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## agriculture

### Dictionary



**ag·ri·cul·ture** (•g'r•-k•l'ch•r)

*n.*

The science, art, and business of cultivating soil, producing crops, and raising livestock; farming.

[Middle English, from Latin *agr•cult•ra* : *agr•*, genitive of *ager*, field + *cult•ra*, cultivation; see [culture](#).]

**ag'ri-cul'tur-al** *adj.*

**ag'ri-cul'tur-al-ly** *adv.*

**ag'ri-cul'tur-ist** or **ag'ri-cul'tur-al-ist** *n.*

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#### Agriculture

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### Encyclopedia



**agriculture**, science and practice of producing crops and livestock from the natural resources of the earth.

The primary aim of agriculture is to cause the land to produce more abundantly and at the same time to protect it from deterioration and misuse. The diverse branches of modern agriculture include [agronomy](#), [horticulture](#), economic [entomology](#), [animal husbandry](#), [dairying](#), agricultural engineering, soil chemistry, and agricultural economics.

#### Early Agriculture

Early people depended for their survival on hunting, fishing, and food gathering. To this day, some groups still pursue this simple way of life, and others have continued as roving herders (see [nomad](#)). However, as various groups of people undertook deliberate cultivation of wild plants and domestication of wild animals, agriculture came into being. Cultivation of crops—notably grains such as wheat, rice, corn, rye, barley, and millet—

encouraged settlement of stable farm communities, some of which grew to be towns and city-states in various parts of the world. Early agricultural implements—the digging stick, the [hoe](#), the scythe, and the [plow](#)—developed slowly over the centuries, each innovation (e.g., the introduction of iron) causing profound changes in human life. From early times, too, people created ingenious systems of irrigation to control water supply, especially in semiarid areas and regions of periodic rainfall, e.g., the Middle East, the American Southwest and Mexico, the Nile Valley, and S Asia.

Farming was often intimately associated with landholding (see [tenure](#)) and therefore with political organization. Growth of large estates involved the use of slaves (see [slavery](#)) and bound or semifree labor. In the Western Middle Ages the [manorial system](#) was the typical organization of more or less isolated units and determined the nature of the agricultural village. In Asia large holdings by the nobles, partly arising from feudalism (especially in China and Japan), produced a similar pattern.

### The Rise of Commercial Agriculture

As the Middle Ages waned, increasing communications, the commercial revolution, and the rise of cities in Western Europe tended to turn agriculture away from subsistence farming toward the growing of crops for sale outside the community (commercial agriculture). In Britain the practice of [inclosure](#) allowed landlords to set aside plots of land, formerly subject to common rights, for intensive cropping or fenced pasturage, leading to efficient production of single crops.

In the 16th and 17th cent. horticulture was greatly developed and contributed to the so-called agricultural revolution. Exploration and intercontinental trade, as well as scientific investigation, led to the development of horticultural knowledge of various crops and the exchange of farming methods and products, such as the potato, which was introduced from America along with beans and corn (maize) and became almost as common in N Europe as rice is in SE Asia.

The appearance of mechanical devices such as the sugar mill and Eli Whitney's cotton gin helped to support the system of large plantations based on a single crop. The Industrial Revolution after the late 18th cent. swelled the population of towns and cities and increasingly forced agriculture into greater integration with general economic and financial patterns. In the American colonies the independent, more or less self-sufficient family farm became the norm in the North, while the plantation, using slave labor, was dominant (although not universal) in the South. The free farm pushed westward with the frontier.

### Modern Agriculture

In the N and W United States the era of mechanized agriculture began with the invention of such farm machines as the [reaper](#), the [cultivator](#), the thresher, and the [combine](#). Other revolutionary innovations, e.g., the [tractor](#), continued to appear over the years, leading to a new type of large-scale agriculture. Modern science has also revolutionized food processing; refrigeration, for example, has made possible the large meatpacking plants and shipment and packaging of perishable foods. Urbanization has fostered the specialties of [market gardening](#) and [truck farming](#). Harvesting operations (see [harvester](#)) have been mechanized for almost every plant product grown. Breeding programs have developed highly specialized animal, plant, and [poultry](#) varieties, thus increasing production efficiency. The development of [genetic engineering](#) has given rise to genetically modified transgenic crops and, to a lesser degree, livestock that possess a gene from an unrelated species that confers a desired quality. Such modification allows livestock to be used as “factories” for the production of growth hormone and other substances (see [pharming](#)). In the United States and other leading food-producing nations agricultural colleges and government agencies attempt to increase output by disseminating knowledge of improved agricultural practices, by the release of new plant and animal types, and by continuous intensive research into basic and applied scientific principles relating to agricultural production

and economics.

These changes have, of course, given new aspects to agricultural policies. In the United States and other developed nations, the family farm is disappearing, as industrialized farms, which are organized according to industrial management techniques, can more efficiently and economically adapt to new and ever-improving technology, specialization of crops, and the volatility of farm prices in a global economy. Niche farming, in which specialized crops are raised for a specialized market, e.g., heirloom tomatoes or exotic herbs sold to gourmet food shops and restaurants, revived or encouraged some smaller farms in the latter 20th and early 21st cents., but did little to stop the overall decrease in family farms. In Third World countries, where small farms, using rudimentary techniques, still predominate, the international market has had less effect on the internal economy and the supply of food.

Most of the governments of the world face their own type of farm problem, and the attempted solutions vary as much as does agriculture itself. The modern world includes areas where specialization and conservation have been highly refined, such as Denmark, as well as areas such as N Brazil and parts of Africa, where forest peoples still employ “slash-and-burn” agriculture—cutting down and burning trees, exhausting the ash-enriched soil, and then moving to a new area. In other regions, notably SE Asia, dense population and very small holdings necessitate intensive cultivation, using people and animals but few machines; here the yield is low in relation to energy expenditure. In many countries extensive government programs control the planning, financing, and regulation of agriculture. Agriculture is still the occupation of almost 50% of the world's population, but the numbers vary from less than 3% in industrialized countries to over 60% in Third World countries.

See also [agricultural subsidies](#); [dry farming](#); [Granger movement](#); [Green Revolution](#); [ranch](#); [range](#).

## Bibliography

See R. Jager, *The Fate of Family Farming* (2004).

## WordNet



*Note: click on a word meaning below to see its connections and related words.*

The noun **Agriculture** has one meaning:

**Meaning #1:** the federal department that administers programs that provide services to farmers (including research and soil conservation and efforts to stabilize the farming economy); created in 1862

Synonyms: [Department of Agriculture](#), [Agriculture Department](#)

## Essay



## What caused the Agricultural Revolution?

The Agricultural Revolution was discovered, named, and studied in the 1920s through the 1940s. In 1950 it

was renamed the Neolithic Revolution by (Vere) Gordon Childe, who is often considered the main early worker in the study of the Agricultural Revolution.

The Neolithic adoption of a new way of life was easy to explain before 1950. The theory was that farming is better than hunting and gathering; so when people found out about farming they stopped hunting and gathering and settled down in villages. Many scientists today, however, believe that farming is not better than hunting and gathering. People knew how to farm for a long time before they bothered to make it a main way of life. There is some evidence that people had known for at least 20,000 years that a single seed planted in the ground could grow into a plant with many seeds on it. Many people who knew how to farm never stopped hunting or gathering. Careful studies have shown that hunter-gatherers have more leisure and a better diet than farmers. People also settled down into permanent villages before they started farming.

Also, it seems very odd that the Agricultural Revolution occurred at quite close to the same time in the Near East, in Southeast Asia, in what is now Mexico, in South America, and in what is now China. Thus, a different explanation for the Agricultural or Neolithic Revolution was required, and many archaeologists have offered their opinions. Here are some of the more popular theories as well as one or two idiosyncratic ideas.

- *There Were Too Many People.* Population pressure caused local environments to become exhausted, and people had to find new sources of food. Diminishing resources caused by population growth finally forced people to do the hard work of planting and harvesting. To replace lost game, people began to breed their own animals for meat and fiber (with milk as a side benefit). This theory does not explain why some low-density populations clearly started farming before the numbers grew (as in highland Mexico). Something else must be involved in this case. All in all, there is less evidence to support high populations before the Agricultural Revolution than there is reason to believe that populations grew rapidly after it.
- *The Climate Changed.* Childe thought that a drier climate induced the Agricultural Revolution in the Middle East by reducing the availability of game and wild food plants. People had to move to oases, where domestication was essential for survival. This idea ran afoul of subsequent studies showing that the Middle Eastern climate did not become drier at the right time. There are other climate-change theories. When the ice caps retreated, for example, people were forced to abandon their reliance on reindeer and mammoths, creatures of the edge of the ice and the tundra. With that major resource gone, some other source of food needed to be found. Similarly, the rise in sea level that accompanied the melting of the glaciers caused people in Southeast Asia to live on less land, resulting in the invention of agriculture there. The problem with the end-of-the-Ice-Age theory is that 1) the Ice Age ended 5000 years too soon for the Agricultural Revolution; and 2) it was not the people living near the edge of the ice or tundra who first started farming.
- *People Moved to Town.* One good reason for calling the change the Neolithic Revolution is that more than farming was involved. About a thousand years before agriculture started, people, especially those dependent on trade or on the storage and processing of wild grass seeds (such as wheat), began to live in permanent communities. Even if the region as a whole still had good food resources, the immediate vicinity of such communities would soon run short of both wild grasses and game. Domestication of plants and animals saved village life. The problem here is showing why people settled down.
- *Plants Grow in Garbage.* Plant remains tossed out in the garbage by people who had settled down sprouted. This produced new crops from the discarded materials, crops that could be easily harvested. People noticed this and developed the systematic way of throwing out parts of plants that we today term agriculture. Again, the problem is explaining why people lived in one place, near piles of garbage.
- *Society Became Complex.* The longer people were around, the more they developed complex societies that included traders (for which there is good evidence), specialists of all kinds, and people in charge. Such a society, with its division of labor and the need to have wealth that can be accumulated (by the people in charge), is forced into farming. Of course, some present-day or recent hunter-gatherer

societies, such as the Native Americans of the northwest coast, developed complex societies without farming -- but they had salmon or some similar resource so they did not need to farm.

- *It's What to Do in the Off-Season.* Hunting and gathering, like farming, are seasonal. The seasons of good hunting and gathering often do not cover the whole year. During the time when not much else is going on, people can improve their food supply by planting crops. Crops that would be harvested after the good gathering season and before the good hunting season would presumably be favored. This fails to explain why people did not farm earlier or why so many started farming in such a short time period. A variation of this concept is that people engaged in hunting and gathering inevitably learn a lot about animals and plants. When they have learned enough, they see that it would be easier to grow their own than to go out and hunt for them. The problem with this theory is the studies that show that even in marginal environments, such as today's Kalahari Desert, it is easier and healthier to hunt for animals and plants than it is to grow them.
- *It Did Not Happen.* The last refuge of the historian or archaeologist faced with a major shift in society is to say that the change started much earlier, went on much longer, and lacks any moment in time that can be singled out. In this view, people replaced hunting and gathering with farming over tens of thousands of years. Even if this were true, which many would disagree with, it would not explain why people made such a change.
- *It Just Happened.* People did not set out to domesticate wheat or goats. Harvesting wheat over a period of years changed the nature of the wheat, since the seeds left behind by stone sickles remained on the plants that held on tightly to their seeds. Evolution then produced fields of wheat where most of the wheat clung tightly to the seeds. Such seeds were not good at producing next year's crop. As a result, people were forced to help the wheat by planting some of the seeds. Similarly, hunters killing larger goats produced an evolutionary shift to smaller goats. It became necessary to take steps to breed these smaller goats to produce enough meat. Domestication was the inevitable result of the farming and hunting practices of the early Neolithic. This theory is fairly reasonable for wheat, but not much good for peas and lentils, which seem to have been domesticated about the same time. There are logical gaps that are hard to fill in for the explanation of animal domestication.
- *Space Creatures Started It.* The proliferation of theories and the flaws in all of them sometimes makes one think that it would be just as well to contend that extraterrestrial beings, thought by people of the early Neolithic to be gods, went from place to place around Earth over a period from about 9000 to 5000 bce teaching people to stop hunting and gathering and to start farming. This theory is essentially the one espoused in most traditional farming societies -- that is, they have legends that tell them that the gods taught them how to raise crops. It has recently resurfaced in popular literature, although not held by any working archaeologist.

## American History



## Agriculture

Agriculture was the most important economic activity in America from the founding of Virginia in 1607 to about 1890. Although farming declined rapidly in relative economic importance in the twentieth century, U.S. agriculture continued to be the most efficient and productive in the world. Its success rested on abundant fertile soil, a moderate climate, the ease of private land ownership, growing markets for farm produce at home and abroad, and the application of science and technology to farm operations.

The first settlers, finding that European agriculture could not easily be transferred to the new environment, adopted the Indian practices of raising corn, squash, tobacco, and other crops. From the beginning corn, grown in all the colonies, was the leading food crop. Tobacco, which was exported to earn foreign exchange, was raised mostly in Virginia and Maryland.

In New England, farmers on small acreages raised corn, oats, and rye, vegetables and fruits, and livestock, especially cattle and sheep. In the central colonies of New York, Pennsylvania, and New Jersey wheat was the major crop. Farmers there were also heavy producers of livestock and animal products, as well as fruit and vegetables. Most farmers in early America were largely self-sufficient, producing enough for their family needs, but also some surplus for sale.

Agriculture from Maryland southward was more specialized and commercialized than in the North. Corn was the main grain and food crop, but tobacco, rice, and indigo were the principal export crops. Farmers grew tobacco in Virginia as early as 1612, and production expanded rapidly. Rice, introduced into South Carolina in 1685, soon became a major commercial crop in that colony and later in Georgia. The plantation system was developed in connection with the production of tobacco and rice, with black slaves providing much of the labor by the late seventeenth century. Cotton was grown for home use in the late eighteenth century, but because it was difficult to extract the seeds it did not become an important commercial crop until after the invention of the cotton gin by Eli Whitney in 1793.

Farmers then used crude hand tools made of wood, sometimes with iron parts. Plows too might have an iron facing on the cutting edge. Planting, weeding, and harvesting were done by hand labor.

Significant changes in farming began to occur at the beginning of the nineteenth century. Between the American Revolution and the Civil War, tens of thousands of farmers surged westward to settle on the rich lands of the Ohio and Mississippi valleys. There a grain-livestock empire gradually took shape that was unequaled anywhere in the world. In the South farmers and planters pushed into Alabama and Mississippi and as far west as Texas, establishing a vast cotton kingdom and backcountry of mainly self-sufficient farmers. By 1860 the nation had 2,044,077 farms. Agricultural expansion was encouraged by removal of Indians from choice farmlands, liberal public land policies, development of canal and rail transportation, demand for food and fiber in the growing towns and cities, increasing exports, and especially improved farm machinery.

One of the greatest advances made in agriculture before the Civil War was the shift from human to animal power and the use of new labor-saving machines. Besides the cotton gin, innovations such as iron and steel plows, reapers, threshing machines, grain drills, corn and cotton planters, and iron harrows and cultivators became common. These implements were drawn by oxen and horses. In 1800, it took fifty-six man-hours to grow and harvest an acre of wheat but only thirty-five man-hours in 1840.

Meanwhile, agricultural reformers advised farmers to rotate their crops, conserve the soil, use fertilizers, adopt new crops, improve livestock breeds, and use the latest machinery. Although a few farmers practiced soil conservation by rotating crops or growing legumes, most simply plowed up new lands when the fertility of their fields declined. Of the three main components of production--land, labor, and capital--land was the cheapest, so it made economic sense in the short run to exploit the soil to the fullest.

By 1860 the nation's 2 million farms were producing a remarkable abundance. In that year, farmers grew 838 million bushels of corn, 172 million bushels of wheat, and large quantities of other grains, plus 5.4 million bales of cotton, millions of pounds of tobacco, and a great variety of fruits, vegetables, and other crops. Livestock numbers ran into the millions.

Farmers continued to supply many of their own needs, but increasingly they were selling their produce, much of it abroad, and buying manufactured goods. In 1860 farm products made up 82 percent of the country's exports. These exports, especially that of cotton, were highly important because they earned foreign exchange for investment in American manufacturing and transportation. Moreover, agriculture supplied the raw materials for some of the nation's leading manufactures such as textiles and food products. In brief, agriculture was a powerful engine behind American economic development in the first half of the nineteenth century.

Following the Civil War, agricultural expansion accelerated at an even faster pace as hundreds of thousands of farmers migrated to the Great Plains and the Rocky Mountain and West Coast states. With the end of slavery, blacks became sharecroppers on hundreds of thousands of small farms in the South. Between 1860 and 1916, the number of farms rose from slightly over 2 million to 6.4 million, and farm acreage more than doubled from 407 million to 879 million acres. Farm machines for planting, cultivating, and harvesting were steadily improved and some new machines such as the steam tractor were introduced. With larger acreages and better machinery the production of corn, wheat, cotton, tobacco, and other crops continued to increase tremendously.

By World War I the nation's agriculture had settled into regional patterns. Farmers in the Northeast concentrated on dairying, poultry raising, and producing fruits and vegetables for the growing urban markets. In the Midwest, corn, oats, and barley were the leading grain crops, which supported a thriving hog and cattle business. Dairying was highly important in the upper midwestern states of Minnesota, Wisconsin, and Michigan. The Great Plains from Texas to the Canadian border became the country's breadbasket with wheat as the main commercial crop, supplemented by a strong livestock economy.

Agriculture in the Rocky Mountain states centered around cattle and sheep raising and the production of wheat and irrigated crops such as sugarbeets and alfalfa. In eastern Washington and Oregon wheat was the principal grain crop, but those states also raised large quantities of apples, peaches, pears, other fruits, and vegetables. California farmers produced a great variety of products, including wheat, vegetables, fruit, nuts, and after World War II, cotton and rice. Much of the agriculture in the Far West depended on irrigation. In the South cotton was the main cash crop from the Carolinas to Texas until after World War II. Tobacco, sugarcane, and rice continued to be the other leading commercial crops in the region.

Although American agriculture was extremely productive, most farmers were not prosperous. Part of the problem was that farmers produced raw materials and exchanged them for more expensive manufactured goods. The terms of trade were unfavorable for farmers. In 1900 income per worker in agriculture was only \$260 annually compared to \$622 for nonagricultural workers. Tenancy increased from 25 to 35 percent between 1880 and 1900. It was especially high throughout the South where hundreds of thousands of black and white farmers worked as tenants and sharecroppers with little prospect of ever owning a farm or making a decent living. Between 1900 and the end of World War I, however, farmers experienced better times. The demand for farm commodities increased, land values rose, and during part of the period, farm prices went up faster than nonfarm prices. The first two decades of the twentieth century became known as the golden age of American agriculture.

Then in 1920 the postwar deflation hit farmers extremely hard as agricultural prices dropped much further than nonfarm prices. Arguing that farmers suffered unfairly from the cost-price squeeze, farm spokesmen began campaigning for federal farm relief. There was plenty of precedent for congressional action on behalf of farmers. In 1862 Congress had passed three basic laws to assist farmers--the Homestead Act, the Morrill Land Grant Act, which provided federal aid to set up agricultural and mechanical colleges, and an act establishing the Department of Agriculture. Later Congress enacted credit and cooperative marketing legislation to help farmers.

None of these laws, or others, however, solved the problem of low returns to farmers or the disparity between agricultural and nonfarm prices. It was not until 1933 that Congress passed the Agricultural Adjustment Act that inaugurated a wide range of federal programs to support the prices of basic agricultural commodities, encourage soil conservation, and subsidize exports. The New Deal programs continued through the rest of the century without major modifications. Government payments to farmers in 1934 totaled \$134 million; by 1961 they had increased to \$1.5 billion, and by 1987 to \$22 billion.

By the 1930s agriculture was undergoing still more fundamental changes through advances in technology and the application of science to farming. The gasoline tractor, which came into general use in the 1920s and

1930s, brought the horse age in farming to a close shortly after World War II. The development of bigger and better machines, like the grain combine harvester and the mechanical cotton picker, continued to reduce the amount of labor needed in agriculture.

A second aspect of the revolution was the widespread use of chemicals for fertilizer, insecticides, and herbicides, and a third phase involved the breeding of better crop strains, such as hybrid corn, and the development of improved livestock. Other dramatic changes included confined hog and poultry production, contract cattle feeding, artificial breeding, and better control of crop and livestock diseases. Major shifts occurred in regional output. Many southern farmers abandoned cotton after World War II and turned to soybeans, poultry, and cattle. Cotton growing moved westward where West Texas, Arizona, and California producers grew the crop under irrigation.

These and other developments combined to increase agricultural productivity dramatically without the need to increase acreages. The amount of land in farms stayed at about 1 billion acres between 1930 and 1980. For example, corn production increased from 20 bushels an acre in 1930 to about 110 bushels half a century later. Annual milk production per cow rose from 4,622 to 12,147 pounds in the same period. A new crop, soybeans, surged to prominence after 1930, and by 1981 farmers were producing slightly more than 2 billion bushels annually.

Even before productivity rose so sharply, American farmers grew a constant surplus, so that a large portion of their output had to be exported. In 1980 one-third of farm production was sold abroad, and agricultural exports made up about 20 percent of the country's overseas sales.

By the end of the twentieth century some new trends were emerging in agriculture. These included organic farming and the reduced use of chemicals in response to health and environmental concerns. Some producers practiced no-till farming to lower costs and conserve the soil. The effects of biotechnology or genetic engineering to increase crop and livestock production were also being felt. With larger and more powerful machines and scientific methods, farmers were able to cultivate more land and handle more livestock with less labor. Consequently, after 1940 there was a sharp increase in the average size of farms and a rapid decline in the number of farmers. In 1940 there were 6.1 million farms averaging 215 acres in size. By 1980 only 2.4 million farms remained, but the average size was 431 acres. Despite the growing size of farms, the great majority of American agriculture remained in the hands of family farmers. There were large plantations in the South and some huge agricultural corporations elsewhere, but at the end of the twentieth century over 90 percent of the nation's farms were still in the hands of family operators.

In 1930 some 30 million Americans lived on farms, or 25 percent of the population. By the 1980s the number of people living on farms had declined to 5.7 million, or less than 2.5 percent. Throughout U.S. history farming had been an important economic activity, but it had also been a distinctive way of life for millions of Americans. Many people held to the Jeffersonian ideal that farming was a superior way of life and that farmers were better people than urbanites. Farming and rural life had become romanticized, mainly by nonfarmers, most of whom had never made a living on the farm. By the end of the twentieth century, however, agriculture had become a business that required skilled labor, capital, and good management and was an activity with which very few Americans had any direct contact. Shifting from a labor-intensive to a capital-intensive industry, commercial agriculture had become a specialized business. Much of the nation's farm production and distribution was in the hands of large agribusiness firms. Nevertheless, some of the ideas, traditions, and values associated with farming and the rural way of life still prevailed in a society that had become predominantly urban.

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*Author:*

Gilbert C. Fite

See also [Carver, George Washington](#); [Chavez, Cesar](#); [Cotton](#); [Cotton Gin](#); [Dust Bowl](#); [Farmers' Alliance](#); [Granger Movement](#); [Homestead Act](#); [McCormick, Cyrus](#); [Morrill Land Grant Act](#); [Plantation System](#); [Public Land Policy](#); [Southern Tenant Farmers' Union](#); [Tobacco](#); [Whitney, Eli](#).

## Wikipedia

### agriculture

**Agriculture** is the process of producing [food](#), [feed](#), [fiber](#) and other desired products by the cultivation of certain [plants](#) and the raising of domesticated [animals](#) ([livestock](#)). The practice of agriculture is also known as **farming**, while scientists, inventors and others devoted to improving farming methods and implements are also said to be engaged in agriculture.

More [people](#) in the [world](#) are involved in agriculture as their primary [economic activity](#) than in any other, yet it only accounts for four percent of the world's [GDP](#).



Farming, ploughing rice paddy, in [Indonesia](#)

### Overview



[Tea plantation in Java, Indonesia](#)

Agriculture can refer to [subsistence agriculture](#), the production of enough [food](#) to meet just the needs of the farmer/[agriculturalist](#) and his/her family. It may also refer to [industrial agriculture](#), (often referred to as [factory farming](#)) long prevalent in "developed" nations and increasingly so elsewhere, which consists of obtaining financial income from the cultivation of land to yield [produce](#), the commercial raising of animals ([animal husbandry](#)), or both.

Agriculture is also short for the *study* of the practice of agriculture—more formally known as [agricultural science](#).

Increasingly, in addition to food for humans and [animal feeds](#), agriculture produces goods such as cut flowers, ornamental and [nursery](#) plants, [timber](#) or lumber, [fertilizers](#), [animal hides](#), [leather](#), industrial chemicals ([starch](#), [sugar](#), [ethanol](#), [alcohols](#) and [plastics](#)), [fibers](#) ([cotton](#), [wool](#), [hemp](#), and [flax](#)), fuels ([methane](#) from [biomass](#),

[biodiesel](#)) and both legal and illegal [drugs](#) ([biopharmaceuticals](#), [tobacco](#), [marijuana](#), [opium](#), [cocaine](#)).

[Genetically engineered](#) plants and animals produce specialty drugs.

In the [Western world](#), the use of [gene manipulation](#), better management of soil nutrients, and improved [weed control](#) have greatly increased yields per unit area. At the same time, the use of mechanization has decreased labor requirements. The developing world generally produce lower yields, having less of the latest science, [capital](#), and technology base.

Modern agriculture depends heavily on engineering and technology and on the biological and physical sciences. [Irrigation](#), [drainage](#), [conservation](#) and sanitary engineering, each of which is important in successful farming, are some of the fields requiring the specialized knowledge of agricultural engineers.

Agricultural chemistry deals with other vital farming concerns, such as the application of fertilizer, insecticides (see [Pest control](#)), and fungicides, soil makeup, analysis of agricultural products, and nutritional needs of farm animals.

[Plant breeding](#) and genetics contribute immeasurably to farm productivity. Genetics has also made a science of livestock breeding. [Hydroponics](#), a method of soilless gardening in which plants are grown in chemical nutrient solutions, may help meet the need for greater food production as the world's population increases.

The packing, processing, and marketing of agricultural products are closely related activities also influenced by science. Methods of quick-freezing and dehydration have increased the markets for farm products (see [Food preservation](#); [Meat packing industry](#)).

Mechanization, the outstanding characteristic of late 19th- and 20th-century agriculture, has eased much of the backbreaking toil of the farmer. More significantly, mechanization has enormously increased farm efficiency and productivity (see [Agricultural machinery](#)). Animals, including horses, mules, oxen, camels, llamas, alpacas, and dogs; however, are still used to cultivate fields, harvest crops and transport farm products to markets in many parts of the world.

Airplanes, helicopters, trucks and tractors are used in agriculture for seeding, spraying operations for insect and disease control, transporting perishable products, and fighting forest fires. Radio and television disseminate vital weather reports and other information such as market reports that concern farmers. Computers have become an essential tool for farm management.

According to the [National Academy of Engineering](#) in the US, agricultural mechanization is one of the 20 greatest engineering achievements of the 20th century. In the early [1900s](#), it took one American farmer to produce food for 2.5 people, where today, due to engineering technology (also, [plant breeding](#) and [agricultural chemicals](#)), a single farmer can feed over 130 people [1]. This comes at a cost, however, of large amounts of energy input, from unsustainable, mostly [fossil fuel](#), sources.

Animal husbandry means breeding and raising animals for meat or to harvest animal products (like milk, eggs, or wool) on a continual basis.



A [tractor ploughing](#) an [alfalfa](#) field



In recent years some aspects of industrial [intensive agriculture](#) have been the subject of increasing discussion. The widening [sphere of influence](#) held by large seed and chemical companies, meat packers and food processors has been a source of concern both within the farming community and for the general public. There has been increased activity of some people against some farming practices, raising chickens for food being one example. Another issue is the type of feed-stock given to some animals that can cause [Bovine Spongiform Encephalopathy](#) in cattle.

The patent protection given to companies that develop new types of [seed](#) using [genetic engineering](#) has allowed seed to be licensed to farmers in much the same way that computer software is licensed to users. This has changed the balance of power in favor of the seed companies, allowing them to dictate terms and conditions previously unheard of. Some argue these companies are guilty of [biopiracy](#).

[Soil conservation](#) and [nutrient management](#) have been important concerns since the [1950s](#), with the best farmers taking a [stewardship](#) role with the land they operate. However, increasing contamination of waterways and wetlands by nutrients like [nitrogen](#) and [phosphorus](#) are of concern in many countries.

Increasing consumer awareness of agricultural issues has led to the rise of [community-supported agriculture](#), [local food movement](#), [slow food](#), and commercial [organic farming](#), though these yet remain fledgling industries.

## History

[Archaeobotanists](#) have traced the selection and cultivation of specific food plant characteristics, such as a semi-tough [rachis](#) and larger [seeds](#), to just after the [Younger Dryas](#) (about 9,500 BC) in the early [Holocene](#) in the [Levant](#) region of the [Fertile Crescent](#). Limited [anthropological](#) and [archaeological](#) evidence both indicate a [grain-grinding culture farming](#) along the [Nile](#) in the [10th millennium BC](#) using the world's earliest known type of [sickle blades](#). There is even earlier evidence for conscious cultivation and seasonal harvest: grains of [rye](#) with domestic traits have been recovered from [Epi-Palaeolithic](#) (10,000+ BC) contexts at [Abu Hureyra](#) in [Syria](#), but this appears to be a localised phenomenon resulting from cultivation of stands of wild rye, rather than a definitive step towards domestication. It is not until ca. 8,500 BC, in middle-Eastern cultures referred to as [Pre-Pottery Neolithic B \(PPNB\)](#), where there is the first definite evidence for the emergence of a widespread subsistence economy that was dependent on domesticated plants and animals. In these contexts lie the origins of the eight so-called [founder crops](#) of agriculture: firstly [emmer wheat](#), [einkorn wheat](#), then hulled [barley](#), [pea](#), [lentil](#), bitter vetch, [chick pea](#) and [flax](#). These eight crops occur more or less simultaneously on [PPNB](#) sites in this region, although the consensus is that wheat (naturally mutated grass) was the first to be sown and harvested on a significant scale. There are many sites that date to between ca. 8,500 BC and 7,500 BC where the systematic farming of these crops contributed the major part of the inhabitants' diet. From the [Fertile Crescent](#) agriculture spread eastwards to [Central Asia](#) and westwards into [Cyprus](#), [Anatolia](#) and, by 7,000 BC, [Greece](#). Farming, principally of emmer and einkorn, reached northwestern [Europe](#) via southeastern and central Europe by ca. 4,800 BC (see, among others, Price, D. [ed.] 2000. *Europe's First Farmers*. Cambridge University Press; Harris, D. [ed.] 1996 *The Origins and Spread of Agriculture in Eurasia*. UCL Press).

The reasons for the earliest introduction of farming may have included [climate](#) change, but possibly there were also social reasons (e.g. accumulation of food surplus for competitive gift-giving). Most certainly there was a gradual transition from [hunter-gatherer](#) to agricultural economies after a lengthy period when some crops were deliberately planted and other foods were gathered from the wild. Although localised climate change is the favoured explanation for the origins of agriculture in the [Levant](#), the fact that farming was 'invented' at least

three times, possibly more, suggests that social reasons may have been instrumental. In addition to emergence of farming in the [Fertile Crescent](#), agriculture appeared by at least 6,800 BC in East Asia ([rice](#)) and, later, in [Central](#) and [South America](#) ([maize](#), [squash](#)). Small scale agriculture also likely arose independently in early Neolithic contexts in [India](#) (rice) and [Southeast Asia](#) (taro).

Full dependency on domestic crops and animals (i.e. when wild resources contributed a nutritionally insignificant component to the diet) was not until the [Bronze Age](#). If the operative definition of *agriculture* includes large scale intensive cultivation of land, [mono-cropping](#), organised [irrigation](#), and use of a specialized [labour](#) force, the title "inventors of agriculture" would fall to the [Sumerians](#), starting ca. 5,500 BC. Intensive farming allows a much greater density of population than can be supported by hunting and gathering and allows for the accumulation of excess product to keep for winter use or to sell for profit. The ability of farmers to feed large numbers of people whose



activities have nothing to do with material production was the crucial factor in the rise of standing armies. The agriculturalism of the Sumerians allowed them to embark on an unprecedented territorial expansion, making them the first [empire](#) builders. Not long after, the Egyptians, powered by effective farming of the [Nile valley](#), achieved a population density from which enough warriors could be drawn for a territorial expansion more than tripling the Sumerian empire in area.

The invention of a three field system of crop rotation during in the [Middle Ages](#) vastly improved agricultural efficiency.

After [1492](#) the world's agricultural patterns were shuffled in the widespread exchange of plants and animals known as the [Columbian Exchange](#). Crops and animals that were previously only known in the Old World were now transplanted to the New and vice versa. Perhaps most notably, the [tomato](#) became a favorite in European cuisine, while certain wheat strains quickly took to western hemisphere soils and became a dietary staple even for native North, Central and South Americans.

By the early [1800s](#) agricultural practices, particularly careful selection of hardy strains and cultivars, had so improved that yield per land unit was many times that seen in the Middle Ages and before, especially in the largely virgin lands of North and South America. With the rapid rise of [mechanization](#) in the 20th century, especially in the form of the [tractor](#), the demanding tasks of [sowing](#), [harvesting](#) and [threshing](#) could be performed with a speed and on a scale barely imaginable before. These advances have led to efficiencies enabling certain modern farms in the United States, Argentina, Israel, Germany and a few other nations to output volumes of high quality produce per land unit at what may be the practical limit.

## Crops

### World production of major crops in 2004

In millions of metric tons, based on [FAO](#) estimates [\[2\]](#):

[Maize](#) 705

[Wheat](#) 624

[Rice](#) 608

[Soybeans](#) 206

However, grazing grass and animal feed-crop production must exceed the total of these crops.

## Crop improvement



• Netting protecting wine grapes from birds  
*See main article on [Plant breeding](#)*



An agricultural scientist records corn growth

Domestication of plants is done in order to increase yield, improve disease resistance and drought tolerance, ease harvest and to improve the taste and [nutritional](#) value and many other characteristics. Centuries of careful selection and breeding have had enormous effects on the characteristics of crop plants. Plant breeders use greenhouses and other techniques to get as many as three generations of plants per year so that they can make improvements all the more quickly.

Plant selection and breeding in the 1920s and '30s improved [pasture](#) (grasses and clover) in New Zealand. Extensive radiation mutagenesis efforts (i.e. primitive genetic engineering) during the [1950s](#) produced the modern commercial varieties of grains such as wheat, corn and barley.

For example, average yields of corn ([maize](#)) in the USA have increased from around 2.5 tons per hectare (40 bushels per acre) in [1900](#) to about 9.4 t/ha (150 bushels per acre) in [2001](#), primarily due to improvements in genetics. Similarly, worldwide average wheat yields have increased from less than 1 t/ha in [1900](#) to more than 2.5 t/ha in [1990](#). [South American](#) average wheat yields are around 2 t/ha, [African](#) under 1 t/ha, [Egypt](#) and Arabia up to 3.5 to 4 t/ha with irrigation. In contrast, the average wheat yield in countries such as [France](#) is over 8 t/ha. Higher yields are due to improvements in genetics, as well as use of intensive farming techniques (use of fertilizers, chemical [pest control](#), growth control to avoid lodging).

[Conversion note: 1 bushel of wheat = 60 pounds (lb)  $\approx$  27.215 kg. 1 bushel of corn = 56 pounds  $\approx$  25.401 kg]

Very recently, [genetic engineering](#) has begun to be employed in some parts of the world to speed up the selection and breeding process. The most widely used modification is a herbicide resistance gene that allows plants to tolerate exposure to glyphosate, which is used to control weeds in the crop. A less frequently used but more controversial modification causes the plant to produce a toxin to reduce damage from insects (c.f. [Starlink](#)).

There are specialty producers who raise less common types of livestock or plants.

[Aquaculture](#), the farming of [fish](#), [shrimp](#), and [algae](#), is closely associated with agriculture.

[Apiculture](#), the culture of bees, traditionally for [honey](#)—increasingly for crop [pollination](#).

See also : [botany](#), [List of domesticated plants](#), [List of vegetables](#), [List of herbs](#), [List of fruit](#)

## Environmental problems

- [Nitrogen](#) and [phosphorus](#) surplus in [rivers](#) and [lakes](#).
- Detrimental effects of [herbicides](#), [fungicides](#), [insecticides](#), and other [biocides](#).
- Conversion of natural [ecosystems](#) of all types into [arable land](#).
- Consolidation of diverse [biomass](#) into a few species.
- [Erosion](#)
- [Particulate matter](#), including [ammonia](#) and [ammonium](#) off-gasing from animal waste contributing to [air pollution](#)
- [Weeds - feral](#) plants and animals
- Odour from agricultural [waste](#)

## Policy

[Agricultural policy](#) focuses on the goals and methods of agricultural production. At the policy level, common goals of agriculture include:

- [Food safety](#): Ensuring that the food supply is free of contamination.
- [Food security](#): Ensuring that the food supply meets the population's needs.
- [Food quality](#): Ensuring that the food supply is of a consistent and known quality.
- Conservation
- Environmental impact
- Economic stability

## Methods

- [aeroponics](#)
- [agricultural machinery](#)
- [animal husbandry](#)
- [aquaculture](#)
- [beekeeping](#)
- [crop rotation](#)
- [Concentrated Animal Feeding Operation \(CAFO, \*factory farming\*\)](#)
- [composting](#)
- [dairy farming](#)
- [detasseling](#)
- [domestication](#)
- [fencing](#)
- [fertilizers](#)
- [greenhouse](#)
- [harvest](#)
- [hybrid seed](#)

- [hydroponics](#)
- [Integrated Pest Management \(IPM\)](#)
- [irrigation](#)
- [livestock](#)
- [market gardening](#)
- [monoculture](#)
- [no-till farming](#)
- [organic farming](#)
- [plant breeding](#)
- [pollination management](#)
- [precision farming](#)
- [ranching](#)
- [season extension](#)
- [seed saving](#)
- [shepherding](#)
- [subsistence farming](#)
- [succession planting](#)
- [sustainable agriculture](#)
- [vegetable farming](#)
- [tillage](#)
- [weed control](#)

## References

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## See also

- [Agricultural and Food Research Council](#), UK
- [Agricultural fair](#)
- [Agricultural science](#)
- [Agricultural sciences basic topics](#)
- [Arid-zone agriculture](#)
- [Community-supported agriculture](#)
- [International agricultural research](#)
- [Farm equipment](#)
- [List of domesticated animals](#)
- [List of subsistence techniques](#)
- [List of sustainable agriculture topics](#)
- [Timeline of agriculture and food technology.](#)
- [USA agriculture](#)

## External links

- [Agriculture Of Pakistan](http://www.nationalpak.com) All Agricultural Information : <http://www.nationalpak.com>
- [FAO of the United Nations](http://www.fao.org) World Agricultural Information Centre : <http://www.fao.org>
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- [U.S. Department of Agriculture's Foreign Agricultural Service: Current World Production, Market and Trade Reports](#)
- [U.S. Department of Agriculture's Economic Research Service: USDA's main source of economic information and research](#)
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- [Agriculture: Demon Engine of Civilization](#) by [John Zerzan](#)

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## Translations



### Translations for: **Agriculture**

#### **Nederlands (Dutch)**

landbouw

#### **Français (French)**

agriculture, exploitation de ferme

#### **Deutsch (German)**

n. - Landwirtschaft

#### **Ελληνικά (Greek)**

n. γεωργία

#### **Italiano (Italian)**

agricoltura, agraria

#### **Português (Portuguese)**

n. - agricultura (f)

#### **••••• (Russian)**

••••• •••••, ••••• •••••, •••••

#### **Español (Spanish)**

n. - agronomía, agricultura

**Svenska (Swedish)**

n. - jordbruk

••• **(Simplified Chinese)**

n. - 农业, 农, 农, 农, 农

••• **(Traditional Chinese)**

n. - 农业, 农, 农, 农, 农

••• **(Japanese)**

n. - 农业, 农, 农

••••• **(Arabic)**

•(•••••) •••••

••••• **(Hebrew)**

n. - •••••••

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[latifundium](#) (obscure word)

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