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ИНОЯЗЫЧНАЯ ПРОФЕССИОНАЛЬНАЯ КОММУНИКАЦИЯ

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АГРАРНЫЙ БИЗНЕС В СОВРЕМЕННОМ МИРЕ

Учебное пособие по английскому языку
для студентов и аспирантов
сельскохозяйственных вузов

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Содержатся оригинальные тексты на английском языке, в которых освещаются общие сведения о сельском хозяйстве как о бизнесе, о научных основах его ведения и особенности сельскохозяйственного производства в странах, где разговорным языком является английский.

Для студентов и аспирантов сельскохозяйственных вузов.

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AGRIBUSINESS

In agriculture, agribusiness is a generic term for the various businesses involved in food production, including farming and contract farming, seed supply, agrichemicals, farm machinery, wholesale and distribution, processing, marketing, and retail sales. Within the agriculture industry, agribusiness is widely used simply as a convenient portmanteau of agriculture and business, referring to the range of activities and disciplines encompassed by modern food production. There are academic degrees in and departments of agribusiness, agribusiness trade associations, agribusiness publications, and so forth, worldwide. Here, the term is only descriptive, and is synonymous in the broadest sense with food industry. The UN's Food and Agriculture Organization (FAO), for example, operates a section devoted to Agribusiness Development, which seeks to promote food industry growth in the third world. Among critics of large-scale, industrialized, vertically integrated food production, the term *agribusiness* is used negatively, synonymous with *corporate farming*. As such, it is often contrasted with smaller family-owned farms. Negative connotations are also derived from the negative associations of "business" and "corporations" by critics of capitalism or corporate excess. As concern over Global warming intensifies, biofuels derived from food crops are gaining increased public and scientific attention, driven by factors such as oil price spikes, the need for increased energy security, concern over greenhouse gas emissions from fossil fuels, and support from government subsidies. In Europe and in the US, increased research and production of biofuels has been mandated by law. **Examples** of agribusinesses include seed and agrichemical producers like Dow AgroSciences, DuPont, Monsanto, and Syngenta; AB Agri (part of Associated British Foods) animal feeds, biofuels, and micro-ingredients, ADM, grain transport and processing; John Deere, farm machinery producer; Ocean Spray, farmer's cooperative; and Purina Farms, agritourism farm.

Agriculture

Agriculture, also called **farming** or **husbandry**, is the cultivation of animals, plants, fungi, and other life forms for food, fiber, biofuel and other products used to sustain 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. Agriculture generally speaking refers to human activities, although it is also observed in certain species of ant and termite. The word *agriculture* is the English adaptation of Latin *agricultūra*, from *ager*, "a field", and *cultūra*, "cultivation" in the strict sense of "tillage of the soil".Thus, a literal reading of the word yields "tillage of fields".

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.g. 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, 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 such as intensive pig farming have similarly increased the output of meat, but have raised concerns about animal cruelty and the health effects of the antibiotics, growth hormones, and other chemicals commonly used in industrial meat production.

The major agricultural products can be broadly grouped into foods, fibers, fuels, and raw materials. In the 21st century, plants have

been used to grow biofuels, biopharmaceuticals, bioplastics, and pharmaceuticals. Specific foods include cereals, vegetables, fruits, and meat. Fibers include cotton, wool, hemp, silk and flax. Raw materials include lumber and bamboo. Other useful materials are produced by plants, such as resins. Biofuels include methane from biomass, ethanol, and biodiesel. Cut flowers, nursery plants, tropical fish and birds for the pet trade are some of the ornamental products. Regarding food production, the World Bank targets agricultural food production and water management as an increasingly global issue that is fostering an important and growing debate.

In 2007, one third of the world's workers were employed in agriculture. The services sector has overtaken agriculture as the economic sector employing the most people worldwide. Despite the size of its workforce, agricultural production accounts for less than five percent of the gross world product (an aggregate of all gross domestic products).

History

Agricultural practices such as irrigation, crop rotation, fertilizers, pesticides and animals were developed long ago, but have made great strides 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. So, too, are arts such as epic literature and monumental architecture, as well as codified legal systems. 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 invention of agriculture.

Prehistoric origins

Forest gardening, a plant-based food production system, is thought to be the world's oldest agroecosystem. Forest gardens originated in prehistoric times along jungle-clad river banks and in the wet foothills of monsoon regions. In the gradual process of a family improving their immediate environment, useful tree and vine species were identified, protected and improved whilst undesirable species were elim-

inated. Eventually superior foreign species were selected and incorporated into the family's garden.

Ancient history

The Fertile Crescent of Western Asia, Egypt, and India were sites of the earliest planned sowing and harvesting of plants that had previously been gathered in the wild. Independent development of agriculture occurred in northern and southern China, Africa's Sahel, New Guinea and several regions of the Americas. The eight so-called Neolithic founder crops of agriculture appear: first emmer wheat and einkorn wheat, then hulled barley, peas, lentils, bitter vetch, chick peas and flax.

By 7000 BC, small-scale agriculture reached Egypt. From at least 7000 BC the Indian subcontinent saw farming of wheat and barley, as attested by archaeological excavation at Mehrgarh in Balochistan in what is present day Pakistan. By 6000 BC, mid-scale farming was entrenched on the banks of the Nile. This, as irrigation had not yet matured sufficiently. About this time, agriculture was developed independently in the Far East, with rice, rather than wheat, as the primary crop. Chinese and Indonesian farmers went on to domesticate taro and beans including mung, soy and azuki. To complement these new sources of carbohydrates, highly organized net fishing of rivers, lakes and ocean shores in these areas brought in great volumes of essential protein. Collectively, these new methods of farming and fishing inaugurated a human population boom that dwarfed all previous expansions and continues today.

By 5000 BC, the Sumerians had developed core agricultural techniques including large-scale intensive cultivation of land, monocropping, organized irrigation, and the use of a specialized labor force, particularly along the waterway now known as the Shatt al-Arab, from its Persian Gulf delta to the confluence of the Tigris and Euphrates. Domestication of wild aurochs and mouflon into cattle and sheep, respectively, ushered in the large-scale use of animals for food/fiber and as beasts of burden. The shepherd joined the farmer as an essential provider for sedentary and semi-nomadic societies. Maize, manioc, and arrowroot were first domesticated in the Americas as far back as 5200 BC.

The potato, tomato, pepper, squash, several varieties of bean, tobacco, and several other plants were also developed in the Americas, as was extensive terracing of steep hillsides in much of Andean South America. The

Greeks and Romans built on techniques pioneered by the Sumerians, but made few fundamentally new advances. Southern Greeks struggled with very poor soils, yet managed to become a dominant society for years. The Romans were noted for an emphasis on the cultivation of crops for trade.

In the same region, a parallel agricultural revolution occurred, resulting in some of the most important crops grown today. In Mesoamerica wild teosinte was transformed through human selection into the ancestor of modern maize, more than 6000 years ago. It gradually spread across North America and was the major crop of Native Americans at the time of European exploration. Other Mesoamerican crops include hundreds of varieties of squash and beans. Cocoa was also a major crop in domesticated Mexico and Central America. The turkey, one of the most important meat birds, was probably domesticated in Mexico or the U.S. Southwest. In the Andes region of South America the major domesticated crop was potatoes, domesticated perhaps 5000 years ago. Large varieties of beans were domesticated, in South America, as well as animals, including llamas, alpacas, and guinea pigs. Coca, still a major crop, was also domesticated in the Andes.

A minor center of domestication, the indigenous people of the Eastern U.S. appear to have domesticated numerous crops. Sunflowers, tobacco, varieties of squash and Chenopodium, as well as crops no longer grown, including marshelder and little barley were domesticated. Other wild foods may have undergone some selective cultivation, including wild rice and maple sugar. The most common varieties of strawberry were domesticated from Eastern North America.

By 3500 BC, the simplest form of the plough was developed, called the ard. Before this period, simple digging sticks or hoes were used. These tools would have also been easier to transport, which was a benefit as people only stayed until the soil's nutrients were depleted. However, through excavations in Mexico it has been found that the continuous cultivating of smaller pieces of land would also have been a sustaining practice. Additional research in central Europe later revealed that agriculture was indeed practiced at this method. For this method, ards were thus much more efficient than digging sticks.

Middle Ages

The Middle Ages saw significant improvements in the agricultural techniques and technology. There was a steady clearing of woodlands and

draining of wetlands for the increase of cropland throughout the period until about the year 1300. Tools such as axes, adzes, and bill-hooks were improved, but most significant was the gradual evolution of the scratch plough from the classical Mediterranean world into the mouldboard plough capable of turning over the heavy soils of northern Europe. The period saw a general move from a two field crop rotation to a three field crop rotation in which one field of three was left fallow every year. Also, there was a general change from small patchworks of fields to one large open field divided into strips owned by various members of a community. The use of watermills was common in the Middle Ages. There was tremendous increase in windmills from the 12th to the 13th century; some tens of thousands were built.

Crops where wheat, rye, barley, and oats. Peas, beans, and vetches became common from the 13th century onward as a fodder crop for animals and also for their nitrogen-fixation fertilizing properties. Crop yields peaked in the 13th century, and according to Bruce Campbell and Mark Overton stayed more or less steady until the 18th century.

Though the limitations of Medieval farming were once thought to have provided a ceiling for the population growth in the Middle Ages, recent studies by Campbell and David Stone[have shown that the technology of Medieval agriculture was always sufficient for the needs of the people under normal circumstances, and that it was only during exceptionally harsh times, such as the

Modern developments

After 1492, a global exchange of previously local crops and livestock breeds occurred. Key crops involved in this exchange included the tomato, maize, potato, manioc, cocoa bean and tobacco going from the New World to the Old, and several varieties of wheat, spices, coffee, and sugar cane going from the Old World to the New. The most important animal exportation from the Old World to the New were those of the horse and dog (dogs were already present in the pre-Columbian Americas but not in the numbers and breeds suited to farm work). Although not usually food animals, the horse (including donkeys and ponies) and dog quickly filled essential production roles on western-hemisphere farms.

The potato became an important staple crop in northern Europe. Since being introduced by Portuguese in the 16th century, maize and ma-

nioc have replaced traditional African crops as the continent's most important staple food crops.

By the early 19th century, agricultural techniques, implements, seed stocks and cultivar had so improved that yield per land unit was many times that seen in the Middle Ages. Although there is a vast and interesting history of crop cultivation before the dawn of the 20th century, there is little question that the work of Charles Darwin and Gregor Mendel created the scientific foundation for plant breeding that led to its explosive impact over the past 150 years.

With the rapid rise of mechanization in the late 19th century and the 20th century, particularly in the form of the tractor, farming tasks could be done with a speed and on a scale previously impossible. These advances have led to efficiencies enabling certain modern farms in the United States, Argentina, Israel, the United Kingdom Germany, and a few other nations to output volumes of high-quality produce per land unit at what may be the practical limit.

The Haber-Bosch method for synthesizing ammonium nitrate represented a major breakthrough and allowed crop yields to overcome previous constraints. In the past century agriculture has been characterized by enhanced productivity, the substitution of synthetic fertilizers and pesticides for labor, water pollution, and farm subsidies. In recent years there has been a backlash against the external environmental effects of conventional agriculture, resulting in the organic movement.

The cereals rice, corn, and wheat provide 60% of human food supply. Between 1700 and 1980, "the total area of cultivated land worldwide increased 466%" and yields increased dramatically, particularly because of selectively bred high-yielding varieties, fertilizers, pesticides, irrigation, and machinery. For example, irrigation increased corn yields in eastern Colorado by 400 to 500% from 1940 to 1997.

However, concerns have been raised over the sustainability of intensive agriculture. Intensive agriculture has become associated with decreased soil quality in India and Asia, and there has been increased concern over the effects of fertilizers and pesticides on the environment, particularly as population increases and food demand expands. The monocultures typically used in intensive agriculture increase the number of pests, which are controlled through pesticides. Integrated pest management (IPM), which "has been promoted for decades and has had some notable successes" has

not significantly affected the use of pesticides because policies encourage the use of pesticides and IPM is knowledge-intensive.

Agricultural exploration expeditions, since the late 19th century, have been mounted to find new species and new agricultural practices in different areas of the world. Two early examples of expeditions include Frank N. Meyer's fruit- and nut-collecting trip to China and Japan from 1916–1918 and the Dorsett-Morse Oriental Agricultural Exploration Expedition to China, Japan, and Korea from 1929–1931 to collect soybean germplasm to support the rise in soybean agriculture in the United States.

Green Revolution

The Green Revolution refers to a series of research, development, and technology transfer initiatives, occurring between the 1940s and the late 1970s, that increased agriculture production around the world, beginning most markedly in the late 1960s. The initiatives, led by Norman Borlaug, the "Father of the Green Revolution" credited with saving over a billion people from starvation, involved the development of high-yielding varieties of cereal grains, expansion of irrigation infrastructure, modernization of management techniques, distribution of hybridized seeds, synthetic fertilizers, and pesticides to farmers.

Synthetic nitrogen, along with mined rock phosphate, pesticides and mechanization, have greatly increased crop yields in the early 20th century. Increased supply of grains has led to cheaper livestock as well. Further, global yield increases were experienced later in the 20th century when high-yield varieties of common staple grains such as rice, wheat, and corn (maize) were introduced as a part of the Green Revolution. The Green Revolution exported the technologies (including pesticides and synthetic nitrogen) of the developed world to the developing world. Thomas Malthus famously predicted that the Earth would not be able to support its growing population, but technologies such as the Green Revolution have allowed the world to produce a surplus of food.

Although the "Green Revolution" significantly increased rice yields in Asia, yield increases have not occurred in the past 15–20 years. The genetic "yield potential" has increased for wheat, but the yield potential for rice has not increased since 1966, and the yield potential for maize has "barely increased in 35 years". It takes a decade or two for herbicide-resistant weeds to emerge, and insects become resistant to insecticides within about a decade. Crop rotation helps to prevent resistances.

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.

In recent years 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. Food riots took place in several countries across the world. Contributing factors included drought in Australia and elsewhere, increasing demand for grain-fed animal products from the growing middle classes of countries such as China and India, diversion of foodgrain to biofuel production and trade restrictions imposed by several countries.

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 2.6 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.

Many governments have subsidized agriculture for a variety of political and economic reasons. These agricultural subsidies are often linked to the production of certain commodities such as wheat, corn (maize), rice, soybeans, and milk.

The Food and Agriculture Organization of the United Nations (FAO) leads international efforts to defeat hunger and provides a neutral forum where nations meet as equals to negotiate agreements and debate food policy and the regulation of agriculture. According to Dr. Samuel Jutzi, director of FAO's animal production and health division, lobbying by "powerful" big food corporations has stopped reforms that would improve human health and the environment. The "real, true issues are not being addressed by the political process because of the influence of lobbyists, of the true powerful entities," he said, speaking at the Compassion in World Farming annual forum. For example, recent proposals 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.

Agriculture remains a hazardous industry, and farmers worldwide remain at high risk of work-related injuries, lung disease, noise-induced hearing loss, skin diseases, as well as certain cancers related to chemical use and prolonged sun exposure. On industrialized farms, injuries frequently involve the use of agricultural machinery. The most common cause of fatal agricultural injuries in the United States is tractor rollovers, which can be prevented by the use of roll over protection structures which limit the risk of injury in case a tractor rolls over Pesticides and other chemicals used in farming can also be hazardous to worker health, and workers exposed to pesticides may experience illnesses or birth defects.

As an industry in which families commonly share in work and live on the farm itself, entire families can be at risk for injuries, illness, and death. Agriculture is an especially dangerous industry for younger workers, accounting for nearly half of work-related fatalities in the United States between 1992 and 2000. Common causes of fatal injuries among young farm worker include drowning, machinery and motor vehicle-related accidents. To reduce the extent of farm-related youth injuries, the National Institute of Occupational Safety and Health (NIOSH) and the Marshfield Clinic Research Foundation have issued a set of guidelines known as the North American Guidelines for Children's Agricultural Tasks (NAGCAT) based on child development principles that matched children's abilities with the requirements of specific farm work. These guidelines have proven effective at reducing work-related injury rates among youth, based on the results of a randomized control trial conducted by NIOSH.

Agricultural production systems

Cropping systems vary among farms depending on the available resources and constraints; geography and climate of the farm; government policy; economic, social and political pressures; and the philosophy and culture of the farmer.

Shifting cultivation (or slash and burn) is a system in which forests are burnt, releasing nutrients to support cultivation of annual and then perennial crops for a period of several years. Then the plot is left fallow to regrow forest, and the farmer moves to a new plot, returning after many more years (10–20). This fallow period is shortened if population density grows, requiring the input of nutrients (fertilizer or manure) and some manual pest control. Annual cultivation is the next phase of intensity in which there is no fallow period. This requires even greater nutrient and pest control inputs.

Further industrialization lead to the use of monocultures, when one cultivar is planted on a large acreage. Because of the low biodiversity, nutrient use is uniform and pests tend to build up, necessitating the greater use of pesticides and fertilizers. Multiple cropping, in which several crops are grown sequentially in one year, and intercropping, when several crops are grown at the same time are other kinds of annual cropping systems known as polycultures.

In subtropical and arid environments, the timing and extent of agriculture may be limited by rainfall, either not allowing multiple annual

crops in a year, or requiring irrigation. In all of these environments perennial crops are grown (coffee, chocolate) and systems are practiced such as agroforestry. In temperate environments, where ecosystems were predominantly grassland or prairie, highly productive annual cropping is the dominant farming system.

The last century has seen the intensification, concentration and specialization of agriculture, relying upon new technologies of agricultural chemicals (fertilizers and pesticides), mechanization, and plant breeding (hybrids and GMO's). In the past few decades, a move towards sustainability in agriculture has also developed, integrating ideas of socio-economic justice and conservation of resources and the environment within a farming system. This has led to the development of many responses to the conventional agriculture approach, including organic agriculture, urban agriculture, community supported agriculture, ecological or biological agriculture, integrated farming and holistic management, as well as an increased trend towards agricultural diversification.

Livestock production systems

Animals, including horses, mules, oxen, camels, llamas, alpacas, and dogs, are often used to help cultivate fields, harvest crops, wrangle other animals, and transport farm products to buyers. Animal husbandry not only refers to the breeding and raising of animals for meat or to harvest animal products (like milk, eggs, or wool) on a continual basis, but also to the breeding and care of species for work and companionship. Livestock production systems can be defined based on feed source, as grassland – based, mixed, and landless.

Grassland based livestock production relies upon plant material such as shrubland, rangeland, and pastures for feeding ruminant animals. Outside nutrient inputs may be used, however manure is returned directly to the grassland as a major nutrient source. This system is particularly important in areas where crop production is not feasible because of climate or soil, representing 30–40 million pastoralists. Mixed production systems use grassland, fodder crops and grain feed crops as feed for ruminant and monogastic (one stomach; mainly chickens and pigs) livestock. Manure is typically recycled in mixed systems as a fertilizer for crops. Approximately 68% of all agricultural land is permanent pastures used in the production of livestock.

Landless systems rely upon feed from outside the farm, representing the de-linking of crop and livestock production found more prevalently in OECD member countries. In the U.S., 70% of the grain grown is fed to animals on feedlots. Synthetic fertilizers are more heavily relied upon for crop production and manure utilization becomes a challenge as well as a source for pollution.

Production practices

Tillage is the practice of plowing soil to prepare for planting or for nutrient incorporation or for pest control. Tillage varies in intensity from conventional to no-till. It may improve productivity by warming the soil, incorporating fertilizer and controlling weeds, but also renders soil more prone to erosion, triggers the decomposition of organic matter releasing CO_2, and reduces the abundance and diversity of soil organisms.

Pest control includes the management of weeds, insects/mites, and diseases. Chemical (pesticides), biological (biocontrol), mechanical (tillage), and cultural practices are used. Cultural practices include crop rotation, culling, cover crops, intercropping, composting, avoidance, and resistance. Integrated pest management attempts to use all of these methods to keep pest populations below the number which would cause economic loss, and recommends pesticides as a last resort.

Nutrient management includes both the source of nutrient inputs for crop and livestock production, and the method of utilization of manure produced by livestock. Nutrient inputs can be chemical inorganic fertilizers, manure, green manure, compost and mined minerals. Crop nutrient use may also be managed using cultural techniques such as crop rotation or a fallow period. Manure is used either by holding livestock where the feed crop is growing, such as in managed intensive rotational grazing, or by spreading either dry or liquid formulations of manure on cropland or pastures.

Water management is where rainfall is insufficient or variable, which occurs to some degree in most regions of the world. Some farmers use irrigation to supplement rainfall. In other areas such as the Great Plains in the U.S. and Canada, farmers use a fallow year to conserve soil moisture to use for growing a crop in the following year. Agriculture represents 70% of freshwater use worldwide.

Processing, distribution, and marketing

In the United States, food costs attributed to processing, distribution, and 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.

Crop alteration and biotechnology

Crop alteration has been practiced by humankind for thousands of years, since the beginning of civilization. Altering crops through breeding practices changes the genetic make-up of a plant to develop crops with more beneficial characteristics for humans, for example, larger fruits or seeds, drought-tolerance, or resistance to pests. Significant advances in plant breeding ensued after the work of geneticist Gregor Mendel. His work on dominant and recessive alleles gave plant breeders a better understanding of genetics and brought great insights to the techniques utilized by plant breeders. Crop breeding includes techniques such as plant selection with desirable traits, self-pollination and cross-pollination, and molecular techniques that genetically modify the organism.

Domestication of plants has, over the centuries increased yield, improved disease resistance and drought tolerance, eased harvest and improved the taste and nutritional value of crop plants. Careful selection and breeding have had enormous effects on the characteristics of crop plants. Plant selection and breeding in the 1920s and 1930s improved pasture (grasses and clover) in New Zealand. Extensive X-ray and ultraviolet induced mutagenesis efforts (i.e. primitive genetic engineering) during the 1950s produced the modern commercial varieties of grains such as wheat, corn (maize) and barley.

The Green Revolution popularized the use of conventional hybridization to increase yield many folds by creating "high-yielding varieties". For example, average yields of corn (maize) in the USA have increased from around 2.5 tons per hectare (t/ha) (40 bushels per acre) in 1900 to about 9.4 t/ha (150 bushels per acre) in 2001. 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. Variations in yields are due mainly to variation in climate, genetics, and the level of intensive farming techniques (use of fertilizers, chemical pest control, growth control to avoid lodging).

Genetic engineering

Genetically Modified Organisms (GMO) are organisms whose genetic material has been altered by genetic engineering techniques generally known as recombinant DNA technology. Genetic engineering has expanded the genes available to breeders to utilize in creating desired germlines for new crops. After mechanical tomato-harvesters were developed in the early 1960s, agricultural scientists genetically modified tomatoes to be more resistant to mechanical handling. More recently, genetic engineering is being employed in various parts of the world, to create crops with other beneficial traits. New research on woodland strawberry genome was found to be short and easy to manipulate. Researchers now have tools to improve strawberry flavors and aromas of cultivated strawberries as stated in a publication by Nature Genetics.

Herbicide-tolerant GMO crops

Roundup Ready seed has a herbicide resistant gene implanted into its genome that allows the plants to tolerate exposure to glyphosate. *Roundup* is a trade name for a glyphosate-based product, which is a systemic, nonselective herbicide used to kill weeds. *Roundup Ready* seeds allow the farmer to grow a crop that can be sprayed with glyphosate to control weeds without harming the resistant crop. Herbicide-tolerant crops are used by farmers worldwide. Today, 92% of soybean acreage in the US is planted with genetically modified herbicide-tolerant plants.

With the increasing use of herbicide-tolerant crops, comes an increase in the use of glyphosate-based herbicide sprays. In some areas gly-

phosate resistant weeds have developed, causing farmers to switch to other herbicides. Some studies also link widespread glyphosate usage to iron deficiencies in some crops, which is both a crop production and a nutritional quality concern, with potential economic and health implications.

Insect-resistant GMO crops

Other GMO crops used by growers include insect-resistant crops, which have a gene from the soil bacterium *Bacillus thuringiensis* (Bt), which produces a toxin specific to insects. These crops protect plants from damage by insects; one such crop is Starlink. Another is cotton, which accounts for 63% of US cotton acreage.

Some believe that similar or better pest-resistance traits can be acquired through traditional breeding practices, and resistance to various pests can be gained through hybridization or cross-pollination with wild species. In some cases, wild species are the primary source of resistance traits; some tomato cultivars that have gained resistance to at least 19 diseases did so through crossing with wild populations of tomatoes.

Costs and benefits of GMOs

Genetic engineers may someday develop transgenic plants which would allow for irrigation, drainage, conservation, sanitary engineering, and maintaining or increasing yields while requiring fewer fossil fuel derived inputs than conventional crops. Such developments would be particularly important in areas which are normally arid and rely upon constant irrigation, and on large scale farms. However, genetic engineering of plants has proven to be controversial. Many issues surrounding food security and environmental impacts have risen regarding GMO practices. For example, GMOs are questioned by some ecologists and economists concerned with GMO practices such as terminator seeds, which is a genetic modification that creates sterile seeds. Terminator seeds are currently under strong international opposition and face continual efforts of global bans.

Another controversial issue is the patent protection given to companies that develop new types of seed using genetic engineering. Since companies have intellectual ownership of their seeds, they have the power to dictate terms and conditions of their patented product. Currently, ten seed companies control over two-thirds of the global seed sales. Vandana Shiva argues that these companies are guilty of biopiracy by patenting life and exploiting organisms for profit.Farmers using patented seed are restricted from saving seed for subsequent plantings, which forces farmers to buy

new seed every year. Since seed saving is a traditional practice for many farmers in both developing and developed countries, GMO seeds legally bind farmers to change their seed saving practices to buying new seed every year.

Locally adapted seeds are an essential heritage that has the potential to be lost with current hybridized crops and GMOs. Locally adapted seeds, also called land races or crop eco-types, are important because they have adapted over time to the specific micro-climates, soils, other environmental conditions, field designs, and ethnic preference indigenous to the exact area of cultivation. Introducing GMOs and hybridized commercial seed to an area brings the risk of cross-pollination with local land races Therefore, GMOs pose a threat to the sustainability of land races and the ethnic heritage of cultures. Once seed contains transgenic material, it becomes subject to the conditions of the seed company that owns the patent of the transgenic material.

GMO regulation

Food security issues also coincide with food safety and food labeling concerns. Currently a global treaty, the BioSafety Protocol, regulates the trade of GMOs. The EU currently requires all GMO foods to be labeled, whereas the US does not require transparent labeling of GMO foods. Since there are still questions regarding the safety and risks associated with GMO foods, some believe the public should have the freedom to choose and know what they are eating and require all GMO products to be labeled.

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 concluded that more should be done to internalize external costs, and neither included subsidies in their analysis, but noted that subsidies also influence the cost of agriculture to society. Both focused on purely fiscal impacts. The 2000 review included reported pesticide poisonings but did not include speculative chronic effects of pesticides, and the 2004 review relied on a 1992 estimate of the total impact of pesticides.

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.

Agriculture accounts for 70 per cent of withdrawals of freshwater resources. However, increasing pressure being placed on water resources by industry, cities and the involving biofuels industry means that water scarcity is increasing and agriculture is facing the challenge of producing more food for the world's growing population with fewer water resources. Scientists are also realising that water resources need to be allocated to maintain natural environmental services, such as protecting towns from flooding, cleaning ecosystems and supporting fish stocks. In the book *Out of Water: From abundance to scarcity and how to solve the world's water problems*, authors Colin Chartres and Samyukta Varma of the International Water Management Institute lay down a six-point plan of action for addressing the global challenge of producing sufficient food for the world with dwindling water resources. One of the actions they say is required is to ensure all water systems, such as lakes and rivers, have water allocated to environmental flow.

A key player who is credited to saving billions of lives because of his revolutionary work in developing new agricultural techniques is Norman Borlaug. His transformative work brought high-yield crop varieties to developing countries and earned him an unofficial title as the father of the Green Revolution.

Livestock issues

A senior UN official and co-author of a UN report detailing this problem, Henning Steinfeld, said "Livestock are one of the most significant contributors to today's most serious environmental problems". Livestock production occupies 70% of all land used for agriculture, or 30% of the land surface of the planet. It is one of the largest sources of greenhouse gases, responsible for 18% of the world's greenhouse gas emissions as measured in CO_2 equivalents. By comparison, all transportation emits 13.5% of the CO_2. It produces 65% of human-related nitrous oxide (which has 296 times the global warming potential of CO_2,) and 37% of all human-induced methane (which is 23 times as warming as CO_2. It also generates 64% of the ammonia emission. Livestock

expansion is cited as a key factor driving deforestation, in the Amazon basin 70% of previously forested area is now occupied by pastures and the remainder used for feedcrops. Through deforestation and land degradation, livestock is also driving reductions in biodiversity.

Land transformation and degradation

Land transformation, the use of land to yield goods and services, is the most substantial way humans alter the Earth's ecosystems, and is considered the driving force in the loss of biodiversity. Estimates of the amount of land transformed by humans vary from 39–50%. Land degradation, the long-term decline in ecosystem function and productivity, is estimated to be occurring on 24% of land worldwide, with cropland overrepresented. The UN-FAO report cites land management as the driving factor behind degradation and reports that 1.5 billion people rely upon the degrading land. Degradation can be deforestation, desertification, soil erosion, mineral depletion, or chemical degradation (acidification and salinization).

Eutrophication

Eutrophication, excessive nutrients in aquatic ecosystems resulting in algal blooms and anoxia, leads to fish kills, loss of biodiversity, and renders water unfit for drinking and other industrial uses. Excessive fertilization and manure application to cropland, as well as high livestock stocking densities cause nutrient (mainly nitrogen and phosphorus) runoff and leaching from agricultural land. These nutrients are major nonpoint pollutants contributing to eutrophication of aquatic ecosystems.

Pesticides

Pesticide use has increased since 1950 to 2.5 million tons annually worldwide, yet crop loss from pests has remained relatively constant. The World Health Organization estimated in 1992 that 3 million pesticide poisonings occur annually, causing 220,000 deaths. Pesticides select for pesticide resistance in the pest population, leading to a condition termed the 'pesticide treadmill' in which pest resistance warrants the development of a new pesticide.

An alternative argument is that the way to 'save the environment' and prevent famine is by using pesticides and intensive high yield farming, a view exemplified by a quote heading the Center for Global Food Issues website: 'Growing more per acre leaves more land for nature'. However, critics argue that a trade-off between the environment and a need for food

is not inevitable, and that pesticides simply replace good agronomic practices such as crop rotation.

Climate change

Climate change has the potential to affect agriculture through changes in temperature, rainfall (timing and quantity), CO_2, solar radiation and the interaction of these elements. Extreme events, such as droughts and floods, are forecast to increase as climate change takes hold. Agriculture is among sectors most vulnerable to the impacts of climate change; water supply for example, will be critical to sustain agricultural production and provide the increase in food output required to sustain the world's growing population. Transformational approaches will be needed to manage natural resources in future. For example, policies, practices and tools promoting climate-smart agriculture will be important, as will better use of scientific information on climate for assessing risks and vulnerability. Planners and policy-makers will need to help create suitable policies that encourage funding for such agricultural transformation.

Agriculture can both mitigate or worsen global warming. Some of the increase in CO_2 in the atmosphere comes from the decomposition of organic matter in the soil, and much of the methane emitted into the atmosphere is caused by the decomposition of organic matter in wet soils such as rice paddies, as well as the normal digestive activities of farm animals. Further, wet or anaerobic soils also lose nitrogen through denitrification, releasing the greenhouse gases nitric oxide and nitrous oxide. Changes in management can reduce the release of these greenhouse gases, and soil can further be used to sequester some of the CO_2 in the atmosphere.

Energy and agriculture

Since the 1940s, agricultural productivity has increased dramatically, due largely to the increased use of energy-intensive mechanization, fertilizers and pesticides. The vast majority of this energy input comes from fossil fuel sources. Between 1950 and 1984, the Green Revolution transformed agriculture around the globe, with world grain production increasing by 250% as world population doubled. Modern agriculture's heavy reliance on petrochemicals and mechanization has raised concerns that oil shortages could increase costs and reduce agricultural output, causing food shortages.

Modern or industrialized agriculture is dependent on fossil fuels in two fundamental ways: 1) direct consumption on the farm and 2) indirect con-

sumption to manufacture inputs used on the farm. Direct consumption includes the use of lubricants and fuels to operate farm vehicles and machinery; and use of gas, liquid propane, and electricity to power dryers, pumps, lights, heaters, and coolers. American farms directly consumed about 1.2 exajoules in 2002, or just over 1 percent of the nation's total energy.

Indirect consumption is mainly oil and natural gas used to manufacture fertilizers and pesticides, which accounted for 0.6 exajoules in 2002. The energy used to manufacture farm machinery is also a form of indirect agricultural energy consumption, but it is not included in USDA estimates of U.S. agricultural energy use. Together, direct and indirect consumption by U.S. farms accounts for about 2 percent of the nation's energy use. Direct and indirect energy consumption by U.S. farms peaked in 1979, and has gradually declined over the past 30 years.

Food systems encompass not just agricultural production, but also off-farm processing, packaging, transporting, marketing, consumption, and disposal of food and food-related items. Agriculture accounts for less than one-fifth of food system energy use in the United States.

In 2007, higher incentives for farmers to grow non-food biofuel crops combined with other factors (such as overdevelopment of former farm lands, rising transportation costs, climate change, growing consumer demand in China and India, and population growth) to cause food shortages in Asia, the Middle East, Africa, and Mexico, as well as rising food prices around the globe. As of December 2007, 37 countries faced food crises, and 20 had imposed some sort of food-price controls. Some of these shortages resulted in food riots and even deadly stampedes.

The biggest fossil fuel input to agriculture is the use of natural gas as a hydrogen source for the Haber-Bosch fertilizer-creation process. Natural gas is used because it is the cheapest currently available source of hydrogen. When oil production becomes so scarce that natural gas is used as a partial stopgap replacement, and hydrogen use in transportation increases, natural gas will become much more expensive. If the Haber Process is unable to be commercialized using renewable energy (such as by electrolysis) or if other sources of hydrogen are not available to replace the Haber Process, in amounts sufficient to supply transportation and agricultural needs, this major source of fertilizer would either become extremely expensive or unavailable. This would either cause food shortages or dramatic rises in food prices.

Mitigation of effects of petroleum shortages

In the event of a petroleum shortage (see peak oil for global concerns), organic agriculture can be more attractive than conventional practices that use petroleum-based pesticides, herbicides, or fertilizers. Some farmers using modern organic-farming methods have reported yields as high as those available from conventional farming. Organic farming may however be more labor-intensive and would require a shift of the workforce from urban to rural areas. The reconditioning of soil to restore nutrients lost during the use of monoculture agriculture techniques also takes time.

It has been suggested that some transgenic plants may some day be developed which would allow for maintaining or increasing yields while requiring fewer fossil-fuel-derived inputs than conventional crops. The possibility of success of these programs is questioned by ecologists and economists concerned with unsustainable GMO practices such as terminator seeds.

While there has been some research on sustainability using GMO crops, at least one prominent multi-year attempt by Monsanto Company has been unsuccessful, though during the same period traditional breeding techniques yielded a more sustainable variety of the same crop.

Agricultural policy

Agricultural policy describes a set of laws relating to domestic agriculture and imports of foreign agricultural products. Governments usually implement agricultural policies with the goal of achieving a specific outcome in the domestic agricultural product markets. Outcomes can involve, for example, a guaranteed supply level, price stability, product quality, product selection, land use or employment.

Agriculture policy concerns

An example of the breadth and types of agriculture policy concerns can be found in the Australian Bureau of Agricultural and Resource Economics article *Agricultural Economies of Australia and New Zealand* which says that the major challenges and issues faced by their industrial agriculture industry are:

- marketing challenges and consumer tastes
- international trading environment (world market conditions, barriers to trade, quarantine and technical barriers, maintenance of global competitiveness and market image, and management of biosecurity issues affecting imports and the disease status of exports)
- biosecurity (pests and diseases such as bovine spongiform encephalopathy (BSE), avian influenza, foot and mouth disease, citrus canker, and sugarcane smut)
- infrastructure (such as transport, ports, telecommunications, energy and irrigation facilities)
- management skills and labor supply (With increasing requirements for business planning, enhanced market awareness, the use of modern technology such as computers and global positioning systems and better agronomic management, modern farm managers will need to become increasingly skilled. Examples: training of skilled workers, the development of labor hire systems that provide continuity of work in industries with strong seasonal peaks, modern communication tools, investigating market opportunities, researching customer requirements, business planning including financial management, researching the latest farming techniques, risk management skills)
- coordination (a more consistent national strategic agenda for agricultural research and development; more active involvement of research investors in collaboration with research providers developing programs of work; greater coordination of research activities across industries, research organisations and issues; and investment in human capital to ensure a skilled pool of research personnel in the future.)
- technology (research, adoption, productivity, genetically modified (GM) crops, investments)
- water (access rights, water trade, providing water for environmental outcomes, assignment of risk in response to reallocation of water from consumptive to environmental use, accounting for the sourcing and allocation of water)
- resource access issues (management of native vegetation, the protection and enhancement of biodiversity, sustainability of productive agricultural resources, landholder responsibilities).

Poverty reduction

Agriculture remains the largest single contributor to the livelihoods of the 75% of the world's poor who live in rural areas. Encouraging agricul-

tural growth is therefore an important aspect of agricultural policy in the developing world. In addition, a recent Natural Resource Perspective paper by the Overseas Development Institute found that good infrastructure, education and effective information services in rural areas were necessary to improve the chances of making agriculture work for the poor.

Biosecurity

The biosecurity concerns facing industrial agriculture can be illustrated by:

the threat to poultry and humans from H5N1; possibly caused by use of animal vaccines

the threat to cattle and humans from bovine spongiform encephalopathy (BSE); possibly caused by the unnatural feeding of cattle to cattle to minimize costs

and the threat to industry profits from diseases like foot-and-mouth disease and citrus canker which increasing globalization makes harder to contain.

Food Security

The United Nations Food and Agriculture Organization (FAO) defines food security as existing when "all people, at all times, have physical and economic access to sufficient safe and nutritious food that meets their dietary needs and food preferences for an active and healthy life". The four qualifications that must be met for a food secure system include physical availability, economic and physical access, appropriate utilization, and stability of the prior three elements over time.

Of the 6.7 billion people on the planet, about 2 billion are food insecure. As the global population grows to 9 billion by 2050, and as diets shift to emphasize higher energy products and greater overall consumption, food systems will be subjected to even greater pressure. Climate change presents additional threats to food security, affecting crop yields, distribution of pests and diseases, weather patterns, and growing seasons around the world.

Food security has thus become an increasingly important topic in agricultural policy as decision makers attempt to reduce poverty and malnutrition while augmenting adaptive capacity to climate change. The Commission on Sustainable Agriculture and Climate Change listed high-priority policy actions to address food security, including integrating food security and sustainable agriculture into global and national policies, signif-

icantly raising the level of global investment in food systems, and developing specific programs and policies to support the most vulnerable populations (namely, those that are already subject to food insecurity).

Policy tools

An agricultural subsidy is a governmental subsidy paid to farmers and agribusinesses to manage the agricultural industry as one part of the various methods a government uses in a mixed economy. The conditions for payment and the reasons for the individual specific subsidies varies with farm product, size of farm, nature of ownership, and country among other factors. Enriching peanut farmers for political purposes, keeping the price of a staple low to keep the poor from rebelling, stabilizing the production of a crop to avoid famine years, encouraging diversification and many other purposes have been suggested as the reason for specific subsidies.

Price floors or price ceilings set a minimum or maximum price for a product. Price controls encourage more production by a price floor or less production by a price ceiling. A government can erect trade barriers to limit the quantity of goods imported (in the case of a Quota Share) or enact tariffs to raise the domestic price of imported products. These barriers give preference to domestic producers.

Objectives of market intervention

National security

Some argue that nations have an interest in assuring there is sufficient domestic production capability to meet domestic needs in the event of a global supply disruption. Significant dependence on foreign food producers makes a country strategically vulnerable in the event of war, blockade or embargo. Maintaining adequate domestic capability allows for food self-sufficiency that lessens the risk of supply shocks due to geopolitical events. Agricultural policies may be used to support domestic producers as they gain domestic and international market share. This may be a short term way of encouraging an industry until it is large enough to thrive without aid. Or it may be an ongoing subsidy designed to allow a product to compete with or undercut foreign competition. This may produce a net gain for a government despite the cost of interventions because it allows a country to build up an export industry or reduce imports. It also helps to form the nations supply and demand market.

Environmental protection and land management

Farm or undeveloped land composes the majority of land in most countries. Policies may encourage some land uses rather than others in the interest of protecting the environment. For instance, subsidies may be given for particular farming methods, forestation, land clearance, or pollution abatement.

Rural poverty and poverty relief

Subsidising farming may encourage people to remain on the land and obtain some income. This might be relevant to a third world country with many peasant farmers, but it may also be a consideration to more developed countries such as Poland. They have a very high unemployment rate, much farmland and retain a large rural population growing food for their own use. Price controls may also be used to assist poor citizens. Many countries have used this method of welfare support as it delivers cheap food to the poorest in urban area's without the need to assess people to give them financial aid. This often goes at the cost of the rural poor, who then earn less from what is often their only realistic or potential source of income: agriculture. Because in almost all countries the rural poor are more poor then the urban poor, cheap food policies through price controls often increase overall poverty. The same often counts for poverty relief in the form of food aid: Food aid (unless while during severe drought) drives small producers in poor countries out of production. It tends to benefit lower middle class groups (sub-urban and urban poor)at the expense of the poorest 20 percent, who as a result remain deprived of customers.

Organic farming assistance

Welfare economics theory holds that sometimes private activities can impose social costs upon others. Industrial agriculture is widely considered to impose social costs through pesticide pollution and nitrate pollution. Further, agriculture uses large amounts of water, a scarce resource. Some economists argue that taxes should be levied on agriculture, or that organic agriculture, which uses little pesticides and experiences relatively little nitrate runoff, should be encouraged with subsidies. In the United States, 65% of the approximately $16.5 billion in annual subsidies went to the top 10% of farmers in 2002 because subsidies are linked to certain commodities. On the other hand, organic farming received $5 million for help in certification and $15 million for research over a 5-year time period.

Fair trade

Some advocate Fair Trade rules to ensure that poor farmers in developing nations that produce crops primarily for export are not exploited or negatively impacted by trade policies, practices, tariffs, and agreements which benefit one competitor at the expense of another - which advocates consider a dangerous "race to the bottom" in agricultural labor and safety standards. Opponents point out that most agriculture in developed nations is produced by industrial corporations (agribusiness) which are hardly deserving of sympathy, and that the alternative to exploitation is poverty.

Fair trade steak? Much of what developing countries export to the rich world, also comes from industrial corporations. The reason for that is, that rich countries have put up elaborate quality demands, most of whom make no factual health contribution. Small farmers often in effect meet these demands, but are rarely able to prove that in western standards. Therefore, the biggest impediment to growth of small farming and therefore of fare trade in sectors beyond coffee and banana's, is these quality demands from the rich world.

Arguments against market intervention

Dumping of agricultural surpluses

In international trade parlance, when a company from country A sells a commodity below the cost of production into country B, this is called "dumping". A number of countries that are signatories to multilateral trade agreements have provisions that prohibit this practice. When rich countries subsidize domestic production, excess output is often given to the developing world as foreign aid. This process eliminates the domestic market for agricultural products in the developing world, because the products can be obtained for free from western aid agencies. In developing nations where these effects are most severe, small farmers could no longer afford basic inputs and were forced to sell their land.

According to The Institute for Agriculture and Trade Policy, corn, soybeans, cotton, wheat and rice are sold below the cost of production, or dumped. Dumping rates are approximately forty percent for wheat, between twenty-five and thirty percent for corn (maize), approximately thirty percent for soybeans, fifty-seven percent for cotton, and approximately twenty percent for rice. For example, wheat is sold for forty percent below cost.

Agricultural Independence

Many developing countries do not grow enough food to feed their own populations. These nations must buy food from other countries. Lower prices and free food save the lives of millions of starving people, despite the drop in food sales of the local farmers. A developing nation could use new improved farming methods to grow more food, with the ultimate goal of feeding their nation without outside help. New greenhouse methods, hydroponics, fertilizers, R/O Water Processors, hybrid crops, fast-growing hybrid trees for quick shade, interior temperature control, greenhouse or tent insulation, autonomous building gardens, sun lamps, mylar, fans, and other cheap tech can be used to grow crops on previously unarable land, such as rocky, mountainous, desert, and even Arctic lands. More food can be grown, reducing dependency on other countries for food.

Replacement crops can also make nations agriculturally independent. Sugar, for example, comes from sugar cane imported from Polynesia. Instead of buying the sugar from Polynesia, a nation can make sugar from sugar beets, maple sap, or sweetener from stevia plant, keeping the profits circulating within the nation's economy. Paper and clothes can be made of hemp instead of trees and cotton. Tropical foods won't grow in many places in Europe, but they will grow in insulated greenhouses or tents in Europe. Soybean plant cellulose can replace plastic (made from oil). Ethanol from farm waste or hempseed oil can replace gasoline. Rainforest medicine plants grown locally can replace many imported medicines. Alternates of cash crops, like sugar and oil replacements, can reduce farmers' dependency on subsidies in both developed and developing nations.

Market interventions may increase the cost to consumers for agricultural products, either via hidden wealth-transfers via the government, or increased prices at the consumer level, such as for sugar and peanuts in the US. This has led to market distortions, such as food processors using high fructose corn syrup as a replacement for sugar. High fructose corn syrup may be an unhealthy food additive, and, were sugar prices not inflated by government fiat, sugar might be preferred over high fructose corn syrup in the marketplace.

THE LARGEST MEMBERS OF AGRIBUSINESS

Dow AgroSciences

Dow AgroSciences LLC is a wholly owned subsidiary of the Dow Chemical Company specializing in not only agricultural chemicals such as pesticides, but also seeds and biotechnology solutions. The company is based in Indianapolis, Indiana, in the United States. On 31 January, 2006, Dow AgroSciences announced that it had received regulatory approval for the world's first plant-cell-produced vaccine against Newcastle disease virus from USDA Center for Veterinary Biologics.

Dow AgroSciences also produces Omega-9 canola and sunflower oils. These oils are said to be more healthy than alternative oils due to a combination of high-oleic and low-linoleic fatty acids.

Ivor Watkins Dow, the predecessor in New Zealand of Dow AgroSciences, operated a plant near New Plymouth, accused of exposing nearby residents to dioxins.

In October 2011, the U.S. Justice Department announced that an biotech specialist at Cargill had pleaded guiltly to stealing information from Cargill and Dow AgroSciences. Kexue Huang, a Chinese national, was discovered to be passing information back to China from Dow from at least 3 years, from 2007 to 2010.

DuPont

E. I. du Pont de Nemours and Company (NYSE: DD), commonly referred to as **DuPont**, is an American chemical company that was founded in July 1802 as a gunpowder mill by Eleuthère Irénée du Pont. DuPont was the world's third largest chemical company based on market capitalization and ninth based on revenue in 2009. Its stock price is a component of the Dow Jones Industrial Average.

In the 20th century, DuPont developed many polymers such as Vespel, neoprene, nylon, Corian, Teflon, Mylar, Kevlar, Zemdrain, M5 fiber, Nomex, Tyvek, Sorona and Lycra. DuPont developed Freon (chlorofluorocarbons) for the refrigerant industry, and later more environ-

mentally friendly refrigerants. It developed synthetic pigments and paints including ChromaFlair.

DuPont's trademarked brands often become genericized. For instance, "neoprene" was originally intended to be a trademark, but quickly came into common usage.

History

Establishment: 1802

DuPont was founded in 1802 by Eleuthère Irénée du Pont, using capital raised in France and gunpowder machinery imported from France. The company was started at the Eleutherian Mills, on the Brandywine Creek, near Wilmington, Delaware two years after his family and he left France to escape the French Revolution. It began as a manufacturer of gunpowder, as du Pont noticed that the industry in North America was lagging behind Europe. The company grew quickly, and by the mid 19th century had become the largest supplier of gunpowder to the United States military, supplying half the powder used by the Union Army during the American Civil War. The Eleutherian Mills site was declared a National Historic Landmark in 1966 and is now a museum.

Expansion: 1902 to 1912

DuPont continued to expand, moving into the production of dynamite and smokeless powder. In 1902, DuPont's president, Eugene du Pont, died, and the surviving partners sold the company to three great-grandsons of the original founder. The company subsequently purchased several smaller chemical companies, and in 1912 these actions gave rise to government scrutiny under the Sherman Antitrust Act. The courts declared that the company's dominance of the explosives business constituted a monopoly and ordered divestment. The court ruling resulted in the creation of the Hercules Powder Company (now Hercules Inc.) and the Atlas Powder Company (purchased by Imperial Chemical Industries (ICI) and now part of AkzoNobel). At the time of divestment, DuPont retained the single base nitrocellulose powders, while Hercules held the double base powders combining nitrocellulose and nitroglycerine. DuPont subsequently developed the Improved Military Rifle (IMR) line of smokeless powders.

In 1910, DuPont published a brochure entitled "Farming with Dynamite". The pamphlet was instructional, outlining the benefits to using their dynamite products on stumps and various other obstacles that would be

easier to detonate with dynamite as opposed to other more conventional, inefficient means.

DuPont also established two of the first industrial laboratories in the United States, where they began the work on cellulose chemistry, lacquers and other non-explosive products. DuPont Central Research was established at the DuPont Experimental Station, across the Brandywine Creek from the original powder mills.

Automotive investments: 1914

In 1914, Pierre S. du Pont invested in the fledgling automobile industry, buying stock of General Motors (GM). The following year he was invited to sit on GM's board of directors and would eventually be appointed the company's chairman. The DuPont company would assist the struggling automobile company further with a $25 million purchase of GM stock. In 1920, Pierre S. du Pont was elected president of General Motors. Under du Pont's guidance, GM became the number one automobile company in the world. However, in 1957, because of DuPont's influence within GM, further action under the Clayton Antitrust Act forced DuPont to divest itself of its shares of General Motors.

Major breakthroughs: 1920

In the 1920s DuPont continued its emphasis on materials science, hiring Wallace Carothers to work on polymers in 1928. Carothers discovered neoprene, the first synthetic rubber; the first polyester superpolymer; and, in 1935, nylon. The discovery of Teflon followed a few years later. DuPont introduced phenothiazine as an insecticide in 1935.

Second World War: 1941 to 1945

Throughout this period, the company continued to be a major producer of war supplies. As the inventor and manufacturer of nylon, DuPont helped produce the raw materials for parachutes, powder bags, and tires.

DuPont also played a major role in the Manhattan Project in 1943, designing, building and operating the Hanford plutonium producing plant in Hanford, Washington and the Savannah River Plant in South Carolina.

Space Age developments: 1950 to 1970

After the war, DuPont continued its emphasis on new materials, developing Mylar, Dacron, Orlon and Lycra in the 1950s, and Tyvek, Nomex, Qiana, Corfam and Corian in the 1960s. DuPont materials were critical to the success of the Apollo Project of the United States space program.

DuPont has been the key company behind the development of modern body armor. In the Second World War DuPont's ballistic nylon was used by Britain's Royal Air Force to make Flak jackets. With the development of Kevlar in the 1960s, DuPont began tests to see if it could resist a lead bullet. This research would ultimately lead to the bullet resistant vests that are the mainstay of police and military units in the industrialized world.

Conoco holdings: 1981 to 1995

In 1981, DuPont acquired Conoco Inc., a major American oil and gas producing company that gave it a secure source of petroleum feedstocks needed for the manufacturing of many of its fiber and plastics products. The acquisition, which made DuPont one of the top ten U.S.-based petroleum and natural gas producers and refiners, came about after a bidding war with the giant distillery Seagram Company Ltd., which would become DuPont's largest single shareholder with four seats on the board of directors. On April 6, 1995, after being approached by Seagram Chief Executive Officer Edgar Bronfman, Jr., DuPont announced a deal whereby the company would buy back all the shares owned by Seagram.

Divestiture: 1999

In 1999, DuPont sold all of its shares of Conoco, which merged with Phillips Petroleum Company.

Current activities

DuPont describes itself as a global science company that employs more than 60,000 people worldwide and has a diverse array of product offerings. In 2005, the Company ranked 66th in the Fortune 500 on the strength of nearly $28 billion in revenues and $1.8 billion in profits.

DuPont businesses are organized into the following five categories, known as marketing "platforms": Electronic and Communication Technologies, Performance Materials, Coatings and Color Technologies, Safety and Protection, and Agriculture and Nutrition.

The agriculture division, Dupont Pioneer makes and sells hybrid seed and genetically modified seed, some of which goes on to become genetically modified food. Genes engineered into their products include the LibertyLink gene, which provides resistance to Bayer's Ignite/Liberty herbicides; the Herculex I Insect Protection gene which provides protection against various insects; the Herculex RW insect protection trait which provides

protection against other insects; the YieldGard Corn Borer gene, which provides resistance to another set of insects; and the Roundup Ready Corn 2 trait that provides crop resistance against glyphosate herbicides. In 2010 Dupont Pioneer received approval to start marketing Plenish soybeans, which contains "the highest oleic acid content of any commercial soybean product, at more than 75%. Plenish provides a product with no trans fat, 20% less saturated fat than regular soybean oil, and more stabile oil with greater flexibility in food and industrial applications." Plenish is genetically engineered to "block the formation of enzymes that continue the cascade downstream from oleic acid (that produces saturated fats), resulting in an accumulation of the desirable monounsaturated acid."

In 2004 the company sold its textiles business, which included some of its best-known brands such as Lycra (Spandex), Dacron polyester, Orlon acrylic, Antron nylon and Thermolite, to Koch Industries. DuPont also manufactures Surlyn, which is used for the covers of golf balls, and, more recently, the body panels of the Club Car Precedent golf cart.

As of 2011, DuPont is the largest producer of titanium dioxide in the world, primarily provided as a white pigment used in the paper industry.

DuPont was listed No. 4 on the Mother Jones Top 20 polluters of 2010; dumping over 5,000,000 pounds of toxic chemicals into New Jersey/Delaware waterways.

DuPont has its R&D facilities located in China, Japan, Taiwan, India, Germany and Switzerland with an average investment of $1.3 billion annually in a diverse range of technologies for many markets including agriculture, genetic traits, biofuels, automotive, construction, electronics, chemicals and industrial materials. DuPont employs more than 5,000 scientists and engineers around the world.

On January 9, 2011, DuPont announced that it had reached a definitive agreement to buy Danish company Danisco for US$6.3 billion. On May 16, 2011, DuPont announced that its tender offer for Danisco had been successful and that it would proceed to redeem the remaining shares and delist the company.

Locations

The company’s corporate headquarters are located in Wilmington, Delaware. The company’s manufacturing, processing, marketing and research and development facilities, as well as regional purchasing offices

and distribution centers are located throughout the world. Major manufacturing sites include the Spruance plant near Richmond, Virginia (currently the company's largest plant), the Mobile Manufacturing Center (MMC) in Axis, Alabama, the Bayport plant near Houston, Texas, the Mechelen site in Belgium, and the Changshu site in China. Other locations include the Yerkes Plant on the Niagara River at Tonawanda, New York, the Sabine River Works Plant in Orange, Texas and the Parlin Site in Sayreville, New Jersey. The facilities in Vadodara, Gujarat, and Hyderabad, Andhra Pradesh in India constitute the Du Pont Services Center and Du Pont Knowledge Center.

Recognition

DuPont has been awarded the National Medal of Technology four times: first in 1990, for its invention of "high-performance man-made polymers such as nylon, neoprene rubber, "Teflon" fluorocarbon resin, and a wide spectrum of new fibers, films, and engineering plastics"; the second in 2002 "for policy and technology leadership in the phaseout and replacement of chlorofluorocarbons". Additionally, DuPont scientist George Levitt was honored with the medal in 1993 for the development of sulfonylurea herbicides—environmentally friendly herbicides for every major food crop in the world. In 1996, DuPont scientist Stephanie Kwolek was recognized for the discovery and development of Kevlar.

On the company's 200th anniversary in 2002, it was presented with the Honor Award by the National Building Museum in recognition of DuPont's "products that directly influence the construction and design process in the building industry."

Monsanto

Monsanto Company (NYSE: MON) is a publicly traded American multinational agricultural biotechnology corporation headquartered in Creve Coeur, Missouri. It is a leading producer of genetically engineered (GE) seed and of the herbicide glyphosate, which it markets under the Roundup brand. Founded in 1901 by John Francis Queeny, by the 1940's it was a major producer of plastics, including polystyrene and synthetic fibers. Notable achievements by Monsanto and its scientists as a chemical company included breakthrough research on catalytic asymmetric hydroge-

nation and being the first company to mass-produce light emitting diodes (LEDs). The company also manufactured controversial products such as the insecticide DDT, PCBs, Agent Orange, and recombinant bovine somatotropin. Monsanto was among the first to genetically modify a plant cell, along with three academic teams, which was announced in 1983, and was among the first to conduct field trials of genetically modified crops, which it did in 1987. It remained one of the top 10 U.S. chemical companies until it divested most of its chemical businesses between 1997 and 2002, through a process of mergers and spin-offs that focused the company on biotechnology.

Monsanto was a pioneer in applying the biotechnology industry business model, developed by Genentech and other biotech drug companies in the late 1970s in California, to agriculture. In this business model, companies invest heavily in research and develop and recoup the expenses through the use and enforcement of biological patents. Monsanto's application of this model to agriculture, along with a growing movement to create a global, uniform system of plant breeders' rights in the 1980s, came into direct conflict with customary practices of farmers to save, reuse, share and develop plant varieties. Its seed patenting model has also been criticized as biopiracy and a threat to biodiversity. Monsanto's role in these changes in agriculture (which include its litigation and its seed commercialization practices), its current and former agbiotech products, its lobbying of government agencies, and its history as a chemical company, have made Monsanto controversial.

History

Monsanto was founded in St. Louis, Missouri, in 1901, by John Francis Queeny, a 30-year veteran of the pharmaceutical industry. He funded the start-up with his own money and capital from a soft drink distributor and gave the company his wife's maiden name. His father-in-law was Emmanuel Mendes de Monsanto, a wealthy financier of a sugar company active in Vieques, Puerto Rico, and based in St. Thomas in the Danish West Indies. The company's first product was the artificial sweetener saccharin, which was sold to the Coca-Cola Company.

In 1919 Monsanto expanded to Europe by entering a partnership with Graesser's Chemical Works at Cefn Mawr near Ruabon, Wales to produce vanillin, aspirin and its raw ingredient salicylic acid, and later rubber

processing chemicals. This site was later sold and closed in 2010. In the 1920s Monsanto expanded into basic industrial chemicals like sulfuric acid and PCBs, and Queeny's son Edgar Monsanto Queeny took over the company in 1928.

In 1946 it developed "All" laundry detergent and began to market it; they sold the product line to Lever Brothers in 1957. Also in the 1940s, Monsanto operated the Dayton Project, and later Mound Laboratories in Miamisburg, Ohio, for the Manhattan Project, the development of the first nuclear weapons and, after 1947, the Atomic Energy Commission. In 1947 one of its factories was destroyed in the Texas City Disaster. Monsanto acquired American Viscose from England's Courtauld family in 1949. In 1954 Monsanto partnered with German chemical giant Bayer to form Mobay and market polyurethanes in the United States.

Monsanto began manufacturing DDT in 1944, along with some 15 other companies. This insecticide was much welcomed in the fight against malaria-transmitting mosquitoes. Due to DDT's toxicity, its use in the United States was banned in 1972. In 1977 Monsanto stopped producing PCBs; the United States Congress banned domestic PCB production two years later. In the 1960s and 1970s, Monsanto was also one of the most important producers of Agent Orange for United States Armed Forces operations in Vietnam.

In the mid-1960s, William Standish Knowles and his team invented a way to selectively synthesize enantiomers via asymmetric hydrogenation. This was an important advancement because it was the first method for the catalytic production of pure chiral compounds. Using this method, Knowles' team designed the "first industrial process to chirally synthesize an important compound" — L-dopa, which is currently the main drug used to treat Parkinson's disease. In 2001 Knowles and Ryōji Noyori won the Nobel Prize in Chemistry. In the mid-60's chemists at Monsanto developed the Monsanto process for making acetic acid, which until 2000 was the method most widely used to make this important industrial chemical. In 1965 Monsanto chemists invented AstroTurf, which the company then commercialized.

In 1968 they became the first company to start mass production of (visible) light emitting diodes (LEDs), using gallium arsenide phosphide. This ushered in the era of solid-state lights. From 1968 to 1970, sales doubled every few months. Their products (discrete LEDs and seven-

segment numeric displays) became the standards of industry. The primary markets then were electronic calculators, digital watches, and digital clocks. Monsanto was a pioneer of optoelectronics in the 1970s.

In 1979 Monsanto established the Edgar Monsanto Queeny safety award in honor of its former CEO (1928-1960), an annual $2,000 prize given to a member of the American Society of Safety Engineers to encourage accident prevention.

Monsanto scientists became the first to genetically modify a plant cell in 1982. Five years later, Monsanto conducted the first field tests of genetically engineered crops.

In 1985 Monsanto acquired G. D. Searle & Company, a life sciences company focusing on pharmaceuticals, agriculture, and animal health. In 1993 Monsanto's Searle division filed a patent application for Celebrex, which in 1998 became the first selective COX-2 inhibitor to be approved by the United States FDA. Celebrex became a blockbuster drug and was often mentioned as a key reason for Pfizer's acquisition of Monsanto's pharmaceutical business in 2002.

In 1994 Monsanto introduced a recombinant version of bovine somatotropin, brand-named Posilac. Monsanto later sold this business off to Eli Lilly and Company.

In 1996 Monsanto purchased Agracetus, the biotechnology company that had generated the first transgenic varieties of cotton, soybeans, peanuts, and other crops, and which Monsanto had already been licencing technology from since 1991. Monsanto first entered the maize seed business when it purchased 40% of DEKALB in 1996; it purchased the remainder of the corporation in 1998. In 1998 Monsanto purchased Cargill's seed business, which gave it access to sales and distribution facilities in 51 countries. In 2005, it finalized the purchase of Seminis Inc, a leading global vegetable and fruit seed company, for $1.4 billion. This made it the world's largest conventional seed company at the time.

In 2007 Monsanto and BASF announced a long-term agreement to cooperate in the research, development, and marketing of new plant biotechnology products.

In October 2008, the company's Canadian division, Monsanto Canada Inc., was named one of Canada's Top 100 Employers by Mediacorp Canada Inc., and was featured in *Maclean's* news magazine.

Current products

Glyphosate herbicides

Monsanto chemist John E. Franz invented glyphosate in 1970. Monsanto is the largest producer of glyphosate herbicides in the United States through its Roundup product line, which is used to kill weeds, especially annual broadleaf weeds and grasses that compete with commercial crops. Monsanto's last commercially relevant United States patent on glyphosate expired in 2000 and it is now produced by many companies in the US and around the world. As of 2009, sales of Roundup herbicides represent about 10% of Monsanto's yearly revenue.

In 2007 glyphosate was the most used herbicide in the US agricultural sector, with 180 to 185 million pounds (82,000 to 84,000 tonnes) applied, and the 2nd most used in home and garden market where users applied 5 to 8 million pounds (2,300 to 3,600 tonnes); additionally industry, commerce and government applied 13 to 15 million pounds (5,900 to 6,800 tonnes). While glyphosate has been approved by regulatory bodies worldwide and is less toxic than all the herbicides it replaced, concerns about its effects on humans and the environment persist.

Seeds

As of 2012, Monsanto's line of seed products includes agricultural seeds and vegetable seeds.

Many of Monsanto's agricultural seed products are genetically modified for resistance to herbicides, such as glyphosate, which Monsanto sells under the brand, "Roundup" - Monsanto calls these seeds "Roundup Ready". Monsanto's introduction of this system (planting glyphosate-resistant seed and then applying glyphosate once plants emerged) provided farmers with an opportunity to dramatically increase the yield from a given plot of land, since this allowed them to plant rows closer together. Without it, farmers had to plant rows far enough apart to control post-emergent weeds with mechanical tillage. Farmers have widely adopted the technology - for example over 90% of maize (Mon 832), soybean, cotton, sugar beet, and canola planted in the United States are glyphosate-resistant, as described in the GM crops article. Monsanto has also developed a Roundup Ready wheat.

As of 2009, the overall Roundup line of products including the GM seeds represented about 50% of Monsanto's business. The patent on the first type of *Roundup Ready* crop that Monsanto produced (soybeans) ex-

pires in 2014. Monsanto has broadly licensed the patent to other seed companies that include the glyphosate resistance trait in their seed products. About 150 companies have licensed the technology, including Syngenta and Dupont/Pioneer.

In addition, Monsanto invented and sells agricultural seeds that are genetically modified to make a crystalline insecticidal protein from *Bacillus thuringiensis*, known as Bt. In 1995 Monsanto's potato plants producing Bt toxin were approved for sale by the Environmental Protection Agency, after having approved by the FDA, making it the first pesticide-producing crop to be approved in the United States. Monsanto has subsequently developed Bt maize (MON 802, MON 809, MON 863, MON 810), Bt soybean, and Bt cotton.

Monsanto also produces seed that has multiple modifications, also known as "stacked traits" —for instance, cotton that make one or more Bt proteins and is resistant to glyphosate. One of these, created in collaboration with Dow, is called SmartStax. In 2011 Monsanto launched the Genuity brand for its stacked-trait products.

As of 2012 the agricultural seed lineup includes Roundup Ready alfalfa; Roundup Ready canola; cotton with Bt, Roundup Ready, or both traits; sorghum hybrids; soybeans with various oil profiles, most with the Roundup Ready trait; Roundup Ready sugarbeet; and a wide range of wheat products, many of which incorporate the nontransgenic "clearfield" imazamox-toleranttrait from BASF.

Along with other ag-biotech companies, Monsanto has been working on developing drought-resistant GM crops.

Monsanto's vegetable seed lineup includes "4,000 distinct seed varieties representing more than 20 species" that are created through breeding, not through genetic engineering.

Patents

US Patent 5,352,605 (Chimeric genes for transforming plant cells using viral promoters) and US Reissued Patent 39247 (Glyphosate-tolerant 5-enolpyruvylshikimate-3-phosphate synthases) have been especially important to Monsanto's GM soybean business; the '605 patent expired in 2011 and '247 reissued patent expires in 2014. The expiration of the '247 patent will mean that glyphosate resistant soybeans will be "generic", which has generated a great deal of discussion in the soybean industry.

Syngenta

Syngenta AG is a large global Swiss specialized chemicals company which markets seeds and pesticides. Syngenta is involved in biotechnology and genomic research. The company ranks third in total sales in the commercial agricultural seeds market. Sales in 2010 were approximately US$ 11.6 billion. Syngenta employs over 26,000 people in over 90 countries. Syngenta is listed on both the Swiss stock exchange and in New York.

History

Based in Basel, Switzerland, Syngenta was formed in 2000 by the merger of Novartis Agribusiness and Zeneca Agrochemicals. Its roots are considerably older.

In 1758 the city's Johann Rudolf Geigy-Gemuseus began trading in "Materials, Chemicals, Dyes and Drugs of all kinds". In 1876, Sandoz Laboratories began business in Basel, followed in 1884 by Ciba. These three companies ultimately became Novartis in 1995. Ciba-Geigy, formed in 1971, had concentrated mainly on crop protection in its agro division, Sandoz more on seeds.

A Syngenta works in Huddersfield, West Yorkshire originally owned by ICI.

Zeneca Agrochemicals was part of AstraZeneca, and formerly of Imperial Chemical Industries. ICI was formed in the UK in 1926. Two years later, work began at the Agricultural Research Station at Jealott's Hill near Bracknell.

In 2004, Syngenta Seeds purchased the North American corn and soybean business of Advanta, as well as Garst and Golden Harvest.

In 2005, Syngenta opposed a Swiss ban on genetically engineered organisms.

In 2007, Syngenta's Canadian division was named one of Canada's Top 100 Employers, as published in Maclean's magazine, one of only a handful of agribusiness firms to receive this honour.

Syngenta finances the Syngenta Foundation for Sustainable Agriculture. This non-profit organization supports sustainable food security projects in a number of countries.

Some of Syngenta's main competitors are: Monsanto Company, BASF, Dow AgroSciences, Bayer CropScience and DuPont.

Products

Syngenta has eight primary product lines. The company develops, markets and sells these worldwide:

Pesticides:

- Selective Herbicides
- Non-selective Herbicides
- Fungicides
- Insecticides
- Professional Products

Seeds:

- Field Crops
- Vegetables
- Flowers

Syngenta's field crops include both hybrid seeds and genetically engineered seeds, some of which enter the food chain and become part of genetically modified food. According to Syngenta, in the US their "proprietary triple stack corn seeds expanded to represent around 25 percent of units sold." In 2010 the US EPA granted registration approval for insecticidal trait stacks including Syngenta's AGRISURE VIPTERA™ gene, which offers resistance to certain corn pests. Syngenta also cross-licenses its proprietary genes with Dow AgroSciences and so is able to include Dow's Herculex®1 I and Herculex® RW insect resistance traits in its seeds. It also sells a VMAX® soybean that is resistant to glyphosate herbicide.

In 2003, more than half of Syngenta sales came from selective herbicides and fungicides.

Biofuels

Like many ag-companies, Syngenta also works in the bio-fuel space.

In 2007, Queensland University in Australia contracted with Syngenta to research different inputs for biofuels as a renewable energy source.

Atrazine has been banned in several Wisconsin counties in the United States and in the European Union. Syngenta has been accused of attempting to block the publication of UC Berkeley Professor Tyrone Hayes's work on Atrazine. Dr. Hayes claims he resigned his contractor position with Syngenta after they refused to allow him to publish the results of studies they had funded. He obtained independent funding to repeat the re-

search and then published the results. Tyrone Hayes's original research found that Atrazine caused hermaphroditism in frogs.

In 2001, the United States Patent and Trademark Office ruled in favor of Syngenta when the company filed suit against Bayer to protect its patent on a class of neonicotinoid insecticides. The following year Syngenta filed suit against Monsanto and a number of other companies claiming infringement of its U.S. biotechnology patents covering transgenic corn and cotton.

In 2004, the company again filed suit against Monsanto, claiming antitrust violations related to the U.S. biotech corn seed market.

Farmers Support Team

Syngenta sponsors several agricultural programs in developing nations. SFI created its flagship program, the Farmer Support Team (FST). The FST is a nationwide program in the Philippine archipelago. It works with farmers in all the major rice, fruit, and vegetable production provinces of the country. It began by helping Filipino farmers gain greater understanding and achieve higher productivity through trainings in Integrated Pest Management (IPM), Integrated Crop Management (ICM) and Total Crop Management (TCM).

Syngenta Foundation

The objectives and goals of the Syngenta Foundation are "to work with rural communities in the semiarid regions of the world and improve their livelihoods."

The Syngenta Foundation addressed the World Food Day Symposium in 2005 as an output of the Millennium Ecosystem Report.

Awards and community involvement

In October 2008, Syngenta Crop Protection Canada, Inc. was recognized as one of Waterloo Area's Top Employers, as announced in the Waterloo Region Record, Guelph Mercury and Cambridge Times. In 2011, Syngenta was named among the top 10 employers in biotechnology by Science magazine. The company was also recognized by the 2011 Dow Jones Sustainability Index (DJSI) as one of the best performing chemical companies worldwide. Syngenta was one of only five chemical companies

in the World and Europe indices based on economic, social and environmental performance.

Associated British Foods

Associated British Foods plc (LSE: ABF) is a British multinational food processing and retailing company whose headquarters are in London, United Kingdom. Its ingredients division is the world's second-largest producer of both sugar and baker's yeast and a major producer of other ingredients including emulsifiers, enzymes and lactose. Its grocery division is a major manufacturer of both branded and private label grocery products and includes the brands Mazola, Ovaltine, Ryvita, Jordans and Twinings. Its retail division, Primark, has around 200 stores with over 6,500,000 sq ft (600,000 m^2) of selling space across Austria, Belgium, Germany, Ireland, the Netherlands, Portugal, Spain and the UK.

History

The company was founded by Canadian Willard Garfield Weston in 1935, initially as *Food Investments Limited*, with the name changing to *Allied Bakeries Limited* a month later. In 1960 the name was changed again to *Associated British Foods.* In 1963 the Company acquired Fine Fare, a leading British supermarket chain. Following the death of the founder in 1978, control of the company was passed on to his son Garry, while the North American operations fell to his son Galen. While Garry maintained the company's prominence in the European foods market, ABF's growth has been eclipsed by the phenomenal performance of George Weston Limited in North America.

The company sold Fine Fare in 1986 and in 1991 went on to acquire British Sugar. In 1997 ABF sold its retail operations in Northern Ireland and the Republic to Tesco. These businesses were: Quinnsworth and Crazy Prices in the Republic of Ireland and Stewarts Supermarkets Ltd and Crazy Prices in Northern Ireland, the Stewarts Winebarrel off-licence chain, Lifestyle Sports & Leisure Ltd (a retail sports and leisure business), Kingsway Fresh Foods (a meat processing facility) and Daily Wrap Produce (a fruit and vegetable packaging plant).

In 2000 the company sold its interests in Burton's Biscuits. In 2004 it acquired the Tone's spice business and Fleischman yeast business from Burns Philp and in 2007 it purchased Patak's Indian food business.

On 26 March 2011 Associated British Foods, and its parent company Wittington Investments, were targeted over tax avoidance by UK Uncut during anti-cuts protests. The tax avoidance scheme involved moving capital between ABF/Primark and the affiliated Luxembourg entity ABF European Holdings & Co SNC by means of interest-free loans, avoiding tax of about £9.7 million per year. The protest took the form of a mass sit-in in Fortnum & Mason.

Controlling shareholder

Some 54.5% of ABF is owned by Wittington Investments. 79.2% of the share capital of Wittington Investments is owned by the Garfield Weston Foundation, which is one of the UK largest grant-making charitable trusts, and the remainder is owned by members of the Weston family. Wittington Investments also owns Fortnum & Mason and Heal & Son. George G. Weston became chief executive of ABF on 1 April 2005, and Galen Weston, the chief executive of George Weston Ltd., is a non-executive director. Garth Weston is Regional President of AB Mauri.

Archer Daniels Midland Company

Archer Daniels Midland Company (ADM) is an American global food processing and commodities trading corporation headquartered in Decatur, Illinois. ADM operates more than 270 plants worldwide, where cereal grains and oilseeds are processed into products used in food, beverage, nutraceutical, industrial and animal feed markets worldwide.

ADM was named the world's most admired food production company by *Fortune* magazine for 3 consecutive years; 2009, 2010, and 2011.

ADM also provides agricultural storage and transportation services. The American River Transportation Company along with ADM Trucking, Inc. are subsidiaries of ADM. ADM's revenues for fiscal year 2011 were US $81 billion.

Products

Products include oils and meal from soybeans, cottonseed, sunflower seeds, canola, peanuts, flaxseed, and Diacylglycerol (DAG) oil, as well as corn germ, corn gluten feed pellets, syrup, starch, glucose, dextrose, crystalline dextrose, High fructose corn syrup sweeteners, cocoa liquor, cocoa

powder, cocoa butter, chocolate, ethanol, and wheat flour. End uses are consumption by people, livestock, and fuel additives.

Long known as a food and ingredients company, ADM recently invested in fuel production. ADM nearly doubled capital spending in its 2007 budget to an estimated $1.12 billion. The increase is planned for bioenergy projects, focusing on bioethanol and biodiesel

History

In 1902, George A. Archer and John W. Daniels began a linseed crushing business. In 1923, Archer-Daniels Linseed Company acquired Midland Linseed Products Company, and the Archer Daniels Midland Company was formed. Every decade since its corporate inception, ADM has added at least one major profit source to its agribusiness: milling, processing, specialty food ingredients, cocoa, nutrition, and more.

In 1971 Dwayne Andreas became Chief Executive Officer of ADM, and is credited with transforming the firm into an industrial powerhouse. Andreas remained CEO until 1997. He was one of the most prominent political campaign donors in the United States, having contributed millions of dollars to Democratic and Republican candidates alike.

In September 1999, executive Marty Andreas announced, under pressure from the European agricultural industry, they were going to separate crops into genetically modified and non-genetically modified groups to give their customers a choice. Previously the company had not disclosed their crop sources.

In 2001, Paul B. Mulhollem became the President of ADM. The Archer Daniels Midland Company made history by becoming the first U.S. company to sign a contract with Cuba since the embargo against Cuba was imposed October 1960.

In May 2006, Patricia A. Woertz became CEO. Formerly of Chevron, she is expected to focus on developing ethanol and biofuels. In February 2007 Ms. Woertz was elected Chairman of the Board at ADM.

On 22 August 2011, Archer Daniels Midland announced that the soybean processing facility in Galesburg, Illinois was closing immediately, and its operations would be transferred to other ADM oilseeds facilities. The facility has been idle since April 2011. Some of the 31 employees will be offered the opportunity to transfer to other ADM facilities.

Agricultural subsidies

ADM lobbies for agricultural subsidies and price supports including sugar and ethanol. According to a 1995 report by the libertarian think tank Cato Institute, "ADM has cost the American economy billions of dollars since 1980 and has indirectly cost Americans tens of billions of dollars in higher prices and higher taxes over that same period. At least 43 percent of ADM's annual profits are from products heavily subsidized or protected by the American government. Moreover, every $1 of profits earned by ADM's corn sweetener operation costs consumers $10, and every $1 of profits earned by its bioethanol operation costs taxpayers $30."

John Deere

Deere & Company, most commonly known by its name **John Deere** is an American corporation based in Moline, Illinois, and the leading manufacturer of agricultural machinery in the world. In 2012, it was listed as 97th in the Fortune 500 America's ranking and 190th in the Fortune 500 Global ranking. Deere and Company agricultural products, sold under the John Deere name, include tractors, combine harvesters, cotton harvesters, balers, planters/seeders, sprayers. The company is also a leading manufacturer of construction equipment and forestry equipment, as well as a supplier of diesel engines and drivetrains (axles, transmissions, gearboxes) used in heavy equipment. Additionally, John Deere manufactures equipment used in lawn, grounds, and turf care, such as walk-behind lawn mowers, zero-turn lawn mowers, lawn tractors, and snowthrowers. To support the core businesses, John Deere also provides financial services and other related activities.

The company's slogan is "Nothing Runs Like a Deere" and has a picture of a leaping deer as a logo, a word play pun on "nothing runs like a deer". Carl Westby is known as the person who coined the phrase "Nothing Runs Like a Deere" for a marketing campaign to sell snowmobiles. The company's products are also easily identifiable by its distinct shade of green paint, usually augmented by yellow trim.

Products

John Deere manufactures a wide range of products, with several models of each in many cases.

Agricultural equipment

Agricultural products include, amongst others, tractors, combine harvesters, cotton harvesters, balers, planters/seeders, sillage machines, and sprayers.

Construction equipment

The company is also a leading manufacturer of heavy equipment.

Forestry equipment

John Deere manufactures a range of forestry machinery, amongst others, harvesters, forwarders, and skidders. Timberjack is a subsidiary of John Deere since 2000.

Other products

The company is also a manufacturer of consumer and commercial equipment (used in lawn, grounds, and turf care, such as lawn mowers, and snow throwers), as well as a supplier of diesel engines and powertrains (axles, transmissions, etc.) used especially in heavy equipment. Other mentionable products were/are snowmobiles, all-terrain vehicles, and StarFire (a wide-area differential GPS).

Ocean Spray (cooperative)

Ocean Spray is an agricultural cooperative of growers of cranberries and grapefruit headquartered in Lakeville/Middleborough, Massachusetts. It currently has over 600 member growers (in Massachusetts, Wisconsin, New Jersey, Oregon, Washington, Florida, British Columbia and other parts of Canada). The cooperative employs about 2,000 people, with sales of $1.4 billion in fiscal year 2005. Their products include cranberry sauce, fruit juices, fruit snacks, and dried cranberries.

Ocean Spray was formed in 1930, in Hanson, Massachusetts, by three cranberry growers who wanted to expand their market for cranberries. Led by grower Marcus L. Urann, who had created a cranberry sauce, the cooperative developed more cranberry-based products. In the same year Ocean Spray became the first producer of cranberry juice drinks with the introduction of Cranberry Juice Cocktail. (A.D. Makepeace Company, one of the original founders of Ocean Spray, has been in continual operation since the late 19th century and is currently the world's largest grower of cranberries.)

In 1964, executive Edward Gelsthorpe worked with Sylvia Schur to develop Cranapple juice, a product that brought the cranberry to greater

popularity and increased usage to year-round, earning Gelsthorpe the nickname "Cranapple Ed".

In 1976, the cooperative expanded its membership to grapefruit growers in Florida.

The cooperative has made a number of innovations, including the first juice blend, the first juice boxes, and sweetened dried cranberries (Craisins). Its cranberry juice won the ChefsBest Award for best taste.

In September 2004, Ocean Spray agreed to purchase the processing assets of Northland Cranberry This acquisition included a juice production facility in Wisconsin Rapids, Wisconsin.

In June 2004, Ocean Spray members voted down a joint venture of the cooperative's beverage business with PepsiCo. Pepsi had offered the co-op $100 million, an assumption of debt and fixed prices for cranberry harvests. In July 2006, the cooperative signed a 25-year single-serve (machine-dispensed) juice distribution deal with Pepsi.

In June 2006, at the request of People for the Ethical Treatment of Animals, PETA, Ocean Spray agreed to end its support for animal experiments. Previously, Ocean Spray had funded tests involving infecting mice with *H. pylori*, bacteria that cause stomach ulcers, and then feeding them cranberry juice to see if it had any positive effect. These experiments were conducted to determine the usefulness of Ocean Spray's cranberry juice as a digestif.

Ocean Spray completed expansion of the Wisconsin Rapids processing plant in September 2008. The addition doubles the facility size to 440,000 sq ft (41,000 m^2)., making it the world's largest cranberry processing facility. The plant has numerous environmentally friendly features including a wastewater treatment facility, energy-efficient lighting, and the use of methane from the nearby Veolia Cranberry Creek Landfill for boiler fuel. With the addition, the plant will produce Craisins, in addition to currently produced juice concentrates.

Throughout 2012, Ocean Spray contributed $387,100 to a $46 million dollar political campaign known as "The Coalition Against The Costly Food Labeling Proposition, sponsored by Farmers and Food Producers" This organization was set up to oppose a citizen's initiative, known as Proposition 37, demanding mandatory labeling of foods containing genetically modified ingredients.

Ocean Spray has Juice filling facilities in Henderson, Nevada, Sulphur Springs, Texas, and Bordentown, New Jersey. They also have a facility in Kenosha, Wisconsin that fills juice and cans sauce.

Nestlé

Nestlé S.A. is a Swiss multinational nutritional and health-related consumer goods company headquartered in Vevey, Switzerland. It is the largest food company in the world measured by revenues.

Nestlé's products include baby food, bottled water, breakfast cereals, coffee, confectionery, dairy products, ice cream, pet foods and snacks. 29 of Nestlé's brands have annual sales of over 1 billion Swiss francs (about $ 1.1 billion), including Nespresso, Nescafé, KitKat, Smarties, Nesquik, Stouffer's, Vittel, and Maggi. Nestlé has around 450 factories, operates in 86 countries, and employs around 328,000 people. It is one of the main shareholders of L'Oréal, the world's largest cosmetics company

Nestlé was formed in 1905 by the merger of the **Anglo-Swiss Milk Company**, established in 1866 by brothers George Page and Charles Page, and **Farine Lactée Henri Nestlé**, founded in 1866 by Henri Nestlé. The company grew significantly during the First World War and again following the Second World War, expanding its offerings beyond its early condensed milk and infant formula products. The company has made a number of corporate acquisitions, including Crosse & Blackwell in 1950, Findus in 1963, Libby's in 1971, Rowntree Mackintosh in 1988 and Gerber in 2007.

Nestlé has a primary listing on the SIX Swiss Exchange and is a constituent of the Swiss Market Index. It has a secondary listing on Euronext. In 2011, Nestlé was listed No. 1 in the Fortune Global 500 as the world's most profitable corporation. With a market capitalization of $ 200 billion, Nestlé ranked No. 13 in the FT Global 2011.

History

Nestlé's origins date back to 1866, when two separate Swiss enterprises were founded that would later form the core of Nestlé. In the succeeding decades, the two competing enterprises aggressively expanded their businesses throughout Europe and the United States.

In August 1867 Charles (US consul in Switzerland) and George Page, two brothers from Lee County, Illinois, USA, established the Anglo-Swiss Condensed Milk Company in Cham, Switzerland. Their first British operation was opened at Chippenham, Wiltshire, in 1873.

In September 1866 in Vevey, Henri Nestlé developed a milk-based baby food, and soon began marketing it. The following year saw Daniel Pe-

ter begin seven years of work perfecting his invention, the milk chocolate manufacturing process. Nestlé's was the crucial cooperation that Peter needed to solve the problem of removing all the water from the milk added to his chocolate and thus preventing the product from developing mildew. Henri Nestlé retired in 1875 but the company under new ownership retained his name as *Société Farine Lactée Henri Nestlé*.

In 1877 Anglo-Swiss added milk-based baby foods to their products and in the following year the Nestlé Company added condensed milk so that the firms became direct and fierce rivals.

In 1905 the companies merged to become the **Nestlé and Anglo-Swiss Condensed Milk Company**, retaining that name until 1947 when the name Nestlé Alimentana SA was taken as a result of the acquisition of Fabrique de Produits Maggi SA (founded 1884) and its holding company Alimentana SA of Kempttal, Switzerland. Maggi was a major manufacturer of soup mixes and related foodstuffs. The company’s current name was adopted in 1977. By the early 1900s, the company was operating factories in the United States, United Kingdom, Germany, and Spain. The First World War created demand for dairy products in the form of government contracts, and, by the end of the war, Nestlé's production had more than doubled.

After the war, government contracts dried up, and consumers switched back to fresh milk. However, Nestlé's management responded quickly, streamlining operations and reducing debt. The 1920s saw Nestlé's first expansion into new products, with chocolate-manufacture becoming the company's second most important activity. Louis Dapples was CEO till 1937, when succeeded by Édouard Muller till his death in 1948.

Nestlé felt the effects of the Second World War immediately. Profits dropped from US$20 million in 1938, to US$6 million in 1939. Factories were established in developing countries, particularly in Latin America. Ironically, the war helped with the introduction of the company's newest product, Nescafé ("Nestlé's Coffee"), which became a staple drink of the US military. Nestlé's production and sales rose in the wartime economy.

The end of World War II was the beginning of a dynamic phase for Nestlé. Growth accelerated and numerous companies were acquired. In 1947 Nestlé merged with Maggi, a manufacturer of seasonings and soups. Crosse & Blackwell followed in 1950, as did Findus (1963), Libby's (1971) and Stouffer's (1973). Diversification came with a shareholding in L'Oréal

in 1974. In 1977, Nestlé made its second venture outside the food industry, by acquiring Alcon Laboratories Inc.

In 1984, Nestlé's improved bottom line allowed the company to launch a new round of acquisitions, notably American food giant Carnation and the British confectionery company Rowntree Mackintosh in 1988, which brought the Willy Wonka brand - among others - to Nestlé.

The first half of the 1990s proved to be favourable for Nestlé. Trade barriers crumbled, and world markets developed into more or less integrated trading areas. Since 1996, there have been various acquisitions, including San Pellegrino (1997), Spillers Petfoods (1998), and Ralston Purina (2002). There were two major acquisitions in North America, both in 2002 – in June, Nestlé merged its U.S. ice cream business into Dreyer's, and in August a US$2.6 billion acquisition was announced of Chef America, the creator of Hot Pockets. In the same time-frame, Nestlé came close to purchasing the iconic American company Hershey's, one of its fiercest confectionery competitors, although the deal eventually fell through. Another recent purchase included the Jenny Craig weight-loss program, for US$600 million.

In December 2005, Nestlé bought the Greek company Delta Ice Cream for €240 million. In January 2006, it took full ownership of Dreyer's, thus becoming the world's largest ice cream maker, with a 17.5% market share.

In November 2006, Nestlé purchased the Medical Nutrition division of Novartis Pharmaceutical for $2.5B, also acquiring, in 2007, the milk-flavouring product known as Ovaltine.

In April 2007, returning to its roots, Nestlé bought US baby-food manufacturer Gerber for $5.5 billion.

In December 2007, Nestlé entered into a strategic partnership with a Belgian chocolate maker, Pierre Marcolini.

Nestlé agreed to sell its controlling stake in Alcon to Novartis on 4 January 2010. The sale was to form part of a broader US$39.3 billion offer, by Novartis, for full acquisition of the world’s largest eye-care company.

On 1 March 2010, Nestlé concluded the purchase of Kraft Foods's North American frozen pizza business for $3.7 billion.

In July 2011, Nestlé SA agreed to buy 60 percent of Hsu Fu Chi International Ltd. for about $1.7 billion. On 23 April 2012, Nestlé agreed to acquire Pfizer Inc.'s infant-nutrition unit for $11.9 billion. Before the acquisition,

there was a 'bidding war' between the three shareholders Nestlé, Mead Johnson Nutrition and Danone. Each of the companies held a share, with Nestlé holding the biggest share (17%) (Johnson held 15%, Danone 13%).

Products

Nestlé has some 8,000 brands, with a wide range of products across a number of markets, including coffee, bottled water, milkshakes and other beverages, breakfast cereals, infant foods, performance and healthcare nutrition, seasonings, soups and sauces, frozen and refrigerated foods, and pet food. As of year end 2010, Nestlé held 29.7% of the shares of L'Oréal, the world's largest company in cosmetics and beauty. Its brands including Garnier, Maybelline, and Lancôme as well as The Body Shop stores. L'Oréal holds 10.41% of the shares of Sanofi-Aventis, the world's number 3 and Europe's number 1 pharmaceutical company.

Joint ventures

The *Laboratoires Inneov* is a joint venture in nutritional cosmetics between Nestlé and L'Oréal, while Galderma is a joint venture in dermatology with L'Oréal. According to a 2006 global survey of online consumers by the *Reputation Institute*, Nestlé has a reputation score of 70.4 on a scale of 1–100.

Financial data

Nestlé is the biggest food company in the world, with a market capitalisation of roughly 191 billion Swiss francs, which is more than 200 billion U.S. dollars.

In 2011, consolidated sales were CHF 107.6 billion and net profit was CHF 10.43 billion. Research and development investment was CHF 2.02 billion.

Kraft Foods

Kraft Foods Group Inc. is a North American grocery manufacturing and processing conglomerate, which is headquartered in Northfield, Illinois, a Chicago suburb

Kraft Foods Group is an independent public company; it is listed on the Nasdaq. (NASDAQ: KRFT)

Split from Mondelēz International

On 1 October 2012, the former Kraft Foods Inc. changed its name to Mondelēz International, Inc. and spun-off its North American grocery business into a new company called Kraft Foods Group, Inc. Kraft Foods Group focuses on the North American grocery business. Mondelēz International focuses on the global snacks business, including the former Cadbury businesses, plus global brands including Dairylea and Oreo.On April 2, 2012, Kraft Foods Inc. announced that it had filed a Form 10 Registration Statement to the SEC to split the company into two companies to serve the "North American grocery business".

Brands

The company's core businesses are in beverage, cheese, dairy foods, snack foods, confectionery, and convenience foods.

Trans Fat Litigation

In 2010, two California residents filed a class action lawsuit against Kraft Foods for claiming certain products are healthy when in fact they contain unhealthy trans fat. Kraft denied any wrongdoing, saying all packaging claims are true and legal. As of June 2012, the case is still ongoing.

Complaint

Teddy Grahams, varieties of Ritz Crackers, Honey Maid Grahams, Premium Saltines, Ginger Snaps, and Vegetable Thins all contain artificial trans fat, and Kraft presents these products as healthy with phrases like "wholesome choice," "sensible snacking," and "made with real vegetables." The complaint in the case argues that these claims are a violation of California's Unfair Competition Law, Consumer Legal Remedies Act, and False Advertising Law.

The lawsuit cites current scientific consensus on the dangerous health effects of trans fat, which causes coronary heart disease and has been linked to type 2 diabetes[1] and some forms of cancer. The American Heart Association concludes that there is "no safe level" of trans fat in the diet.

Based on the trans fat content and other unhealthy ingredients in Kraft products, the lawsuit makes several arguments: Health claims like "a wholesome choice," which appears on Teddy Grahams, and "Sensible Snacking," which appears on several products, are false.

Kraft's Response

Kraft denies any wrongdoing. Its response briefs emphasize that the challenged claims are technically true. For example, Vegetable Thins are "made with real vegetables," and Kraft argues that this true statement cannot be called misleading. Kraft uses a similar line of argument for claims like "good source of calcium, iron & zinc to support kids' growth and development," "whole wheat," and others.

Regarding several packaging claims, Kraft argues that they are not factual statements that can be proven true or false. For example, Kraft argues that the word "wholesome" is subjective and vague. Promotional statements that are too vague to prove or disprove are called puffery and are not actionable under the law. Kraft argues that "wholesome," "sensible," and "smart" are all puffery and therefore cannot be found misleading or deceitful.

Kraft Foods in the news

Kraft began a major restructuring process in January 2004, following a year of declining sales (blamed largely on the rising health consciousness of Americans) and the sacking of co-CEO Betsy Holden. The company announced closures of 19 production facilities worldwide and the reduction of 5,500 jobs, as well as the sale of 10% of its branded products.

On January 19, 2010, Kraft sealed the deal to buy 100% of the share capital of Cadbury for over $19 billion dollars.

On March 17, 2010, Kraft Foods said it was "truly sorry" over its closure of a Cadbury factory in Somerdale. Senior Kraft executive Marc Firestone made the public apology to MPs at a parliamentary select committee hearing.

In March 2011, in the US, Kraft Foods introduced MiO, a liquid flavoring product with zero calories and sugar-free geared to 18 to 39-year-old consumers. MiO has no artificial flavors but it does have artificial colors, artificial sweeteners and artificial preservatives, unlike some competing flavoring products, according to USA Today.

In August 2011, Kraft Foods announced plans to split into two publicly traded companies—a snack food company and a grocery company.

Unilever

Unilever (Euronext: UNA, LSE: ULVR) is an Anglo–Dutch multinational consumer goods company. Its products include foods, beverages,

cleaning agents and personal care products. It is the world's third-largest consumer goods company measured by 2011 revenues (after Procter & Gamble and Nestlé) and the world's largest maker of ice cream.

Unilever is a dual-listed company consisting of Unilever N.V., based in Rotterdam, Netherlands, and Unilever PLC, based in London, United Kingdom. Both companies have the same directors and they operate as a single business. Unilever owns over 400 brands .Unilever PLC has a primary listing on the London Stock Exchange and is a constituent of the FTSE 100 Index. It had a market capitalisation of £27.3 billion as of 23 December 2011, the 18th-largest of any company with a primary listing on the London Stock Exchange. Unilever N.V. has a primary listing on Euronext Amsterdam and is a constituent of the AEX index. Both Unilever PLC and Unilever N.V. have secondary listings on the New York Stock Exchange.

Unilever was founded on 1 January 1930 by Antonius Johannes Jurgens, Samuel van den Bergh and William Hulme Lever, 2nd Viscount Leverhulme.

The amalgamation of the operations of British soapmaker *Lever Brothers* and Dutch margarine producer *Margarine Unie* (a 1927 amalgamation of Anton Jurgens Margarinefabrieken N.V. and Samuel van den Bergh) made sound commercial sense, as palm oil was a major raw material for both margarines and soaps, and could be imported more efficiently in larger quantities.

The initial harvesting of palm oil was from British West Africa, from where news reports seen back in England showed the workers abroad in favourable conditions. In 1911, the company received a concession for 750,000 hectares of forest in Belgian Congo, mostly south of Bandundu, where a system of forced labour operated. The subsidiary of *Lever Brothers* was named "Huileries du Congo Belge"..

In the 1930s, the Unilever business grew and new ventures were launched in Africa and Latin America. In 1972, Unilever purchased A&W Restaurants' Canadian division but sold its shares through a management buyout to former A&W Food Services of Canada CEO Jefferson J. Mooney in July 1996. By 1980 soap and edible fats contributed just 40% of profits, compared with an original 90%. In 1984 the company bought the brand Brooke Bond (maker of PG Tips tea).

In 1987, Unilever strengthened its position in the world skin care market by acquiring Chesebrough-Ponds (merged from Chesebrough Man-

ufacturing and Pond's Creams), the maker of Ragú, Pond's, Aqua-Net, Cutex Nail Polish, and Vaseline. In 1989, Unilever bought Calvin Klein Cosmetics, Fabergé, and Elizabeth Arden, but the latter was later sold (in 2000) to FFI Fragrances.

In 1996, Unilever purchased Helene Curtis Industries, giving the company "a powerful new presence in the United States shampoo and deodorant market". The purchase brought Unilever the Suave and Finesse haircare product brands and Degree deodorant brand.

In 1997, Unilever sold the speciality chemicals businesses *National Starch & Chemical*, Quest, *Unichema* and *Crosfield* to ICI for US$8 billion.

The US division carried the Lever Brothers name until the 1990s, when it adopted that of the parent company. The American unit has headquarters in New Jersey, and no longer maintains a presence at Lever House, the iconic skyscraper on Park Avenue in New York City.

In 2000, the company absorbed the American business Best Foods, strengthening its presence in North America and extending its portfolio of foods brands. In April 2000, it bought both Ben & Jerry's and Slim Fast. In May 2007, Unilever became the first large-scale company to commit to sourcing all its tea in a sustainable manner, employing the Rainforest Alliance, an international environmental NGO, to certify its tea estates in East Africa, as well as third-party suppliers in Africa and other parts of the world. It declared its aim to have all Lipton Yellow Label and PG Tips tea bags sold in Western Europe certified by 2010, followed by all Lipton tea bags globally by 2015.

Covalence, an ethical reputation ranking agency, placed Unilever at the top of its ranking based on positive versus negative news coverage for 2007.

In 2007, Unilever's Dove "Evolution" video that ran only online, was named the first ever non-TV spot to win the Grand Lion at the Cannes Advertising Festival. And in March, 2008, Unilever was named "Digital Marketer of the Year" by Advertising Age.

In 2008, Unilever was honoured at the 59th Annual Technology & Engineering Emmy Awards for "Outstanding Achievement in Advanced Media Technology for Creation and Distribution of Interactive Commercial Advertising Delivered Through Digital Set Top Boxes" for its program *Axe: Boost Your ESP*. On 25 September 2009, Unilever agreed to acquire

the personal care business of Sara Lee Corporation, including brands such as Radox, Badedas and Duschdas, strengthening its category leadership in skin cleansing and deodorants.

On 23 March 2011, it was announced that Unilever had entered into a binding agreement to sell the Sanex brand to Colgate-Palmolive for €672 million, and that Unilever would acquire Colgate-Palmolive's laundry detergent brands in Colombia (Fab, Lavomatic and Vel) for US$215 million.

On 24 August 2011, it was announced that Unilever had agreed to sell the Alberto

On 14 October 2011, it was announced that Unilever had agreed to acquire 82% of the Russia-based beauty company Kalina.

On 22 May 2012, it was announced that Unilever achieved top-ten status in the 2012 Gartner Supply Chain Top 25, resulting in the company's best-ever performance in the index and establishing Unilever as one of the world's top supply chains.

On 27 December 2012, it was announced the Unilever is phasing out the use of microplastics in their personal care products by 2015.

Unilever is multinational with operating companies and factories on every continent (except Antarctica) and research laboratories at: Colworth and Port Sunlight in England; Vlaardingen in the Netherlands; Trumbull, Connecticut and Englewood Cliffs, New Jersey in the United States; Bangalore in India (see also Hindustan Unilever Limited); and Shanghai in China.

Products

Unilever's products include foods, beverages, cleaning agents and personal care products. The company owns more than 400 brands, although its 25 largest brands account for over 70% of total sales. Unilever focuses resources on 13 "billion-Euro brands", each of which has annual sales in excess of €1 billion. Unilever organises its brands into four categories: Homecare, Personal Care, Foods and Refreshment (which includes tea, ice-cream and beverages).

Corporate affairs

Unilever has two holding companies: Unilever PLC, which has its registered office at Port Sunlight in Merseyside, United Kingdom and its head office at Unilever House in London, United Kingdom; and Unilever

N.V., which has its registered and head office in Rotterdam, The Netherlands. Unilever PLC and Unilever N.V. and their subsidiary companies operate as nearly as practicable as a single economic entity, whilst remaining separate legal entities with different shareholders and separate stock exchange listings.

There are a series of legal agreements between the parent companies, together with special provisions in their respective Articles of Association, which are known as the Foundation Agreements. A key requirement of the agreements is that the same people be on the Boards of the two parent companies. An Equalisation Agreement regulates the mutual rights of shareholders in Unilever PLC and Unilever N.V. with the objective of ensuring that, in principle, it does not make any financial difference to hold shares in Unilever PLC rather than Unilever N.V.

Mars, Inc.

Mars, Incorporated is an American global manufacturer of confectionery, pet food, and other food products with US$30 billion in annual sales in 2010, and is ranked as the 3rd largest privately held company in the United States by Forbes. Headquartered in McLean, unincorporated Fairfax County, Virginia, US, the company is entirely owned by the Mars family. Mars operates in six business segments in the US: Chocolate (Hackettstown, New Jersey), Petcare (Franklin, Tennessee), Wm. Wrigley Jr. Company (Chicago, Illinois), Food (Los Angeles, California), Drinks (West Chester, Pennsylvania), and Symbioscience (Germantown, Maryland).

History

Mars was founded by Frank C. Mars and is a company that is known for the confectionery items that it creates, such as Milky Way, M&M's, Twix, Skittles, Snickers, and the Mars bar. They also produce non-confectionery snacks (including Combos) and other foods (including Uncle Ben's and pasta sauce brand Dolmio) as well as pet foods (such as Whiskas and Pedigree brands).

Orbit gum is among the most popular brands, managed by the Mars subsidiary brand Wrigley. During World War II, Wrigley was selling their eponymous gum only to soldiers, while Orbit was the gum made available

to the public. Though abandoned shortly after the war, about 60 years later Orbit made a comeback in America during the gum craze.

Frank C. Mars, whose mother taught him to hand dip candy, sold candy by age 19. The Mars Candy Factory he started in 1911 with Ethel V. Mars, his second wife, in Tacoma, Washington, ultimately failed but it had already become a large employer, producing and selling fresh candy wholesale. By 1920, Frank Mars had returned to his home state, Minnesota, where the company was founded that year as Mar-O-Bar Co. in Minneapolis and later incorporated there as Mars, Incorporated. Forrest Mars, son of Frank Mars and his first wife who was also named Ethel, was inspired by a popular type of milkshakein 1923, to introduce the *Milky Way* bar, advertised as a "chocolate Malted Milk in a candy bar", and became the best-selling candy bar. In 1929, Frank moved the company to Chicago, Illinois and started full production in a plant which still exists today. In 1932, Forrest started Mars Limited in the United Kingdom, and launched the Mars bar.

Mars is still a family owned business, belonging to the Mars family. The company is famous for its secrecy. A 1993 *Washington Post Magazine* article was a rare raising of the veil, as the reporter was able to see the "M"s being applied to the M&M's, something that "no out-sider had ever before been invited to observe." In 1999, for example, the company did not acknowledge that Forrest Mars, Sr., had died or that he had worked for the company.

The company published its Principles in Action communication in September 2011. This communication outlines the history of Mars, its legacy as a business committed to its Five Principles and the company’s goal of putting its Principles into action to make a difference to people and the planet through performance. Encompassing themes of Health and Nutrition, Supply Chain, Operations, Products and Working at Mars, the Principles in Action communication outlines Mars Incorporated’s targets, progress, and ongoing challenges. It also describes its businesses – including Petcare, Chocolate, Wrigley, Food, Drinks and Symbioscience.

Mars, Incorporated has developed a reputation across its leading markets to be excellent training grounds for managers. In the United Kingdom for instance, many CEOs of large companies learned their trade at Mars, Inc., including former Mars executives Allan Leighton and Justin King, the former appointed CEO of the supermarket chain Asda and then

the British postal service Royal Mail, with the latter presently the CEO of the retailer J Sainsbury plc. Recently, the company caught on to that and re-branded their employer brand to "Mars — The Ultimate Business School".

Moving into the fourth generation of family ownership, the company recently passed from family leadership into non-family leadership; however, the business is still owned by the family. The global CEO of Mars, Inc. is Paul Michaels. Michaels is part of a new group of non-family management that has taken over since the retirement of John and Forrest Mars, Jr.. The family now oversees the business as a council or board of directors.

In the United States the company has manufacturing facilities in Hackettstown, New Jersey; Albany, Georgia; Burr Ridge, Chicago and Mattoon, Illinois; Cleveland, Tennessee; Columbia, South Carolina; Columbus, Ohio; Elizabethtown, Pennsylvania; Greenville, Mississippi; Greenville and Waco, Texas; Henderson and Reno, Nevada; Vernon, California; Ft.Smith, Arkansas; Joplin, Missouri; Miami, Oklahoma; and Galena, Kansas. Their Canadian facilities are located in Bolton and Newmarket, Ontario.

Recent history

Mars's purchase of Doane Petcare Company in June 2007 significantly increased its position in the U.S. dry pet food category. In addition to these businesses, Mars also operates a chain of premium chocolate shops across the United States called Ethel M Chocolates .These shops are an outgrowth of the Ethel M premium chocolate business that Forrest Mars started in Las Vegas in 1980 when he became bored with retirement.

On April 28, 2008, Mars, Incorporated, together with Berkshire Hathaway Incorporated, announced the buyout of Wm. Wrigley Jr. Company, the world's largest chewing gum producer, for $23 billion in an all-cash deal. The two companies together are expected to generate sales in excess of $27 billion.

The company spent more than $1.8 million on lobbying during 2008, almost all of it at Patton Boggs, where it has long been one of the largest lobbying clients. Mars also spent $10,000 at Skadden, Arps, Slate, Meagher & Flom. In 2009, Mars also hired Ernst & Young to lobby on corporate and international tax issues, including issues related to tax changes proposed by the Obama administration. The company spent another $1,655,000 that year.

Until sold in June 2006, a division of Mars known as Mars Electronics International produced, among other products, coin mechanisms such as those used in vending machines. MEI also manufactured bill validators, which were among the most common bill validators found in the US.

A further Mars business – Four Square – utilize those products formerly made at MEI in their vending machines. Four Square comprises the *Flavia* and Klix brands. *Flavia* operates within the US, UK and Japanese markets, while *Klix* operates within UK, Germany and France.

In 2007, Mars, Incorporated undertook a major rebranding operation which saw, among other global changes, Four Square being renamed to Mars Drinks, the pet food division (formerly part of Masterfoods) being renamed to Mars Petfoods and Masterfoods itself (the largest division of Mars, Incorporated) being renamed to Mars Snacks.

Mars Food UK Limited is the name of the British branch of Mars, Inc. The company is based in Slough, UK. Mars brands manufactured for the UK market but not for the US include Maltesers and Tunes.

In 1932, Forrest Mars, Sr., opened what was then Mars (Europe) headquarters, and remains Mars (UK) headquarters in Slough, UKon the then-new Slough Trading Estate after a disagreement with his father, Frank C. Mars. In this factory, he produced the first Mars bar, based on the American Milky Way. In 1936, Mars separated the vanilla version of Milky Way to a separate brand, Forever Yours, which was discontinued and later reintroduced as Milky Way Dark and later still, Milky Way Midnight.

Many brands which were later introduced in the US were first created and sold in Britain; these include Starburst, Skittles, Twix, Snickers and Topic.

The bar formerly sold in the U.S. as the Mars bar is now marketed in that country as the Snickers Almond Bar and is not sold consistently in the UK where it has appeared with other special editions that are released occasionally.

Milky Way in Europe and worldwide is known as the 3 Musketeers in America. Similarly, the Snickers bar was previously marketed in Britain and the Republic of Ireland as Marathon until 1990; in the UK, France, Germany and the Netherlands, also until 1990; Galaxy is known as Dove in America and the Middle East; and Starburst was known in the UK and Ireland as Opal Fruits until 1998. Chocolate and peanut M&M's were introduced in 1990.

Groupe Danone

Groupe Danone is a French food-products multinational corporation based in the 9th arrondissement of Paris. It claims world leadership in fresh dairy products, marketed under the corporate name, and also in bottled water. In 2007 it swapped its world number 2 position as producer of cereals and biscuits for the same position in baby foods, having sold the biscuits division to Kraft Foods and acquired Numico. In the United States, the Danone brand is marketed as **Dannon**, a subsidiary of Groupe Danone (under the name **The Dannon Company**).

Besides the Danone/Dannon brand of yogurts, the company owns several internationally known brands of bottled water: Volvic, Evian, and Badoit. About 56% of its 2006 net sales derived from dairy, 28% from beverages, and 16% from biscuits and cereals.

Danone owns many water brands worldwide. In Asia, it has acquired Yili, Aqua (Indonesia) and Robust (92%) and has a 51% holding in China's Wahaha Joint Venture Company, giving it a total market share of 20% and making it the leading vendor of packaged water in Asia.

History

Name

The original company bearing the corporate name was founded in 1919 by Isaac Carasso in Barcelona as a small factory producing yoghurt. The factory was named Danone, a Catalan diminutive of the name of his first son, Daniel Carasso.

Ten years later, the company moved from Spain to neighboring France, and the first French factory was built. During the German occupation of France during World War II, Daniel moved the company to New York to avoid persecution as a result of his Jewish faith. In the United States, Daniel partnered with the Swiss-born Spaniard Joe Metzger and changed the brand name to Dannon to sound more American.

In 1951, Daniel Carasso returned to Paris to manage the family's businesses in France and Spain, and the American business was sold in 1959. In Europe in 1967, Danone merged with Gervais, the leading fresh cheese producer in France and became Gervais Danone.

Strategic reorientation

The acquisitions initially took the shape of vertical integration, acquiring Alsatian brewer Kronenbourg and Evian mineral water who were

the glassmaker's largest customers. This move provided content with which to fill the factory's bottles. In 1973, the company merged with Gervais Danone and began to expand internationally. In 1979, the company abandoned glass-making by disposing of Verreries Boussois. In 1987, Gervais Danone acquired European biscuit manufacturer Général Biscuit, owners of the LU brand, and, in 1989, it bought out the European biscuit operations of Nabisco.

In 1994, BSN changed its name to Groupe Danone, adopting the name of the group's best-known international brand. Franck Riboud succeeded his father, Antoine, as the company's chairman and chief executive officer in 1996 when Riboud senior retired. Under Riboud junior, the company continued to pursue its focus on three product groups (dairy, beverages, and cereals) and divested itself of several activities which had become non-core.

In 1999 and 2003, the group sold 56% and 44%, respectively, of its glass-containers business. In 2000, the group also sold most of its European beer activities (the brand Kronenbourg and the brand 1664 were sold to Scottish & Newcastle for UK£ 1.7 billion; Its Italian cheese and meat businesses (Egidio Galbani Spa) were sold in March 2002; as were its beer producing activities in China. The company's British (*Jacob's*) and Irish biscuit operations were sold to United Biscuits in September 2004. In August 2005, the Group sold its sauces business in the United Kingdom and in the United States (HP Foods), in January 2006, its sauces business in Asia (Amoy Food) was sold to Ajinomoto. Despite these divestitures, Danone continues to expand internationally in its 3 core business units, emphasising health and well-being products.

In July 2007, it was announced that Danone had reached agreement with Kraft to sell its biscuits division, including the LU and Prince brands, for around €5.3 billion. Also in July 2007, a €12.3 billion cash offer by Danone for the Dutch baby food and clinical nutrition company Numico was agreed to by both boards, creating the world's second largest manufacturer of baby food.

GRAMMAR EXERCISES

I. Open the brackets.

1. Would you mind [to open, open, opening, /open] the window, please?
2. Detergent is normally [use, usually, to use, used] for washing clothes.
3. When I bought my car, I had to [lend, borrow, owe, save] the money from the bank.
4. "Shall we watch the film, the news or the football?" "Oh, switch off the TV. I don't fancy [all, three, either, any] of them."
5. After the operation, the doctors wouldn't [let, allow, to let, a/lowing] him get out of bed for three days.
6. She drove into town [to make, for doing, making, to do] some shopping.
7. "Mr. Smith, can I see you later today?" "Yes. Come at any time, Jenny. Oh, you'd better not come between one and two. I [shall, be, I'll be, I'll] haying lunch then."
8. "You'll need some small change [to, because, so, for] tip the porter."
9. Flight SK526 to Stockholm is now [bored, on bored, aboard, boarding] at Gate 4.
10. "He can't speak to you now. He's in a meeting. Call back in half an hour. He'll [has, to be, have,] finished by then."
11. Her teacher [advised, suggested, made, tell] her to go to the Ga-reers Advisory Service.
12. I don't speak French at all, but I'm very interested [with, by, in, of learning it.
13. I'm sorry to hear you're ill. I hope you get [best, good, not Hi, well] soon.
14. We had a terrible row. I'd rather not [told, to tell, tell, telling] you what we said!
15. "Do you mind if I turn up the heater?" [Yes, I do, not at all, no, thanks, yes], I'm cold too. It's a good idea.
16. I think people in cars [ought, should, 'd better, must] to wear safety belts.
17. We [hadn't would] better hurry, or we'll miss the bus!

18. He was sent to prison for [have robbed, robbed, to

19. rob, robbing] a bank.

20. "It's a secret. You'd better [have, make, do, keep] it quiet!"

21. "Hello? This is Jane. We've got a lot to do at the office. I [might be, might, might have, possibly] late home this evening."

22. "Hello, Anne. I haven't seen you for ages! How are you?

23. "Oh, ["how do you do?", "very well thanks, and you?", "I'm pleased to meet you. My name's Anne." "Good afternoon. I'm Anne."]

24. "Jack! What are you doing in the pub? You [should, had better, supposed, 're supposed] to be working this morning!"

25. "Excuse me... that's my newspaper!" I'm terribly sorry. I thought someone had left it there. I didn't [mind, mean, realize, matter] it was yours."

26. He phoned [for, to, and, because] tell her about the party.

27. [If, If not, Unless, Even if] they don't increase my salary, I'll look for another job.

28. "Ow! Ouch! You idiot! I think you've broken my foot." "I [ever so, really, terribly, awfully] am very sorry."

29. "Were you out this morning? I phoned and there was no reply." "That's funny. I was at home. I must [have put, put, have been putting, had been putting] out the washing in the garden."

30. "Steve, didn't I see you at the concert last night?" "It [may not, mightn't, mustn't, couldn't] have been me. I was at home."

31. "If I [won, would win, will win, win] a lot of money, I'd never work again.

32. "The phone's ringing, but nobody's answering." "Really? Oh, they're [must, possible, probably, certain] lunch."

33. The captain of the winning team was [received, given, gave, present] the cup by the Queen.

34. They won the championship after [scored, score, scored, had scored] three goals in ten minutes.

35. The accident was his fault. He [shouldn't, oughtn't, mustn't, isn't supposed] have been driving so fast.

36. You'd better not do it, [hadn't you? wouldn't you? would you ? had you ?]

37. Her English won't improve unless she [will practice, practices, will be practicing, would practice.]

38. If someone had been holding the bottom of the ladder, he wouldn't [have been falling, fall, have fallen, be falling] off,

39. He stopped [from writing, to write, write, writing] to answer the phone.

II. Put an appropriate verb in its correct form into each gap.

The verbs are can, could, to be able. The forms are positive and negative.

1. In my country you get married when you are 16.
2. Women vote in England until 1922.
3. Last night I get into my house because I had forgotten my key.
4. I phoned the Gas Board because I thought I
smell gas, which is very dangerous.
5. "Hello. Is that the dentist? I make an
appointment to see you, please?"
6. I'm learning car mechanics because I want to service my own car. It costs
a fortune if you send it to garage.
7. Many night animals see very well, but they have a highly developed sense of smell.
8. If you do this exercise, you're very clever!

III. Compare these sentences.

People speak English all over the world. English is spoken all over the world.

In the passive, the agent (in this sentence "people") is often unnecessary.

Put these sentences into the passive. *By+* agent is not necessary.

1. The postman delivers the letters at 8.00.
2. Someone built the hotel two years ago.
3. They use a lot of preservatives in food these days.
4. Has anyone answered your questions?
5. Somebody found your keys on top of the photocopier.
6. People should not take reference books out of the library.
7. They have increased the rate of taxation to forty per cent.
8. A scientist discovered penicillin in 1928.

IV. Report these words and thoughts using the verb suggested.

1. "I'm going to Paris soon".

She said_____ .

2. "It's time to start revising for the exam," said the teacher.

The teacher told_____.

3. "The film will be interesting"

I thought _____.

4. "I can't help you because I have too much to do.

She said _____ .

5. "Anne has bought the tickets."

I was told_____.

6. "It took me three hours to get here because the roads are flooded."

He told me_____ .

7. "I think it's a crazy idea. It won't work."

She said _____.

8. "Breakfast is served between 7.00 and 9.00".

The receptionist explained_____ .

V. Respond in a similar way.

Why did you buy a dog? – /bought a dog because I was lonely.

1. Buy a dog/lonely
2. Buy a new car/very old
3. Go to the bank/need some money
4. Go to the cinema/feel bored
5. Walk out of the exam/too difficult
6. Go back home every weekend /feel homesick
7. Do the shopping/clean the house

VI. Use the Present Perfect or Present Perfect Continuous form of the verb in brackets.

1. I (wait) for my plane for more than seven hours.
2. The people next door (move) to another town.
3. Have you (sit) here for a long time?
4. I've just (make) some coffee – would you like a cup?
5. Where have you been? I (call) you for the last three hours.

VII. Rewrite the sentences, putting the verbs in the passive.

1. Customers bought more than 400 000 cars in the UK last year.
2. Tourists see the Loch Ness monster almost every year.
3. Someone robbed me almost as soon as I got off the train.
4. Germany beat England in semi-final of the competition in 1997.
5. Workers have to chop down hundreds of trees in order to build one kilometer of a new road.

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сельскохозяйственных вузов

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