

Agriculture – modern agronomy



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Agriculture, also called farming or husbandry, is the cultivation of animals, plants, fungi, and other life forms for food, fiber, biofuel, drugs and other products used to sustain and enhance human life. Agriculture was the key development in the rise of sedentary human civilization, whereby farming of domesticated species created food surpluses that nurtured the development of civilization. The study of agriculture is known as agricultural science. The history of agriculture dates back thousands of years, and its development has been driven and defined by greatly different climates, cultures, and technologies.

However, all farming generally relies on techniques to expand and maintain the lands that are suitable for raising domesticated species. For plants, this usually requires some form of irrigation, although there are methods of dryland farming; pastoral herding on rangeland is still the most common means of raising livestock. In the developed world, industrial agriculture based on large-scale monoculture has become the dominant system of modern farming, although there is growing support for sustainable agriculture (e. . permaculture or organic agriculture). Until the Industrial Revolution, the vast majority of the human population labored in agriculture. Pre-industrial agriculture was typically subsistence agriculture in which farmers raised most of their crops for their own consumption instead of for trade. A remarkable shift in agricultural practices has occurred over the past century in response to new technologies, and the development of world markets.

This also led to technological improvements in agricultural techniques, such as the Haber-Bosch method for synthesizing ammonium nitrate which made

the traditional practice of recycling nutrients with crop rotation and animal manure less necessary. Modern agronomy, plant breeding, agrochemicals such as pesticides and fertilizers, and technological improvements have sharply increased yields from cultivation, but at the same time have caused widespread ecological damage and negative human health effects.

Selective breeding and modern practices in animal husbandry have similarly increased the output of meat, but have raised concerns about animal welfare and the health effects of the antibiotics, growth hormones, and other chemicals commonly used in industrial meat production. Genetically Modified Organisms are an increasing component of agriculture today, although they are banned in several countries. Agricultural food production and water management is targeted as an increasingly global issue that is fostering debate on a number of issues.

Significant degradation of land and water resources, including the depletion of aquifers, has been seen in recent decades, and the effects of global warming on agriculture and of agriculture on global warming are still not fully known. The major agricultural products can be broadly grouped into foods, fibers, fuels, and raw materials. Specific foods include cereals (grains), vegetables, fruits, oils, meat and spices. Fibers include cotton, wool, hemp, silk and flax. Raw materials include lumber and bamboo.

Other useful materials are produced by plants, such as resins, dyes, drugs, perfume, biofuels and ornamental products such as cut flowers and nursery plants. Over one third of the world's workers are employed in agriculture, second only to the services sector, although the percentages of agricultural

workers in developed countries has decreased significantly over the past several centuries. The word agriculture is a late Middle English adaptation of Latin *agricultura*, from *ager*, “field”, and *cultura*, “cultivation” or “growing”.

Agriculture usually refers to human activities, although it is also observed in certain species of ant, termite and ambrosia beetle. To practice agriculture means to use natural resources to “produce commodities which maintain life, including food, fiber, forest products, horticultural crops, and their related services.” This definition includes arable farming or agronomy, and horticulture, all terms for the growing of plants, animal husbandry and forestry.

A distinction is sometimes made between forestry and agriculture, based on the former’s longer management rotations, extensive versus intensive management practices and development mainly by nature, rather than by man. Even then, it is acknowledged that there is a large amount of knowledge transfer and overlap between silviculture (the management of forests) and agriculture. In traditional farming, the two are often combined even on small landholdings, leading to the term agroforestry.

Agricultural practices such as irrigation, crop rotation, fertilizers, pesticides and the domestication of livestock were developed a long time ago, but have made great progress in the past century. The history of agriculture has played a major role in human history, as agricultural progress has been a crucial factor in worldwide socio-economic change. Division of labor in agricultural societies made commonplace specializations rarely seen in

hunter-gatherer cultures, which allowed the growth of towns and cities, and the complex societies we call civilizations.

When farmers became capable of producing food beyond the needs of their own families, others in their society were freed to devote themselves to projects other than food acquisition. Historians and anthropologists have long argued that the development of agriculture made civilization possible. The total world population probably never exceeded 15 million inhabitants before the development of agriculture. In the past century agriculture has been characterized by enhanced productivity, the use of synthetic fertilizers and pesticides, selective breeding, mechanization, water contamination, and farm subsidies.

Proponents of organic farming such as Sir Albert Howard argued in the early 20th century that the overuse of pesticides and synthetic fertilizers damages the long-term fertility of the soil. While this feeling lay dormant for decades, as environmental awareness has increased in the 21st century there has been a movement towards sustainable agriculture by some farmers, consumers, and policymakers. Since the 1990s, there has been a backlash against perceived external environmental effects of mainstream agriculture, particularly regarding water pollution, resulting in the organic movement.

One of the major forces behind this movement has been the European Union, which first certified organic food in 1991 and began reform of its Common Agricultural Policy (CAP) in 2005 to phase out commodity-linked farm subsidies, also known as decoupling. The growth of organic farming has renewed research in alternative technologies such as integrated pest

management and selective breeding. Recent mainstream technological developments include genetically modified food.

In late 2007, several factors pushed up the price of grains consumed by humans as well as used to feed poultry and dairy cows and other cattle, causing higher prices of wheat (up 58%), soybean (up 32%), and maize (up 11%) over the year. Contributing factors included increased demand for grain-fed animal products from the growing middle classes of countries such as China and India and the diversion of food grain to biofuel production. Food riots took place in several countries across the world.

The International Fund for Agricultural Development posits that an increase in smallholder agriculture may be part of the solution to concerns about food prices and overall food security. They in part base this on the experience of Vietnam, which went from a food importer to large food exporter and saw a significant drop in poverty, due mainly to the development of smallholder agriculture in the country. An epidemic of stem rust on wheat caused by race Ug99 is currently spreading across Africa and into Asia and is causing major concern.

Approximately 40% of the world's agricultural land is seriously degraded. In Africa, if current trends of soil degradation continue, the continent might be able to feed just 25% of its population by 2025, according to UNU's Ghana-based Institute for Natural Resources in Africa. In 2009, the agricultural output of China was the largest in the world, followed by the European Union, India and the United States, according to the International Monetary Fund. Economists measure the total factor productivity of agriculture and by

this measure agriculture in the United States is roughly 1. times more productive than it was in 1948. Six countries - the US, Canada, France, Australia, Argentina and Thailand - supply 90% of grain exports. Water deficits, which are already spurring heavy grain imports in numerous middle-sized countries, including Algeria, Iran, Egypt, and Mexico, may soon do the same in larger countries, such as China or India. The Food and Agriculture Organization of the United Nations (FAO) leads international efforts to defeat hunger and provides forum for the negotiation of global agricultural regulations and agreements.

Dr. Samuel Jutzi, director of FAO's animal production and health division, states that lobbying by large corporations has stopped reforms that would improve human health and the environment. For example, proposals in 2010 for a voluntary code of conduct for the livestock industry that would have provided incentives for improving standards for health, and environmental regulations, such as the number of animals an area of land can support without long-term damage, were successfully defeated due to large food company pressure. Environmental impact

Agriculture imposes external costs upon society through pesticides, nutrient runoff, excessive water usage, and assorted other problems. A 2000 assessment of agriculture in the UK determined total external costs for 1996 of ? 2, 343 million, or ? 208 per hectare. A 2005 analysis of these costs in the USA concluded that cropland imposes approximately \$5 to 16 billion (\$30 to \$96 per hectare), while livestock production imposes \$714 million. Both studies, which focused solely on the fiscal impacts, concluded that more should be done to internalize external costs.

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Neither included subsidies in their analysis, but they noted that subsidies also influence the cost of agriculture to society. In 2010, the International Resource Panel of the United Nations Environment Programme published a report assessing the environmental impacts of consumption and production. The study found that agriculture and food consumption are two of the most important drivers of environmental pressures, particularly habitat change, climate change, water use and toxic emissions.

Agricultural economics Agricultural economics relates to the “ production, distribution and consumption of [agricultural] goods and services”. National government policies can significantly change the economic marketplace for agricultural products, in the form of taxation, subsidies, tariffs and other measures. Since at least the 1960s, a combination of import/export restrictions, exchange rate policies and subsidies have affected farmers in both the developing and developed world.

In the 1980s, it was clear that non-subsidized farmers in developing countries were experiencing adverse affects from national policies that created artificially low global prices for farm products. Between the mid-1980s and the early 2000s, several international agreements were put into place that limited agricultural tariffs, subsidies and other trade restrictions. However, as of 2009, there was still a significant amount of policy-driven distortion in global agricultural product prices.

The three agricultural products with the greatest amount of trade distortion were sugar, milk and rice, mainly due to taxation. Among the oilseeds, sesame had the greatest amount of taxation, but overall, feed grains and

oilseeds had much lower levels of taxation than livestock products. Since the 1980s, policy-driven distortions have seen a greater decrease among livestock products than crops during the worldwide reforms in agricultural policy.

Despite this progress, certain crops, such as cotton, still see subsidies in developed countries artificially deflating global prices, causing hardship in developing countries with non-subsidized farmers. In the United States, food costs attributed to food processing, distribution, and agricultural marketing have risen while the costs attributed to farming have declined. This is related to the greater efficiency of farming, combined with the increased level of value addition (e. g. more highly processed products) provided by the supply chain.

From 1960 to 1980 the farm share was around 40%, but by 1990 it had declined to 30% and by 1998, 22. 2%. Market concentration has increased in the sector as well, with the top 20 food manufacturers accounting for half the food-processing value in 1995, over double that produced in 1954. As of 2000 the top six US supermarket groups had 50% of sales compared to 32% in 1992. Although the total effect of the increased market concentration is likely increased efficiency, the changes redistribute economic surplus from producers (farmers) and consumers, and may have negative implications for rural communities.