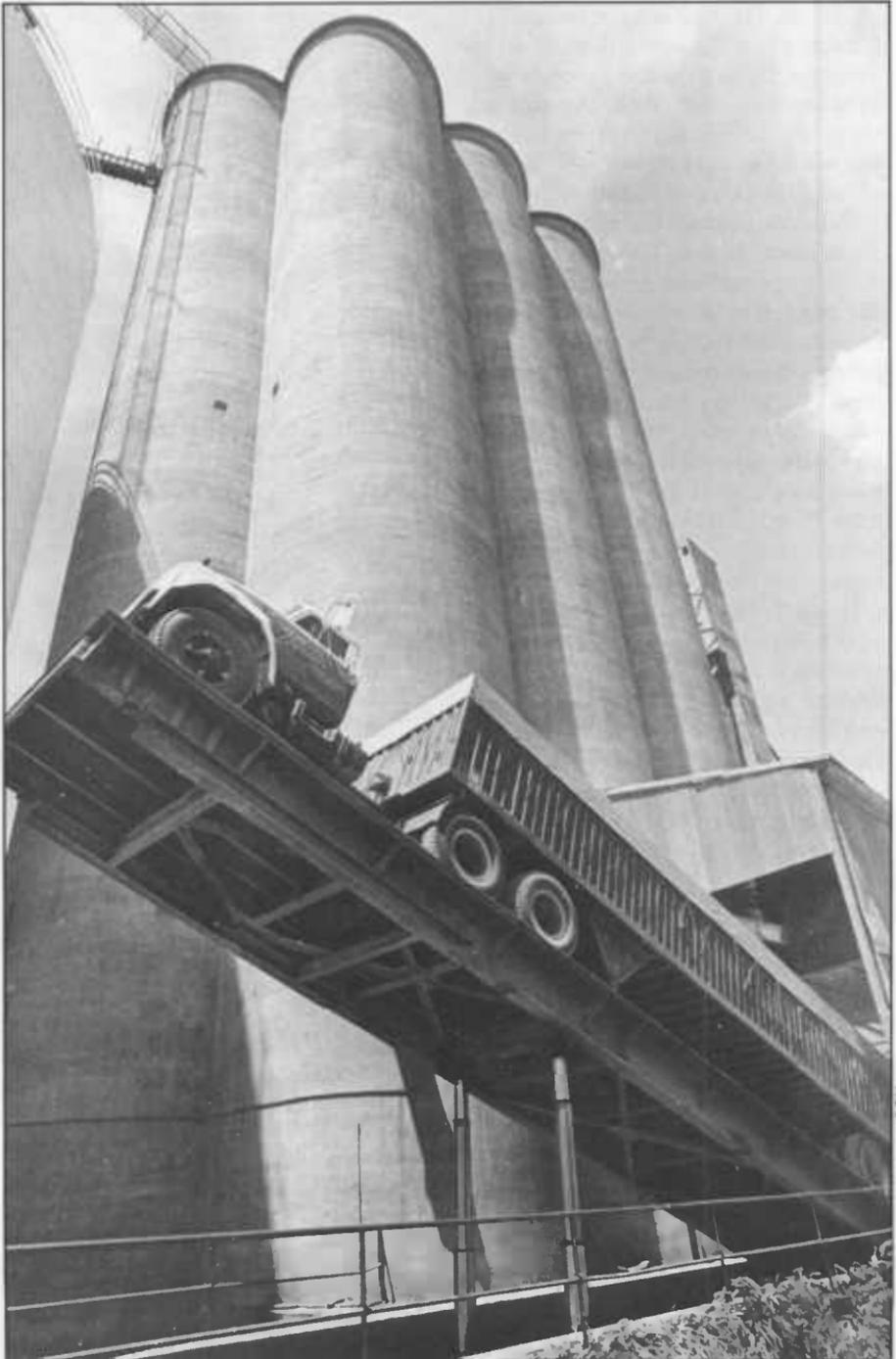


Section Two
Agriculture's Critical Role



DOUG WILSON

Farming and U.S. Well-Being Through the Years

By W.B. Sundquist

Almost 375 years have passed since the initial settlement of the Virginia Colony on the Jamestown Peninsula in 1607. And, throughout this period, U.S. agriculture has played a key role in the well-being of our Nation's population.

Colonial agriculture was a rugged hand-labor process because the machinery and equipment to ease the burden of labor had not yet been invented. Moreover, primitive transportation and communication systems of that day made an organized marketing system for farm products virtually impossible. As a result, most people were involved in some kind of agricultural production if only to produce some of the food they needed for their own survival.

By early in the 17th century, U.S. agriculture had accepted what were to be its dual long-term roles of (1) feeding a growing local population and (2) producing goods for trade and export.

Borrowing from the know-how of the local Indians and using the crude tools available to them, colonial farmers produced corn as their staple food crop and tobacco for export. Virginia, Maryland and North Carolina led the way in production of tobacco, while corn was grown throughout the Colonies. Later on Southern plantation growers added rice and cotton to their list of export crops. Other cereal grains and livestock products soon augmented corn in the local diet and, by 1700 or so, these products



LIBRARY OF CONGRESS



Colonial artists romanticized American agriculture. In reality it required long hours of rugged hand labor. Transportation and communication systems were primitive.



Horses and mules were the farmers' primary source of power until the early 1900's. They numbered 27 million head during World War I and dropped to less than 8 million by 1950 when tractor power came into its own.

were traded locally throughout the Colonies.

By 1775, on the eve of the War for Independence, expanded production of tobacco leaf, mainly for sale to England, had pushed export levels for that crop to over 100 million pounds. But the production of tobacco, and of all other crops, remained labor intensive as humans and animals alike shared their common task as beasts of burden.

Contrast with Others

In contrast to Western Europe and Japan where additional land for farming was scarce, the growth process for American agriculture was,

for a long period following independence, mainly one of settling, clearing, breaking and planting new land. Thus, little attention was given to increasing output per acre as America's farm population moved west to occupy the vast spaces beyond the Appalachians. But, some other changes in farm technology did occur.

The early 1800's brought development of the plow and, by the mid-decades of the 19th century, other tillage machines and mechanical planters, grain reapers and threshers had replaced the hoe and scythe. This eased the labor burden in farming tremendously and spawned development of a supporting farm machinery industry.



It was not until the beginning of the 20th century, however, that mechanical power began to replace animal power in any significant amount. Once underway, the process of replacing draft animals with tractors moved quickly to near completion within the decade following the end of World War II. Horses and mules totaled about 27 million head at the time of World War I and by 1950, the substitution of tractors had driven their numbers down to less than 8 million.

With the coming of the industrial revolution to the United States in the late 18th century and throughout the 19th, new job opportunities were created off-the-farm. And, farm-

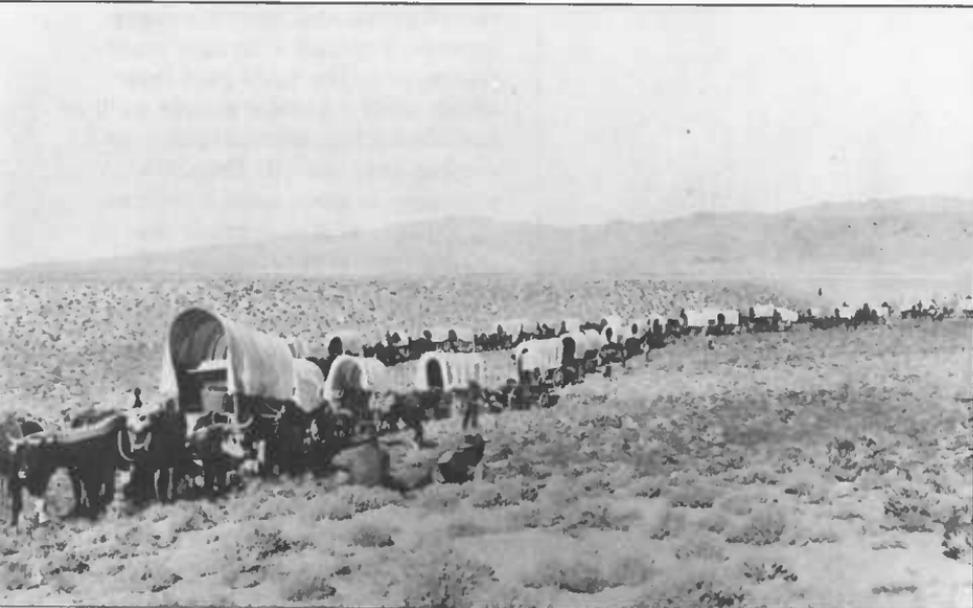
reared youth and income-hungry farmers, together with new immigrants, were the labor pool from which other economic sectors such as manufacturing, transportation and mining were staffed. Thus, the pressures to mechanize American agriculture and to upgrade the productivity of farm workers came from three major sources:

- The loss of farmers and farm workers through their migration to other employment opportunities,
- The opening of vast new lands to the West for farming, and
- The needs of the individual farmer to expand the size of his farm in order to produce more to earn more. The latter pressure for mechanization continues to this day.

The last half of the 19th century was the period when farmers settled much of the vast land area from the Great Plains west. The Homestead Act of 1862, grants to the States and railroads, sales of land at public auction and other major land disposal acts all played key roles in disposing of some 500 million acres of public domain between 1860 and 1900. Thus, though the land base of U.S. farming expanded even into the 20th century, the 100-year period from 1880 to the present merits review because of the dramatic changes which occurred in agricultural productivity during that century.

Farm Population

In 1880 the U.S. farm population stood at 22 million, or about 44 percent of the total U.S. population, and total farms numbered about 4 million. By 1910 both farm population and farm numbers had almost peaked at 32 million and 6.4 million respectively. It was not, however,



SMITHSONIAN INSTITUTION

As a result of the Homestead Act, farmers migrated from the East to establish agriculture as a viable industry in the West.



DOUG WILSON

During the 1900's machine-power rapidly replaced manpower on America's farms and ranches. In 1880 it took 373 hours of labor to produce 100 bushels of wheat. Today it takes less than 10.

until the drought and depression of the 1930's that both reversed direction to begin the sharp decline to their dramatically lower current levels.

By 1979 the farm population of 6.2 million represented less than 3 percent of the total population, or only about 1 person in 35. And farm numbers had dropped to 2.4 million, or only slightly more than one-third of their all-time high in the mid 1930's.

Not all of these farm people left agricultural pursuits voluntarily, however. Many were driven out by inadequate resources and low incomes. Others were displaced by such technologies as the mechanical cotton picker, the tomato harvester and others. Those farms which remained grew in size, in productivity and in technological sophistication in order to provide food and fiber for rapidly growing domestic and foreign markets.

Labor Use in Farming

The tremendous gains in agricultural labor efficiency during the past century can be quickly perceived by viewing the labor requirements for producing key crops in 1880 and again in the 1970's.

In 1880 U.S. farmers used 180 man hours of labor to produce 100 bushels of corn through harvest. This requirement had dropped 44-fold to only 4 hours by 1974-78.

Comparable labor requirements for wheat were 373 hours in 1880 and 10 hours in 1974-78, a 36-fold reduction, and the labor requirement of more than 300 hours to produce a bale of cotton in 1880 dropped by 27-fold to 11 hours in 1974-78.

Though smaller percentage-wise than for field crops, major declines in

labor requirements also occurred in the livestock sector. Chicken broiler and turkey producers led the way with declines of over 2,000 percent in man-hour requirements per hundredweight produced between 1940 and 1970 alone. And major gains in labor productivity were made for swine and dairy production and for cattle feeding.

These tremendous increases in labor productivity in agriculture were not achieved without a cost, however. New technology had to be developed in the Land Grant Universities in the U.S. Department of Agriculture (USDA) and in the private agribusiness sector. Farmers had to adopt this technology and learn how to use it. Moreover, farmers had to substitute large quantities of capital for labor. Many, unable to make this adjustment, left farming.

Input Mix in Farming

In 1880 labor represented an estimated 62 percent of the total inputs (value weighted basis) used in U.S. agriculture and real estate and capital inputs totaled 19 percent each. By the beginning of World War II the labor input had declined to 40 percent of the total, capital had risen to 41 percent and real estate had remained relatively constant at 18 percent.

But the most rapid change in farm inputs was to come after World War II. By 1976 labor had declined to 16 percent of total inputs, real estate increased slightly to 22 percent and capital had jumped to 62 percent.

Thus, over the period of the last century, production agriculture shifted from a labor intensive production sector to a capital intensive one.

Excluding farm real estate, the capital component of agriculture in 1880 was made up mainly of machinery, feed, seed and livestock. Purchased inputs were used only sparingly by farmers and agricultural chemicals were almost nonexistent. The widespread use of agricultural chemicals (particularly fertilizer and pesticides) is, in fact, mainly a post-World War II phenomenon as the index of their use increased more than eight-fold between 1945 and 1979. And mechanical power and machinery inputs more than doubled during this same period.

Thus, adjustments in the post-World War II mix of farm inputs have been heavily to purchased inputs, and the farm machinery and agricultural chemical industries have grown rapidly to become major economic sectors in their own right. These adjustments were clearly induced in no small part by cheap fossil source energy and by the rising real cost of labor. They have resulted in a high degree of oil dependence by U.S. agriculture.

The Farming Business

In the process of becoming a capital intensive economic sector, agriculture has taken on many characteristics of other "value-added" economic sectors with high capital expenditures, both for long-term investments in plant and equipment (feedlots, machinery and power, irrigation equipment, etc.), and for short-term operating expenditures (fuel, fertilizer, chemicals, etc.).

Along with the tremendous shifts in input mix in farming there has been an increase in size of farms and in degree of specialization. Average acres per farm about doubled to over

400 acres between 1950 and 1979 alone. The size of "operating units" increased much more. Most family-scale commercial farms now utilize capital resources (including real estate) of \$500,000 or more. And, a resource base of \$2 to \$3 million is not unusual. Moreover, in 1979 farms with sales of \$200,000 and over accounted for 43 percent of all cash receipts. Thus, farming today is big business.

As a consequence, farmers are now concerned with many of the same investment decisions and cash flow problems of other businesses. Moreover, they share with other businessmen the uncertainties of the market place for their purchased inputs and for their final products. This uncertainty has sped the formal integration of the input supply-production-product marketing stages in agriculture.

In addition, however, farmers find themselves faced with a rather unique set of exposures to 1) the biological processes of plants and animals, and 2) the natural environment, with their attendant complex risks and uncertainties of diseases, insects, droughts, hailstorms and the like. Moreover, in order to survive economically, farmers have had to add high-level financial management skills to go with those of increased technical expertise.

Farm Output Changes

Farm output in the United States doubled in the 50 years from 1880 to 1930. And 1979 found farm output about 2½ times its 1930 level. While most of the increase in output prior to 1930 was due to farming additional land, almost all the post-1930 increase is attributable to other



PAUL HIXSON

Soybean production in the U.S. rose from one million acres in 1930 to more than 70 million acres in 1979, the greatest growth among major farm products.

sources. In fact, the 348 million acres of crops harvested in 1979 were about 6 percent fewer than those harvested in 1930.

Most categories of agricultural products grew in volume over the century of 1880-1979 though the production of some, such as cotton, varied greatly during that period. Between 1910 and 1979 alone, dairy production doubled, meat animal production increased by almost 150 percent and poultry products grew by over 400 percent. On the crops side, feed grain production almost tripled

and food grain production more than quadrupled.

But the single most sensational growth among major farm products occurred for soybeans. The soybeans for bean acreage in 1930 totaled only about 1 million with a total production of about 14 million bushels. In 1979, acreage exceed 70 million and production exceeded 2¼ billion bushels!

The rapid growth of the soybean crop was undergirded by a much expanded demand from both 1) the modernizing livestock sector for

high protein feed supplements, and 2) the human food sector for edible vegetable oils. Thus, when provided economic inducements to do so, U.S. farmers have been able to make major shifts in farm production, particularly for field crops.

In colonial days much of a farmer's production went directly into consumption on the farm or in the local community. By 1840, an extensive canal system moved some farm produce to markets but at a high per unit cost.

Rail Network

By 1860, a railroad network linked the country east of the Mississippi. And by the end of the 19th century a rail transportation system was largely in place to move agricultural produce to distant domestic and foreign markets or to intermediate points for processing or storage.

This transportation system was among the early components of what was to become a major off-farm agribusiness system. Initially these businesses were mainly involved in the processing and marketing of farm products. Later, the farm supply businesses were to grow tremendously as farmers purchased more and more of their inputs from off-the-farm.

A century ago a very high proportion of total employment in the United States (about 50 percent) was in agriculture. Gainful workers in agriculture totaled 8.6 million persons at that time and most were employed on the farm, since the complex modern-day marketing and food processing systems were yet to evolve.

As of 1978, however, agriculturally related employment had grown to about 22.4 million, of whom only 3.4

million were employed in production agriculture. In addition, 7.2 million persons were employed in agriculturally related transportation, trade and retailing; 4.8 million in manufacturing; 1.7 million in food processing; and 2.2 million in resource and service jobs related to agriculture. This aggregate employment in 1978 represented about 22.3 percent of the total U.S. labor force.

By 1978 the estimated bill for marketing domestic farm foods alone had grown to \$140 billion, or more than two-thirds of the \$207 billion which consumers spent for these foods.

Production agriculture has cut its labor force dramatically. But between 1968 and 1978 alone, marketing workers handling food produced on U.S farms increased by over 30 percent with away-from-home eating establishments being the single most rapidly growing component of the food marketing system. The cost of labor remains the largest component (often around 50 percent or more) of the cost of transporting, processing and distributing food.

A century ago, in 1880, agricultural products dwarfed those from other sectors in their economic importance in U.S. trade. Totalling \$694 million, agricultural exports were 84 percent of the value of total domestic exports.

But the U.S. economy grew rapidly in its production of non-agricultural goods. And, though growing in total dollar value over time, agricultural exports declined to 62 percent of total exports by 1900, to 32 percent by 1930, and to 16 percent by 1970.

In 1979, the United States exported more than a third of its total agricultural production.



DOUG WILSON

In 1970 agricultural exports totaled about \$6.7 billion. Then, following the tight supply-high price situation for grains on a world-wide basis in 1973-74 they moved up sharply to over \$40 billion and to about 20 percent of total U.S. exports in 1980.

Exports A Beacon of Hope

In a generally bleak current trade-balance situation for the United States, the trade-balance surplus generated by agricultural products stands out like a beacon of economic hope. This trade balance is evidence of the strong comparative economic advantage of U.S. farmers in world production of grains and soybeans.

In fact, in 1979 the U.S. share of world soybean exports was 82 percent; for coarse grains, 67 percent; for wheat, 41 percent; and for cotton, 37 percent. Of the 164 million metric tons of U.S. agricultural exports in 1980, feed-grains led the way volume-wise with 72 million metric tons, wheat (including flour) was next with 37 million metric tons, and soybeans were third with 24 million metric tons. The United States, in exporting over one-third its total agricultural production in 1979, exported over half of its wheat, rice, soybeans and cotton production.

U.S. imports of agricultural products totaled \$315 million or 47 percent of all imports on a value basis in 1980. Though increasing on a total current-dollar basis over time to a total of \$17.4 billion in 1980, they represented only 7 percent of total U.S. imports in that year, leaving a net favorable trade balance in agricultural products of between \$23 billion and \$24 billion. Moreover, a substantial proportion of agricultural imports were of products such as cof-

fee, tea, bananas, and other products not grown in the United States.

One measure of the strong economic performance of U.S. agriculture over the past century has been its ability to provide food for domestic consumers at decreasing real prices. Limited data for the period 1888-1891 indicate that consumers spent about 40 percent of their income for food at that time. During the period of 1930-1960 this percentage ranged from 20 to 24 percent. But from 1971 to 1980 the proportion of total disposable personal income spent for food dropped to a range of between 16.2 and 17 percent.

Costs to Consumer Cut

Thus the U.S. agricultural system has provided a broad variety of food to consumers at decreasing real cost. And along with this food, today's consumers receive much more in the way of services (processing, packaging and preparation) than did their counterparts in 1880.

Some individuals and families in the United States even today have inadequate income for food purchase. Some others, either by ignorance or personal choice, have a diet which is inadequate nutritionally. And some issues of food safety and nutrition exist which will not be solved immediately. But U.S. agriculture has demonstrated clearly its capacity to produce food not only to service the food requirements of domestic consumers but for an increasing number of foreign consumers as well.

Any statistical depiction of the developmental history of U.S. agriculture will be deficient in its enlightenment. It cannot capture adequately the human struggle of the people involved or the signifi-

cance of key individual events. For that reason several generalizations may be warranted in retrospect.

First, U.S. agriculture was richly endowed with natural and human resources. The strong natural resource base of land, water and climate permitted a productive agriculture to evolve. An industrious, productive labor force was enticed into using these resources.

Second, an effective infrastructure of public services (research, education, governmental institutions, etc.) evolved to support the productivity of the land and labor inputs in agriculture.

Third, the private sector, in the form of small businesses, corporations and cooperatives, played a key role in supplying agriculture with needed production inputs, marketing services and applied technology.

Much of the support system supplied to agriculture by both the public and private sectors was not systematically planned in advance but was induced by economic crisis or financial incentive and implemented by human ingenuity or political pressure. Yet, in accomplishment, this total agricultural system has far outpaced that of most other countries. And we are all the beneficiaries of it.

Further Reading

A Chronology of American Agriculture 1776-1976, ESS Publications, U.S. Department of Agriculture, Room 0054-S, Washington, DC 20250. Free.

Economic Indicators of the Farm Sector: Production and Efficiency Statistics, 1979, Statistical Bulletin 657, ESS Publications, U.S. Department of Agriculture, Room 0054-S, Washington, DC 20250. Free.

Historical Statistics of the United States, Colonial Times to 1970, #003-024-001-20-9, U.S. Department of Commerce, Bureau of Census, for sale from Superintendent of Documents, U.S. Government Printing Office, Washington, DC 20402. \$26.

The Development of American Agriculture: A Historical Analysis, Willard W. Cochrane, University of Minnesota Press, 2037 University Avenue, S.E., Minneapolis, MN 55414. \$10.95 paperback, \$25 hardback.

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