and farm families have one or more members commuting to work in the city.

The city limit sign at the edge of your county seat town does not mean the same thing it did just a generation ago. It is now just a tax boundary. It is no longer a cultural boundary, an educational boundary, a social boundary, a

recreational boundary, or an economic boundary. The same kind of people live on both sides of that city limit sign. They have the same communications, the same transportation, the same electricity, the same educational opportunities, the same recreational outlets, the same church facilities, the same modernized kitchens, and the same standards of living.

More than half of our farm families have one or more members of the family doing either part-time or full-time work off the farm. On approximately 1.5 million farm units in the United States in 1958, the farm operator either worked off the farm 100 days or more for wages, or his nonfarm income exceeded his farm income. This is one means whereby operators of less than economic-sized units increase their volume and achieve acceptable incomes. There are relatively few farm families who do not live within commuting distance of a nonfarm job.

When this tendency of farm people to get either part-time or full-time work off the farm is put alongside the tendency of growing numbers of urban people to move to a country home, the pattern of our newly rurbanized communities becomes clear. As the farmer himself becomes a well-capitalized, highly specialized producer, a new community culture will emerge in which the farmer will tend to lose his vocational identity, just as the lawyer, the doctor, or the machinist now loses his in his own community.

The very cornerstone of our high standard of life is our ever-increasing efficiency in the production and marketing of food and fiber, made possible by the specialized functions that characterize agribusiness. Increased efficiency in production and distribution of food and fiber and the subsequent release of manpower for other work are the first prerequisites for an industrialized society. The first claim of any organized society on its total production resources is food. The cry for food has echoed through the ages. Food remains man's first physical need.