



# Food

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**Food** is any substance<sup>[1]</sup> consumed to provide nutritional support for the body. It is usually of plant or animal origin, and contains essential nutrients, such as carbohydrates, fats, proteins, vitamins, or minerals. The substance is ingested by an organism and assimilated by the organism's cells to provide energy, maintain life, or stimulate growth.

Historically, people secured food through two methods: hunting and gathering and agriculture. Today, the majority of the food energy required by the ever increasing population of the world is supplied by the food industry.

Food safety and food security are monitored by agencies like the International Association for Food Protection, World Resources Institute, World Food Programme, Food and Agriculture Organization, and International Food Information Council. They address issues such as sustainability, biological diversity, climate change, nutritional economics, population growth, water supply, and access to food.

The right to food is a human right derived from the International Covenant on Economic, Social and Cultural Rights (ICESCR), recognizing the "right to an adequate standard of living, including adequate food", as well as the "fundamental right to be free from hunger".



Various foods



Foods from plant sources

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## Food sources

Most food has its origin in plants. Some food is obtained directly from plants; but even animals that are used as food sources are raised by feeding them food derived from plants. Cereal grain is a staple food that provides more food energy worldwide than any other type of crop. Corn (maize), wheat, and rice – in all of their varieties – account for 87% of all grain production worldwide.<sup>[2]</sup> Most of the grain that is produced worldwide is fed to livestock.

Some foods not from animal or plant sources include various edible fungi, especially mushrooms. Fungi and ambient bacteria are used in the preparation of fermented and pickled foods like leavened bread, alcoholic drinks, cheese, pickles, kombucha, and yogurt. Another example is blue-green algae such as *Spirulina*.<sup>[3]</sup> Inorganic substances such as salt, baking soda and cream of tartar are used to preserve or chemically alter an ingredient.

## Plants

Many plants and plant parts are eaten as food and around 2,000 plant species are cultivated for food. Many of these plant species have several distinct cultivars.<sup>[4]</sup>

Seeds of plants are a good source of food for animals, including humans, because they contain the nutrients necessary for the plant's initial growth, including many healthful fats, such as omega fats. In fact, the majority of food consumed by human beings are seed-based foods. Edible seeds include cereals (corn, wheat, rice, et cetera), legumes (beans, peas, lentils, et cetera), and nuts. Oilseeds are often pressed to produce rich oils - sunflower, flaxseed, rapeseed (including canola oil), sesame, et cetera.<sup>[5]</sup>

Seeds are typically high in unsaturated fats and, in moderation, are considered a health food, although not all seeds are edible. Large seeds, such as those from a lemon, pose a choking hazard, while seeds from cherries and apples contain cyanide which could be poisonous only if consumed in large volumes.<sup>[6]</sup>

Fruits are the ripened ovaries of plants, including the seeds within. Many plants and animals have coevolved such that the fruits of the former are an attractive food source to the latter, because animals that eat the fruits may excrete the seeds some distance away. Fruits, therefore, make up a significant part of the diets of most cultures. Some botanical fruits, such as tomatoes, pumpkins, and eggplants, are eaten as vegetables.<sup>[7]</sup> (For more information, see list of fruits.)

Vegetables are a second type of plant matter that is commonly eaten as food. These include root vegetables (potatoes and carrots), bulbs (onion family), leaf vegetables (spinach and lettuce), stem vegetables (bamboo shoots and asparagus), and inflorescence vegetables (globe artichokes and broccoli and other vegetables such as cabbage or cauliflower).<sup>[8]</sup>

## Animals

Animals are used as food either directly or indirectly by the products they produce. Meat is an example of a direct product taken from an animal, which comes from muscle systems or from organs.

Food products produced by animals include milk produced by mammary glands, which in many cultures is drunk or processed into dairy products (cheese, butter, etc.). In addition, birds and other animals lay eggs, which are often eaten, and bees produce honey, a reduced nectar from flowers, which is a popular sweetener in many cultures. Some cultures consume blood, sometimes in the form of blood sausage, as a thickener for sauces, or in a cured, salted form for times of food scarcity, and others use blood in stews such as jugged hare.<sup>[9]</sup>



Various raw meats

Some cultures and people do not consume meat or animal food products for cultural, dietary, health, ethical, or ideological reasons. Vegetarians choose to forgo food from animal sources to varying degrees. Vegans do not consume any foods that are or contain ingredients from an animal source.

## Production

Most food has always been obtained through agriculture. With increasing concern over both the methods and products of modern industrial agriculture, there has been a growing trend toward sustainable agricultural practices. This approach, partly fueled by consumer demand, encourages biodiversity, local self-reliance and organic farming methods.<sup>[10]</sup> Major influences on food production include international organizations (e.g. the World Trade Organization and Common Agricultural Policy), national government policy (or law), and war.<sup>[11]</sup>



A tractor pulling a chaser bin

In popular culture, the mass production of food, specifically meats such as chicken and beef, has come under fire from various documentaries, most recently *Food, Inc.*, documenting the mass slaughter and poor treatment of animals, often for easier revenues from large corporations. Along with a current trend towards environmentalism, people in Western culture have had an increasing trend towards the use of herbal supplements, foods for a specific group of people (such as dieters, women, or athletes), functional foods (fortified foods, such as omega-3 eggs), and a more ethnically diverse diet.<sup>[12]</sup>

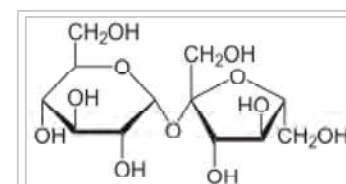
Several organisations have begun calling for a new kind of agriculture in which agroecosystems provide food but also support vital ecosystem services so that soil fertility and biodiversity are maintained rather than compromised. According to the International Water Management Institute and UNEP, well-managed agroecosystems not only provide food, fiber and animal products, they also provide services such as flood mitigation, groundwater recharge, erosion control and habitats for plants, birds fish and other animals.<sup>[13]</sup>

## Taste perception

Animals, specifically humans, have five different types of tastes: sweet, sour, salty, bitter, and umami. As animals have evolved, the tastes that provide the most energy (sugar and fats) are the most pleasant to eat while others, such as bitter, are not enjoyable.<sup>[14]</sup> Water, while important for survival, has no taste.<sup>[15]</sup> Fats, on the other hand, especially saturated fats, are thicker and rich and are thus considered more enjoyable to eat.

### Sweet

Generally regarded as the most pleasant taste, sweetness is almost always caused by a type of simple sugar such as glucose or fructose, or disaccharides such as sucrose, a molecule combining glucose and fructose.<sup>[16]</sup> Complex carbohydrates are long chains and thus do not have the sweet taste. Artificial sweeteners such as sucralose are used to mimic the sugar molecule, creating the sensation of sweet, without the calories. Other types of sugar include raw sugar, which is known for its amber color, as it is unprocessed. As sugar is vital for energy and survival, the taste of sugar is pleasant.



Structure of sucrose

The stevia plant contains a compound known as steviol which, when extracted, has 300

times the sweetness of sugar while having minimal impact on blood sugar.<sup>[17]</sup>

## Sour

Sourness is caused by the taste of acids, such as vinegar in alcoholic beverages. Sour foods include citrus, specifically lemons, limes, and to a lesser degree oranges. Sour is evolutionarily significant as it is a sign for a food that may have gone rancid due to bacteria.<sup>[18]</sup> Many foods, however, are slightly acidic, and help stimulate the taste buds and enhance flavor.

## Salty

Saltiness is the taste of alkali metal ions such as sodium and potassium. It is found in almost every food in low to moderate proportions to enhance flavor, although to eat pure salt is regarded as highly unpleasant. There are many different types of salt, with each having a different degree of saltiness, including sea salt, fleur de sel, kosher salt, mined salt, and grey salt. Other than enhancing flavor, its significance is that the body needs and maintains a delicate electrolyte balance, which is the kidney's function. Salt may be iodized, meaning iodine has been added to it, a necessary nutrient that promotes thyroid function. Some canned foods, notably soups or packaged broths, tend to be high in salt as a means of preserving the food longer. Historically salt has long been used as a meat preservative as salt promotes water excretion. Similarly, dried foods also promote food safety.<sup>[19]</sup>



Salt mounds in Bolivia

## Bitter

Bitterness is a sensation often considered unpleasant characterized by having a sharp, pungent taste. Unsweetened dark chocolate, caffeine, lemon rind, and some types of fruit are known to be bitter.

## Umami

Umami, the Japanese word for delicious, is the least known in Western popular culture but has a long tradition in Asian cuisine. Umami is the taste of glutamates, especially monosodium glutamate (MSG).<sup>[16]</sup> It is characterized as savory, meaty, and rich in flavor. Salmon and mushrooms are foods high in umami.

## Cuisine

Many scholars claim that the rhetorical function of food is to represent the culture of a country, and that it can be used as a form of communication. According to Goode, Curtis and Theophano, food "is the last aspect of an ethnic culture to be lost".<sup>[20]</sup>

Many cultures have a recognizable cuisine, a specific set of cooking traditions using various spices or a combination of flavors unique to that culture, which evolves over time. Other differences include preferences (hot or cold, spicy, etc.) and practices, the study of which is known as gastronomy. Many cultures have diversified their foods by means of preparation, cooking methods, and manufacturing. This also includes a complex food trade which helps the cultures to economically survive by way of food, not just by consumption.



Typical Balinese cuisine in Indonesia

Some popular types of ethnic foods include Italian, French, Japanese, Chinese, American, Cajun, Thai, African, and Indian cuisine. Various cultures throughout the world study the dietary analysis of food habits. While evolutionarily speaking, as opposed to culturally, humans are omnivores, religion and social constructs such as morality, activism, or environmentalism will often affect which foods they will consume. Food is eaten and typically enjoyed through the sense of taste, the perception of flavor from eating and drinking. Certain tastes are more enjoyable than others, for evolutionary purposes.

## Presentation



A French basil salmon terrine, with eye-appealing garnishes

Aesthetically pleasing and eye-appealing food presentations can encourage people to consume foods. A common saying is that people "eat with their eyes". Food presented in a clean and appetizing way will encourage a good flavor, even if unsatisfactory.<sup>[21][22]</sup>

### Contrast in texture

Texture plays a crucial role in the enjoyment of eating foods. Contrasts in textures, such as something crunchy in an otherwise smooth dish, may increase the appeal of eating it. Common examples include adding granola to yogurt, adding croutons to a salad or soup, and toasting bread to enhance its crunchiness for a smooth topping, such as jam or butter.<sup>[23]</sup>

### Contrast in taste

Another universal phenomenon regarding food is the appeal of contrast in taste and presentation. For example, such opposite flavors as sweetness and saltiness tend to go well together, as in kettle corn and nuts.

## Food preparation

While many foods can be eaten raw, many also undergo some form of preparation for reasons of safety, palatability, texture, or flavor. At the simplest level this may involve washing, cutting, trimming, or adding other foods or ingredients, such as spices. It may also involve mixing, heating or cooling, pressure cooking, fermentation, or combination with other food. In a home, most food preparation takes place in a kitchen. Some preparation is done to enhance the taste or aesthetic appeal; other preparation may help to preserve the food; others may be involved in cultural identity. A meal is made up of food which is prepared to be eaten at a specific time and place.<sup>[24]</sup>

### Animal preparation

The preparation of animal-based food usually involves slaughter, evisceration, hanging, portioning, and rendering. In developed countries, this is usually done outside the home in slaughterhouses, which are used to process animals en masse for meat production. Many countries regulate their slaughterhouses by law. For example, the United States has established the Humane Slaughter Act of 1958, which requires that an animal be stunned before killing. This act, like those in many countries, exempts slaughter in accordance to religious law, such as kosher, shechita, and dhabiha halal. Strict interpretations of kashrut require the animal to be fully aware when its carotid artery is cut.<sup>[25]</sup>

On the local level, a butcher may commonly break down larger animal meat into smaller manageable cuts, and pre-wrap them for commercial sale or wrap them to order in butcher paper. In addition, fish and seafood may be fabricated into smaller cuts by a fish monger. However fish butchery may be done on board a fishing vessel and quick-frozen for preservation of quality.<sup>[26]</sup>

### Cooking

The term "cooking" encompasses a vast range of methods, tools, and combinations of ingredients to improve the flavor or digestibility of food. Cooking technique, known as culinary art, generally requires the selection, measurement, and combining of ingredients in an ordered procedure in an effort to achieve the desired result. Constraints on success include the variability of ingredients, ambient conditions, tools, and the skill of the individual cook.<sup>[27]</sup> The diversity of cooking worldwide is a reflection of the myriad nutritional, aesthetic, agricultural, economic, cultural, and religious considerations that affect it.<sup>[28]</sup>



A refrigerator helps to keep foods fresh.



Cooking with a wok in China

Cooking requires applying heat to a food which usually, though not always, chemically changes the molecules, thus changing its flavor, texture, appearance, and nutritional properties.<sup>[29]</sup> Cooking certain proteins, such as egg whites, meats, and fish, denatures the protein, causing it to firm. There is archaeological evidence of roasted foodstuffs at *Homo erectus* campsites dating from 420,000 years ago.<sup>[30]</sup> Boiling as a means of cooking requires a container, and has been practiced at least since the 10th millennium BC with the introduction of pottery.<sup>[31]</sup>

#### Cooking equipment

There are many different types of equipment used for cooking.

Ovens are mostly hollow devices that get very hot (up to 500 °F) and are used for baking or roasting and offer a dry-heat cooking method. Different cuisines will use different types of ovens. For

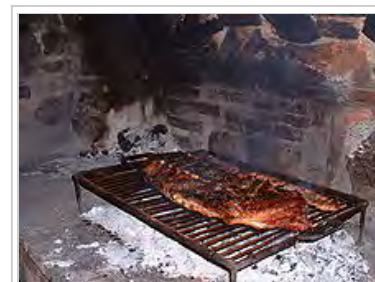
example, Indian culture uses a Tandoor oven, which is a cylindrical clay oven which operates at a single high temperature.<sup>[32]</sup> Western kitchens use variable temperature convection ovens, conventional ovens, toaster ovens, or non-radiant heat ovens like the microwave oven. Classic Italian cuisine includes the use of a brick oven containing burning wood. Ovens may be wood-fired, coal-fired, gas, electric, or oil-fired.<sup>[33]</sup>

Various types of cook-tops are used as well. They carry the same variations of fuel types as the ovens mentioned above. Cook-tops are used to heat vessels placed on top of the heat source, such as a sauté pan, sauce pot, frying pan, or pressure cooker. These pieces of equipment can use either a moist or dry cooking method and include methods such as steaming, simmering, boiling, and poaching for moist methods, while the dry methods include sautéing, pan frying, and deep-frying.<sup>[34]</sup>

In addition, many cultures use grills for cooking. A grill operates with a radiant heat source from below, usually covered with a metal grid and sometimes a cover. An open pit barbecue in the American south is one example along with the American style outdoor grill fueled by wood, liquid propane, or charcoal along with soaked wood chips for smoking.<sup>[35]</sup> A Mexican style of barbecue is called barbacoa, which involves the cooking of meats such as whole sheep over an open fire. In Argentina, an asado (Spanish for "grilled") is prepared on a grill held over an open pit or fire made upon the ground, on which a whole animal or smaller cuts are grilled.<sup>[36]</sup>



A stainless steel frying pan



A traditional asado (barbecue)

#### Raw food preparation



Many types of fish ready to be eaten, including salmon and tuna

Certain cultures highlight animal and vegetable foods in their raw state. Salads consisting of raw vegetables or fruits are common in many cuisines. Sashimi in Japanese cuisine consists of raw sliced fish or other meat, and sushi often incorporates raw fish or seafood. Steak tartare and salmon tartare are dishes made from diced or ground raw beef or salmon, mixed with various ingredients and served with baguettes, brioche, or frites.<sup>[37]</sup> In Italy, carpaccio is a dish of very thinly sliced raw beef, drizzled with a vinaigrette made with olive oil.<sup>[38]</sup> The health food movement known as raw foodism promotes a mostly vegan diet of raw fruits, vegetables, and grains prepared in various ways, including juicing, food dehydration, sprouting, and other methods of preparation that do not heat the food above 118 °F (47.8 °C).<sup>[39]</sup> An example of a raw

meat dish is ceviche, a Latin American dish made with raw meat that is "cooked" from the highly acidic citric juice from lemons and limes along with other aromatics such as garlic.

## Restaurants

Restaurants employ trained chefs who prepare food, and trained waitstaff to serve the customers. The term restaurant is credited to the French from the 19th century, as it relates to the restorative nature of the bouillons that were once served in them. However, the concept pre-dates the naming of these establishments, as evidence suggests commercial food preparation may have existed during the age of the city of Pompeii, and urban sales of prepared foods may have existed in China during the Song dynasty. The coffee shops or cafés of 17th century Europe may also be considered an early version of the restaurant.<sup>[40]</sup> In 2005, the population of the United States spent \$496 billion for out-of-home dining. Expenditures by type of out-of-home dining were as follows: 40% in full-service restaurants, 37.2% in limited service restaurants (fast food), 6.6% in schools or colleges, 5.4% in bars and vending machines, 4.7% in hotels and motels, 4.0% in recreational places, and 2.2% in others, which includes military bases.<sup>[41]</sup>

## Food manufacturing

Packaged foods are manufactured outside the home for purchase. This can be as simple as a butcher preparing meat, or as complex as a modern international food industry. Early food processing techniques were limited by available food preservation, packaging, and transportation. This mainly involved salting, curing, curdling, drying, pickling, fermenting, and smoking.<sup>[42]</sup> Food manufacturing arose during the industrial revolution in the 19th century.<sup>[43]</sup> This development took advantage of new mass markets and emerging technology, such as milling, preservation, packaging and labeling, and transportation. It brought the advantages of pre-prepared time-saving food to the bulk of ordinary people who did not employ domestic servants.<sup>[44]</sup>

At the start of the 21st century, a two-tier structure has arisen, with a few international food processing giants controlling a wide range of well-known food brands. There also exists a wide array of small local or national food processing companies.<sup>[45]</sup> Advanced technologies have also come to change food manufacture. Computer-based control systems, sophisticated processing and packaging methods, and logistics and distribution advances can enhance product quality, improve food safety, and reduce costs.<sup>[44]</sup>

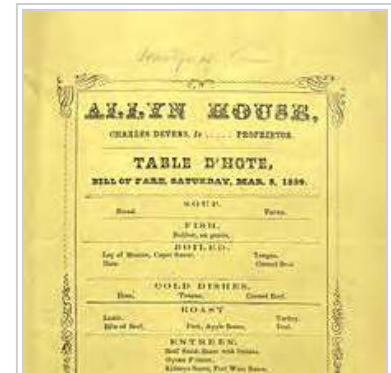
## Commercial trade

### International food imports and exports

The World Bank reported that the European Union was the top food importer in 2005, followed at a distance by the USA and Japan. Britain's need for food was especially well illustrated in World War II. Despite the implementation of food rationing, Britain remained dependent on food imports and the result was a long term engagement in the Battle of the Atlantic.

Food is traded and marketed on a global basis. The variety and availability of food is no longer restricted by the diversity of locally grown food or the limitations of the local growing season.<sup>[46]</sup> Between 1961 and 1999, there was a 400% increase in worldwide food exports.<sup>[47]</sup> Some countries are now economically dependent on food exports, which in some cases account for over 80% of all exports.<sup>[48]</sup>

In 1994, over 100 countries became signatories to the Uruguay Round of the General Agreement on Tariffs and Trade in a dramatic increase in trade liberalization. This included an agreement to reduce subsidies paid to farmers, underpinned by the WTO enforcement of agricultural subsidy, tariffs, import quotas, and settlement of trade disputes that cannot be bilaterally



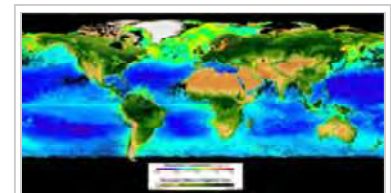
The Allyn House restaurant menu (March 5, 1859)



Tom's Restaurant, a restaurant in New York City



Packaged household food items



SeaWiFS image for the global biosphere

resolved.<sup>[49]</sup> Where trade barriers are raised on the disputed grounds of public health and safety, the WTO refer the dispute to the Codex Alimentarius Commission, which was founded in 1962 by the United Nations Food and Agriculture Organization and the World Health Organization. Trade liberalization has greatly affected world food trade.<sup>[50]</sup>

## Marketing and retailing

Food marketing brings together the producer and the consumer. It is the chain of activities that brings food from "farm gate to plate".<sup>[51]</sup> The marketing of even a single food product can be a complicated process involving many producers and companies. For example, fifty-six companies are involved in making one can of chicken noodle soup. These businesses include not only chicken and vegetable processors but also the companies that transport the ingredients and those who print labels and manufacture cans.<sup>[52]</sup> The food marketing system is the largest direct and indirect non-government employer in the United States.

In the pre-modern era, the sale of surplus food took place once a week when farmers took their wares on market day into the local village marketplace. Here food was sold to grocers for sale in their local shops for purchase by local consumers.<sup>[28][44]</sup> With the onset of industrialization and the development of the food processing industry, a wider range of food could be sold and distributed in distant locations. Typically early grocery shops would be counter-based shops, in which purchasers told the shop-keeper what they wanted, so that the shop-keeper could get it for them.<sup>[28][53]</sup>

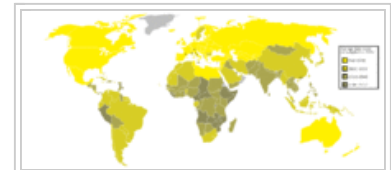
In the 20th century, supermarkets were born. Supermarkets brought with them a self service approach to shopping using shopping carts, and were able to offer quality food at lower cost through economies of scale and reduced staffing costs. In the latter part of the 20th century, this has been further revolutionized by the development of vast warehouse-sized, out-of-town supermarkets, selling a wide range of food from around the world.<sup>[54]</sup>

Unlike food processors, food retailing is a two-tier market in which a small number of very large companies control a large proportion of supermarkets. The supermarket giants wield great purchasing power over farmers and processors, and strong influence over consumers. Nevertheless, less than 10% of consumer spending on food goes to farmers, with larger percentages going to advertising, transportation, and intermediate corporations.<sup>[55]</sup>

## Prices

It was reported on March 24, 2008, that consumers worldwide faced rising food prices.<sup>[56]</sup> Reasons for this development include changes in the weather and dramatic changes in the global economy, including higher oil prices, lower food reserves, and growing consumer demand in China and India.<sup>[56]</sup> In the long term, prices are expected to stabilize.<sup>[56]</sup> Farmers will grow more grain for both fuel and food and eventually bring prices down.<sup>[56]</sup> Already this is happening with wheat,<sup>[57][58]</sup> with more crops to be planted in the United States, Canada, and Europe in 2009. However, the Food and Agriculture Organization projects that consumers still have to deal with more expensive food until at least 2018.<sup>[56]</sup>

It is rare for the spikes to hit all major foods in most countries at once. Food prices rose 4% in the United States in 2007, the highest increase since 1990, and are expected to climb as much again in 2008. As of December 2007, 37 countries faced food crises, and 20 had imposed some sort of food-price controls. In China, the price of pork jumped 58% in 2007. In the 1980s and 1990s, farm subsidies and support programs allowed major grain exporting countries to hold large surpluses, which could be tapped during food shortages to keep prices down. However, new trade policies have made agricultural production much more responsive to market demands, putting global food reserves at their lowest since 1983.<sup>[56]</sup>



Global average daily calorie consumption in 1995



Food imports in 2005



Population density of world regions



Packaged food aisles of supermarket in Portland, Oregon, United States of America



Food prices are rising, wealthier Asian consumers are westernizing their diets, and farmers and nations of the third world are struggling to keep up the pace. The past five years have seen rapid growth in the contribution of Asian nations to the global fluid and powdered milk manufacturing industry, which in 2008 accounted for more than 30% of production, while China alone accounts for more than 10% of both production and consumption in the global fruit and vegetable processing and preserving industry. The trend is similarly evident in industries such as soft drink and bottled water manufacturing, as well as global cocoa, chocolate, and sugar confectionery manufacturing, forecast to grow by 5.7% and 10.0% respectively during 2008 in response to soaring demand in Chinese and Southeast Asian markets.<sup>[60]</sup>

Rising food prices over recent years have been linked with social unrest around the world, including rioting in Bangladesh and Mexico,<sup>[61]</sup> and the Arab Spring.

In 2013 Overseas Development Institute researchers showed that rice has more than doubled in price since 2000, rising by 120% in real terms. This was as a result of shifts in trade policy and restocking by major producers. More fundamental drivers of increased prices are the higher costs of fertiliser, diesel and labour. Parts of Asia see rural wages rise with potential large benefits for the 1.3 billion (2008 estimate) of Asia's poor in reducing the poverty they face. However, this negatively impacts more vulnerable groups who don't share in the economic boom, especially in Asian and African coastal cities. The researchers said the threat means social-protection policies are needed to guard against price shocks. The research proposed that in the longer run, the rises present opportunities to export for Western African farmers with high potential for rice production to replace imports with domestic production.<sup>[62]</sup>

## As investment

Institutions such as hedge funds, pension funds and investment banks like Barclays Capital, Goldman Sachs and Morgan Stanley<sup>[61]</sup> have been instrumental in pushing up prices in the last five years, with investment in food commodities rising from \$65bn to \$126bn (£41bn to £79bn) between 2007 and 2012, contributing to 30-year highs. This has caused price fluctuations which are not strongly related to the actual supply of food, according to the United Nations.<sup>[61]</sup> Financial institutions now make up 61% of all investment in wheat futures. According to Olivier De Schutter, the UN special rapporteur on food, there was a rush by institutions to enter the food market following George W Bush's Commodities Futures Modernization Act of 2000.<sup>[61]</sup> De Schutter told the Independent in March 2012: "What we are seeing now is that these financial markets have developed massively with the arrival of these new financial investors, who are purely interested in the short-term monetary gain and are not really interested in the physical thing – they never actually buy the ton of wheat or maize; they only buy a promise to buy or to sell. The result of this financialisation of the commodities market is that the prices of the products respond increasingly to a purely speculative logic. This explains why in very short periods of time we see prices spiking or bubbles exploding, because prices are less and less determined by the real match between supply and demand."<sup>[61]</sup> In 2011, 450 economists from around the world called on the G20 to regulate the commodities market more.<sup>[61]</sup>

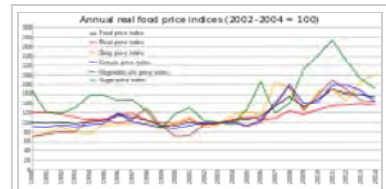
Some experts have said that speculation has merely aggravated other factors, such as climate change, competition with bio-fuels and overall rising demand.<sup>[61]</sup> However, some such as Jayati Ghosh, professor of economics at Jawaharlal Nehru University in New Delhi, have pointed out that prices have increased irrespective of supply and demand issues: Ghosh points to world wheat prices, which doubled in the period from June to December 2010, despite there being no fall in global supply.<sup>[61]</sup>

## Famine and hunger

Food deprivation leads to malnutrition and ultimately starvation. This is often connected with famine, which involves the absence of food in entire communities. This can have a devastating and widespread effect on human health and mortality. Rationing is sometimes used to distribute food in times of shortage, most notably during times of war.<sup>[11]</sup>



Some essential food products including bread, rice and pasta



Food, meat, dairy, cereals, vegetable oil, and sugar price indices, deflated using the World Bank Manufactures Unit Value Index (MUV)<sup>[59]</sup>

Starvation is a significant international problem. Approximately 815 million people are undernourished, and over 16,000 children die per day from hunger-related causes.<sup>[63]</sup> Food deprivation is regarded as a deficit need in Maslow's hierarchy of needs and is measured using famine scales.<sup>[64]</sup>

## Food aid

Food aid can benefit people suffering from a shortage of food. It can be used to improve peoples' lives in the short term, so that a society can increase its standard of living to the point that food aid is no longer required.<sup>[65]</sup> Conversely, badly managed food aid can create problems by disrupting local markets, depressing crop prices, and discouraging food production. Sometimes a cycle of food aid dependence can develop.<sup>[66]</sup> Its provision, or threatened withdrawal, is sometimes used as a political tool to influence the policies of the destination country, a strategy known as food politics. Sometimes, food aid provisions will require certain types of food be purchased from certain sellers, and food aid can be misused to enhance the markets of donor countries.<sup>[67]</sup> International efforts to distribute food to the neediest countries are often coordinated by the World Food Programme.<sup>[68]</sup>

## Safety



Salmonella bacteria is a common cause of foodborne illness, particularly in undercooked chicken and chicken eggs.

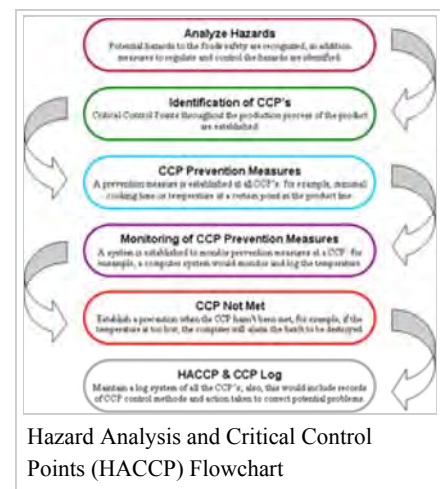
Foodborne illness, commonly called "food poisoning", is caused by bacteria, toxins, viruses, parasites, and prions. Roughly 7 million people die of food poisoning each year, with about 10 times as many suffering from a non-fatal version.<sup>[69]</sup> The two most common factors leading to cases of bacterial foodborne illness are cross-contamination of ready-to-eat food from other uncooked foods and improper temperature control. Less commonly, acute adverse reactions can also occur if chemical contamination of food occurs, for example from improper storage, or use of non-food grade soaps and disinfectants. Food can also be adulterated by a very wide range of

articles (known as "foreign bodies") during farming, manufacture, cooking, packaging, distribution, or sale. These foreign bodies can include pests or their droppings, hairs, cigarette butts, wood chips, and all manner of other contaminants. It is possible for certain types of food to become contaminated if stored or presented in an unsafe container, such as a ceramic pot with lead-based glaze.<sup>[69]</sup>

Food poisoning has been recognized as a disease since as early as Hippocrates.<sup>[70]</sup> The sale of rancid, contaminated, or adulterated food was commonplace until the introduction of hygiene, refrigeration, and vermin controls in the 19th century. Discovery of techniques for killing bacteria using heat, and other microbiological studies by scientists such as Louis Pasteur, contributed to the modern sanitation standards that are ubiquitous in developed nations today. This was further underpinned by the work of Justus von Liebig, which led to the development of modern food storage and food preservation methods.<sup>[71]</sup> In more recent years, a greater understanding of the causes of food-borne illnesses has led to the development of more systematic approaches such as the Hazard Analysis and Critical Control Points (HACCP), which can identify and eliminate many risks.<sup>[72]</sup>

Recommended measures for ensuring food safety include maintaining a clean preparation area with foods of different types kept separate, ensuring an adequate cooking temperature, and refrigerating foods promptly after cooking.<sup>[73]</sup>

Foods that spoil easily, such as meats, dairy, and seafood, must be prepared a certain way to avoid contaminating the people for whom they are prepared. As such, the rule of thumb is that cold foods (such as dairy products) should be kept cold and hot foods (such as soup) should be kept hot until storage. Cold meats, such as chicken, that are to be cooked should not be placed at room temperature for thawing, at the risk of dangerous bacterial growth, such as *Salmonella* or *E. coli*.<sup>[74]</sup>



## Allergies

Some people have allergies or sensitivities to foods which are not problematic to most people. This occurs when a person's immune system mistakes a certain food protein for a harmful foreign agent and attacks it. About 2% of adults and 8% of children have a food allergy.<sup>[75]</sup> The amount of the food substance required to provoke a reaction in a particularly susceptible individual can be quite small. In some instances, traces of food in the air, too minute to be perceived through smell, have been known to provoke lethal reactions in extremely sensitive individuals. Common food allergens are gluten, corn, shellfish (mollusks), peanuts, and soy.<sup>[75]</sup> Allergens frequently produce symptoms such as diarrhea, rashes, bloating, vomiting, and regurgitation. The digestive complaints usually develop within half an hour of ingesting the allergen.<sup>[75]</sup>

Rarely, food allergies can lead to a medical emergency, such as anaphylactic shock, hypotension (low blood pressure), and loss of consciousness. An allergen associated with this type of reaction is peanut, although latex products can induce similar reactions.<sup>[75]</sup> Initial treatment is with epinephrine (adrenaline), often carried by known patients in the form of an Epi-pen or Twinject.<sup>[76][77]</sup>

## Other health issues

Human diet was estimated to cause perhaps around 35% of cancers in a human epidemiological analysis by Richard Doll and Richard Peto in 1981.<sup>[78]</sup> These cancer may be caused by carcinogens that are present in food naturally or as contaminants. Food contaminated with fungal growth may contain mycotoxins such as aflatoxins which may be found in contaminated corn and peanuts. Other carcinogens identified in food include heterocyclic amines generated in meat when cooked at high temperature, polyaromatic hydrocarbons in charred meat and smoked fish, and nitrosamines generated from nitrites used as food preservatives in cured meat such as bacon.<sup>[79]</sup>

Anticarcinogens that may help prevent cancer can also be found in many food especially fruits and vegetable. Antioxidants are important groups of compounds that may help remove potentially harmful chemicals. It is however often difficult to identify the specific components in diet that serve to increase or decrease cancer risk since many food, such as beef steak and broccoli, contain low concentrations of both carcinogens and anticarcinogens.<sup>[79]</sup>

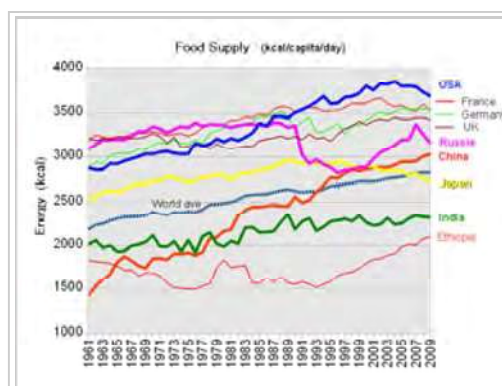
## Diet

### Cultural and religious diets

Dietary habits are the habitual decisions a person or culture makes when choosing what foods to eat.<sup>[83]</sup> Many cultures hold some food preferences and some food taboos. Dietary choices can also define cultures and play a role in religion. For example, only kosher foods are permitted by Judaism, halal foods by Islam, and in Hinduism beef is restricted.<sup>[84]</sup> In addition, the dietary choices of different countries or regions have different characteristics. This is highly related to a culture's cuisine.

### Diet deficiencies

Dietary habits play a significant role in the health and mortality of all humans. Imbalances between the consumed fuels and expended energy results in either starvation or excessive reserves of adipose tissue, known as body fat.<sup>[85]</sup> Poor intake of various vitamins and minerals can lead to diseases that can have far-reaching effects on health. For instance, 30% of the world's population either has, or is at risk for developing, iodine deficiency.<sup>[86]</sup> It is estimated that at least 3 million children are blind due to vitamin A deficiency.<sup>[87]</sup> Vitamin C deficiency results in scurvy.<sup>[88]</sup> Calcium, Vitamin D, and phosphorus are inter-related; the consumption of each may affect the absorption of the others. Kwashiorkor and marasmus are childhood disorders caused by lack of dietary protein.<sup>[89]</sup>



Changes of food supply (by energy)<sup>[80][81]</sup>

Other area (Yr 2010)<sup>[82]</sup> \* Africa, sub-Saharan - 2170 kcal/capita/day \* N.E. and N. Africa - 3120 kcal/capita/day \* South Asia - 2450 kcal/capita/day \* East Asia - 3040 kcal/capita/day \* Latin America / Caribbean - 2950 kcal/capita/day \* Developed countries - 3470 kcal/capita/day

## Moral, ethical, and health-conscious diets

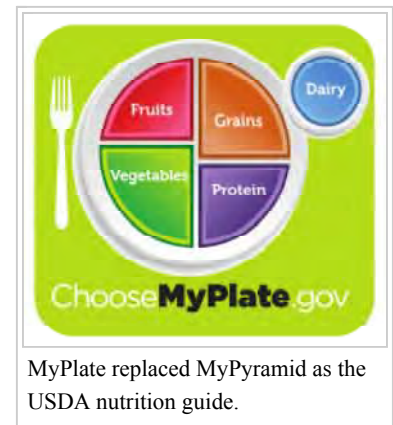
Many individuals limit what foods they eat for reasons of morality, or other habit. For instance, vegetarians choose to forgo food from animal sources to varying degrees. Others choose a healthier diet, avoiding sugars or animal fats and increasing consumption of dietary fiber and antioxidants.<sup>[90]</sup> Obesity, a serious problem in the western world, leads to higher chances of developing heart disease, diabetes, cancer and many other diseases.<sup>[91]</sup> More recently, dietary habits have been influenced by the concerns that some people have about possible impacts on health or the environment from genetically modified food.<sup>[92]</sup> Further concerns about the impact of industrial farming (grains) on animal welfare, human health, and the environment are also having an effect on contemporary human dietary habits. This has led to the emergence of a movement with a preference for organic and local food.<sup>[93]</sup>

## Nutrition and dietary problems

Between the extremes of optimal health and death from starvation or malnutrition, there is an array of disease states that can be caused or alleviated by changes in diet. Deficiencies, excesses, and imbalances in diet can produce negative impacts on health, which may lead to various health problems such as scurvy, obesity, or osteoporosis, diabetes, cardiovascular diseases as well as psychological and behavioral problems. The science of nutrition attempts to understand how and why specific dietary aspects influence health.

Nutrients in food are grouped into several categories. Macronutrients are fat, protein, and carbohydrates. Micronutrients are the minerals and vitamins. Additionally, food contains water and dietary fiber.

As previously discussed, the body is designed by natural selection to enjoy sweet and fattening foods for evolutionary diets, ideal for hunters and gatherers. Thus, sweet and fattening foods in nature are typically rare and are very pleasurable to eat. In modern times, with advanced technology, enjoyable foods are easily available to consumers. Unfortunately, this promotes obesity in adults and children alike.



MyPlate replaced MyPyramid as the USDA nutrition guide.

## Legal definition

Some countries list a legal definition of food, often referring them with the word *foodstuff*. These countries list food as any item that is to be processed, partially processed, or unprocessed for consumption. The listing of items included as food include any substance intended to be, or reasonably expected to be, ingested by humans. In addition to these foodstuffs, drink, chewing gum, water, or other items processed into said food items are part of the legal definition of food. Items not included in the legal definition of food include animal feed, live animals (unless being prepared for sale in a market), plants prior to harvesting, medicinal products, cosmetics, tobacco and tobacco products, narcotic or psychotropic substances, and residues and contaminants.<sup>[94]</sup>

## Types of food

- Comfort food
- Fast food
- Junk food
- Natural food
- Organic food
- Slow food
- Whole food

## See also

- Bulk foods
- Beverages
- *Food and Bioprocess Technology*
- Category:Lists of foods
- Food engineering
- *Food Inc.*, a 2009 documentary
- Food science
- Food security
- Future food technology
- List of foods
- Lists of prepared foods
- Non-food crop
- Nutrition facts label
- Optimal foraging theory
- Outline of cooking

- Outline of nutrition
- Packaging and labeling
- Traditional food
- Urban farming

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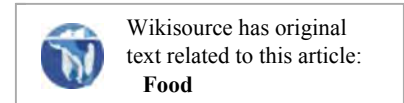
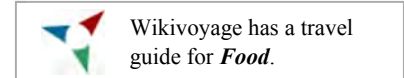
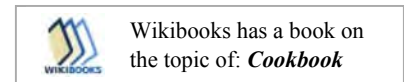
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- The Future of Food (<https://www.youtube.com/watch?v=VQsC7e2qAcY>) (2015). A panel discussion at the 2015 *Digital Life Design (DLD)* Annual Conference. "How can we grow and enjoy food, closer to home, further into the future? *MIT Media Lab*'s Kevin Slavin hosts a conversation with food artist, educator, and entrepreneur Emilie Baltz, professor Caleb Harper from *MIT Media Lab*'s CityFarm project, the Barbarian Group's Benjamin Palmer, and Andras Forgacs, the co-founder and CEO of *Modern Meadow*, who is growing 'victimless' meat in a lab. The discussion addresses issues of sustainable urban farming, ecosystems, technology, food supply chains and their broad environmental and humanitarian implications, and how these changes in food production may change what people may find delicious ... and the other way around." Posted on the official YouTube Channel of *DLD*

## External links

-  The dictionary definition of food at Wiktionary
-  Media related to food at Wikimedia Commons
- Food Timeline (<http://www.foodtimeline.org/>)
- Wikibooks Cookbook (<http://wikibooks.org/wiki/Cookbook>)



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Categories: Foods | Cuisine

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