

Organic food

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Organic food is food produced by methods that comply with the standards of organic farming. Standards vary worldwide, but organic farming in general features practices that strive to cycle resources, promote ecological balance, and conserve biodiversity. Organizations regulating organic products may restrict the use of certain pesticides and fertilizers in farming. In general, organic foods are also usually not processed using irradiation, industrial solvents or synthetic food additives.^[1]

Currently, the European Union, the United States, Canada, Mexico, Japan, and many other countries require producers to obtain special certification in order to market food as organic within their borders. In the context of these regulations, organic food is produced in a way that complies with organic standards set by regional organizations, national governments and international organizations. Although the produce of kitchen gardens may be organic, selling food with an organic label is regulated by governmental food safety authorities, such as the US Department of Agriculture (USDA) or European Commission (EC).^[2]

There is not sufficient evidence in medical literature to support claims that organic food is safer or healthier than conventionally grown food. While there may be some differences in the nutrient and antinutrient contents of organically- and conventionally-produced food, the variable nature of food production and handling makes it difficult to generalize results.^{[3][4][5][6][7]} Claims that organic food tastes better are generally not supported by evidence.^{[4][8]}



Organic vegetables at a farmers' market in Argentina

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Meaning and origin of the term

For the vast majority of its history, agriculture can be described as having been organic; only during the 20th century was a large supply of new products, generally deemed not organic, introduced into food production.^[9] The organic farming movement arose in the 1940s in response to the industrialization of agriculture.^[10]

In 1939, Lord Northbourne coined the term *organic farming* in his book *Look to the Land* (1940), out of his conception of "the farm as organism," to describe a holistic, ecologically balanced approach to farming—in contrast to what he called *chemical farming*, which relied on "imported fertility" and "cannot be self-sufficient nor an organic whole."^[11] Early soil scientists also described the differences in soil composition when animal manures were used as "organic", because they contain carbon compounds where superphosphates and haber process nitrogen do not. Their respective use affects humus content of soil.^{[12][13]} This is different from the scientific use of the term "organic" in chemistry, which refers to a class of molecules that contain carbon, especially those involved in the chemistry of life. This class of molecules includes everything likely to be considered edible, and include most pesticides and toxins too, therefore the term "organic" and, especially, the term "inorganic" (sometimes wrongly used as a contrast by the popular press) as they apply to organic chemistry is an equivocation fallacy when applied to farming, the production of food, and to foodstuffs themselves. Properly used in this agricultural science context, "organic" refers to the methods grown and processed, not necessarily the chemical composition of the food.

Ideas that organic food could be healthier and better for the environment originated in the early days of the organic movement as a result of publications like the 1943 book *The Living Soil*^{[14][15]} and *Farming and Gardening for Health or Disease* (1945).^[16]

Early consumers interested in organic food would look for non-chemically treated, non-use of unapproved pesticides, fresh or minimally processed food. They mostly had to buy directly from growers. Later, "Know your farmer, know your food" became the motto of a new initiative instituted by the USDA in September 2009.^[17] Personal definitions of what constituted "organic" were developed through firsthand experience: by talking to farmers, seeing farm conditions, and farming activities. Small farms grew vegetables (and raised livestock) using organic farming practices, with or without certification, and the individual consumer monitored. Small specialty health food stores and co-operatives were instrumental to bringing organic food to a wider audience. As demand for organic foods continued to increase, high volume sales through mass outlets such as supermarkets rapidly replaced the direct farmer connection. Today, many large corporate farms have an organic division. However, for supermarket consumers, food production is not easily observable, and product labeling, like "certified organic", is relied upon. Government regulations and third-party inspectors are looked to for assurance.

In the 1970s, interest in organic food grew with the publication of *Silent Spring*^[18] and the rise of the environmental movement, and was also spurred by food-related health scares like the concerns about Alar that arose in the mid-1980s.^[19]

Legal definition

Organic food production is a self-regulated industry with government oversight in some countries, distinct from private gardening. Currently, the European Union, the United States, Canada, Japan, and many other countries require producers to obtain special certification based on government-defined standards in order to market food as organic within their borders. In the context of these regulations, foods marketed as organic are produced in a way that complies with organic standards set by national governments and international organic industry trade organizations.

In the United States, organic production is managed in accordance with the Organic Foods Production Act of 1990 (OFPA) and regulations in Title 7, Part 205 of the Code of Federal Regulations to respond to site-specific conditions by integrating cultural, biological, and mechanical practices that foster cycling of resources, promote ecological balance, and conserve biodiversity.^[20] If livestock are involved, the livestock must be reared with regular access to pasture and without the routine use of antibiotics or growth hormones.^[21]

Processed organic food usually contains only organic ingredients. If non-organic ingredients are present, at least a certain percentage of the food's total plant and animal ingredients must be organic (95% in the United States,^[22] Canada, and Australia). Foods claiming to be organic must be free of artificial food additives, and are often processed with fewer artificial methods, materials and conditions, such as chemical ripening, food irradiation, and genetically modified ingredients.^[23]

Pesticides are allowed as long as they are not synthetic.^[24] However, under US federal organic standards, if pests and weeds are not controllable through management practices, nor via organic pesticides and herbicides, "a substance included on the National List of synthetic substances allowed for use in organic crop production may be applied to prevent, suppress, or control pests, weeds, or diseases."^[25] Several groups have called for organic standards to prohibit nanotechnology on the basis of the precautionary principle^[26] in light of unknown risks of nanotechnology.^{[27]:5–6} The use of nanotechnology-based products in the production of organic food is prohibited in some jurisdictions (Canada, the UK, and Australia) and is unregulated in others.^{[28][29]:2, section 1.4.1(4)}

To be **certified organic**, products must be grown and manufactured in a manner that adheres to standards set by the country they are sold in:

- Australia: NASAA Organic Standard^[30]
- Canada:^[31]
- European Union: EU-Eco-regulation
 - Sweden: KRAV^[32]
 - United Kingdom: DEFRA^[33]
 - Poland: Association of Polish Ecology^[34]
 - Norway: Debio Organic certification^[35]
- India: NPOP, (National Program for Organic Production)^[36]
- Indonesia: BIOCert, run by Agricultural Ministry of Indonesia.^[37]
- Japan: JAS Standards^[38]
- Mexico: Consejo Nacional de Producción Orgánica, department of Sagarpa^[39]
- United States: National Organic Program (NOP) Standards

In the United States, there are four different levels or categories for organic labeling. 1)'100%' Organic: This means that all ingredients are produced organically. It also may have the USDA seal. 2)'Organic': At least 95% or more of the ingredients are organic. 3)'Made With Organic Ingredients': Contains at least 70% organic ingredients. 4)'Less Than 70% Organic Ingredients': Three of the organic ingredients must be listed under the ingredient section of the label.^[40] In the U.S., the food label "natural" or "all natural" does not mean that the food was produced and processed organically.^{[41][42]}

Public perception

There is widespread public belief that organic food is safer, more nutritious, and better tasting than conventional food.^[43] Consumers purchase organic foods for different reasons, including concerns about the effects of conventional farming practices on the environment, human health, and animal welfare.^[44]

The most important reason for purchasing organic foods seems to be beliefs about the products' health-giving properties and higher nutritional value.^[45] These beliefs are promoted by the organic food industry,^[46] and have fueled increased demand for organic food despite higher prices and difficulty in confirming these claimed benefits scientifically.^{[3][5][6][47][48]} Organic labels also stimulate the consumer to view the product as having more positive nutritional value.^[49]

Psychological effects such as the "halo" effect, which are related to the choice and consumption of organic food, are also important motivating factors in the purchase of organic food.^[4] The perception that organic food is low-calorie food or health food appears to be common.^{[4][50]}



The National Organic Program (run by the USDA) is in charge of the legal definition of *organic* in the United States and does organic certification.

In China the increasing demand for organic products of all kinds, and in particular milk, baby food and infant formula, has been "spurred by a series of food scares, the worst being the death of six children who had consumed baby formula laced with melamine" in 2009 and the 2008 Chinese milk scandal, making the Chinese market for organic milk the largest in the world as of 2014.^{[51][52][53]} A Pew Research Centre survey in 2012 indicated that 41% of Chinese consumers thought of food safety as a very big problem, up by three times from 12% in 2008.^[54]

Taste

There is no good evidence that organic food tastes better than its non-organic counterparts.^[8] There is evidence that some organic fruit is drier than conventionally grown fruit; a slightly drier fruit may also have a more intense flavor due to the higher concentration of flavoring substances.^[4]

Some foods, such as bananas, are picked when unripe, are cooled to prevent ripening while they are shipped to market, and then are induced to ripen quickly by exposing them to propylene or ethylene, chemicals produced by plants to induce their own ripening; as flavor and texture changes during ripening, this process may affect those qualities of the treated fruit.^{[55][56]} The issue of ethylene use to ripen fruit in organic food production is contentious because ripeness when picked often does affect taste; opponents claim that its use benefits only large companies and that it opens the door to weaker organic standards.^{[57][58]}

Chemical composition

With respect to chemical differences in the composition of organically grown food compared with conventionally grown food, studies have examined differences in nutrients, antinutrients, and pesticide residues. These studies generally suffer from confounding variables, and are difficult to generalize due to differences in the tests that were done, the methods of testing, and because the vagaries of agriculture affect the chemical composition of food; these variables include variations in weather (season to season as well as place to place); crop treatments (fertilizer, pesticide, etc.); soil composition; the cultivar used, and in the case of meat and dairy products, the parallel variables in animal production.^{[3][6]} Treatment of the foodstuffs after initial gathering (whether milk is pasteurized or raw), the length of time between harvest and analysis, as well as conditions of transport and storage, also affect the chemical composition of a given item of food.^{[3][6]} Additionally, there is evidence that organic produce is drier than conventionally grown produce; a higher content in any chemical category may be explained by higher concentration rather than in absolute amounts.^[4]



Organic vegetables at a farmers' market

Nutrients

Many people believe that organic foods have higher content of nutrients and thus are healthier than conventionally produced foods. However, scientists have not been equally convinced that this is the case as the research conducted in the field has not shown consistent results.

A 2009 systematic review in the *American Journal of Clinical Nutrition* found that organically produced foodstuffs are not richer in vitamins and minerals than conventionally produced foodstuffs.^[59] The results of the systematic review only showed a lower nitrogen and higher phosphorus content in organic produced compared to conventionally grown foodstuffs. Content of vitamin C, calcium, potassium, total soluble solids, copper, iron, nitrates, manganese, and sodium did not differ between the two categories.^[60]

A 2014 meta-analysis of 343 studies^[3] found that organically grown crops had 17% higher concentrations of polyphenols than conventionally grown crops. Concentrations of phenolic acids, flavanones, stilbenes, flavones, flavonols, and anthocyanins were elevated, with flavanones being 69% higher.

A 2012 survey of the scientific literature did not find significant differences in the vitamin content of organic and conventional plant or animal products, and found that results varied from study to study.^[6] Produce studies reported on ascorbic acid (Vitamin C) (31 studies), beta-carotene (a precursor for Vitamin A) (12 studies), and alpha-tocopherol (a form of Vitamin E) (5 studies) content; milk studies reported on beta-carotene (4 studies) and alpha-tocopherol levels (4 studies). Few studies examined vitamin content in meats, but these found no difference in beta-carotene in beef, alpha-tocopherol in pork or beef, or vitamin A (retinol) in beef. The authors analyzed 11 other nutrients reported in studies of produce. Only two nutrients were significantly higher in organic than conventional produce: phosphorus and total polyphenols). A 2011 literature review found that organic foods had a higher micronutrient content overall than conventionally produced foods.^[61]

Similarly, organic chicken contained higher levels of omega-3 fatty acids than conventional chicken. The authors found no difference in the protein or fat content of organic and conventional raw milk.^{[62][63]}

A 2016 systematic review and meta-analysis found that organic meat had comparable or slightly lower levels of saturated fat and monounsaturated fat as conventional meat, but higher levels of both overall and n-3 polyunsaturated fatty acids.^[64] Another meta-analysis published the same year found no significant differences in levels of saturated and monounsaturated fat between organic and conventional milk, but significantly higher levels of overall and n-3 polyunsaturated fatty acids in organic milk than in conventional milk.^[65]

Anti-nutrients

The amount of nitrogen content in certain vegetables, especially green leafy vegetables and tubers, has been found to be lower when grown organically as compared to conventionally.^[5] When evaluating environmental toxins such as heavy metals, the USDA has noted that organically raised chicken may have lower arsenic levels.^[66] Early literature reviews found no significant evidence that levels of arsenic, cadmium or other heavy metals differed significantly between organic and conventional food products.^{[4][5]} However, a 2014 review found lower concentrations of cadmium, particularly in organically grown grains.^[3]

Pesticide residues

The amount of pesticides that remain in or on food is called pesticides residue. In the United States, before a pesticide can be used on a food crop, the U.S.

Environmental Protection Agency must determine whether that pesticide can be used without posing a risk to human health.^[67]

A 2012 meta-analysis determined that detectable pesticide residues were found in 7% of organic produce samples and 38% of conventional produce samples. This result was statistically heterogeneous, potentially because of the variable level of detection used among these studies. Only three studies reported the prevalence of contamination exceeding maximum allowed limits; all were from the European Union.^[6] A 2014 meta-analysis found that conventionally grown produce was four times more likely to have pesticide residue than organically grown crops.^[3]

The American Cancer Society has stated that no evidence exists that the small amount of pesticide residue found on conventional foods will increase the risk of cancer, though it recommends thoroughly washing fruits and vegetables. They have also stated that there is no research to show that organic food reduces cancer risk compared to foods grown with conventional farming methods.^[68]

The Environmental Protection Agency maintains strict guidelines on the regulation of pesticides by setting a tolerance on the amount of pesticide residue allowed to be in or on any particular food.^{[69][70]} Although some residue may remain at the time of harvest, residue tend to decline as the pesticide breaks down over time. In addition, as the commodities are washed and processed prior to sale, the residues often diminish further.

Bacterial contamination

A 2012 meta-analysis determined that prevalence of *E. coli* contamination was not statistically significant (7% in organic produce and 6% in conventional produce). While bacterial contamination is common among both organic and conventional animal products, differences in the prevalence of bacterial contamination between organic and conventional animal products were also statistically insignificant.^[6]

Organic meat production requirements

United States

Organic meat certification in the United States requires farm animals to be raised according to USDA organic regulations throughout their lives. These regulations require that livestock are fed certified organic food that contains no animal byproducts.^[71] Further, organic farm animals can receive no growth hormones or antibiotics, and they must be raised using techniques that protect native species and other natural resources. Irradiation and genetic engineering are not allowed with organic animal production.^{[71][72][73]} One of the major differences in organic animal husbandry protocol is the "pasture rule":^[71] minimum requirements for time on pasture do vary somewhat by species and between the certifying agencies, but the common theme is to require as much time on pasture as possible and reasonable.^{[74][75]}

Health and safety

There is little scientific evidence of benefit or harm to human health from a diet high in organic food, and conducting any sort of rigorous experiment on the subject is very difficult. A 2012 meta-analysis noted that "there have been no long-term studies of health outcomes of populations consuming predominantly organic versus conventionally produced food controlling for socioeconomic factors; such studies would be expensive to conduct."^[6] A 2009 meta-analysis noted that "most of the included articles did not study direct human health outcomes. In ten of the included studies (83%), a primary outcome was the change in antioxidant activity. Antioxidant status and activity are useful biomarkers but do not directly equate to a health outcome. Of the remaining two articles, one recorded proxy-reported measures of atopic manifestations as its primary health outcome, whereas the other article examined the fatty acid composition of breast milk and implied possible health benefits for infants from the consumption of different amounts of conjugated linoleic acids from breast milk."^[47] In addition, as discussed above, difficulties in accurately and meaningfully measuring chemical differences between organic and conventional food make it difficult to extrapolate health recommendations based solely on chemical analysis.

With regard to the possibility that some organic food may have higher levels of certain anti-oxidants, evidence regarding whether increased anti-oxidant consumption improves health is conflicting.^{[76][77][78][79][80]}

As of 2012, the scientific consensus is that while "consumers may choose to buy organic fruit, vegetables and meat because they believe them to be more nutritious than other food... the balance of current scientific evidence does not support this view."^[81] A 12-month systematic review commissioned by the FSA in 2009 and conducted at the London School of Hygiene & Tropical Medicine based on 50 years' worth of collected evidence concluded that "there is no good evidence that consumption of organic food is beneficial to health in relation to nutrient content."^[82] There is no support in the scientific literature that the lower levels of nitrogen in certain organic vegetables translates to improved health risk.^[5]

Consumer safety

Pesticide exposure

The main difference between organic and conventional food products are the chemicals involved during production and processing. The residues of those chemicals in food products have dubious effects on the human health. All food products on the market including those that contain residues of pesticides, antibiotics, growth hormones and other types of chemicals that are used during production and processing are said to be safe.^[83]

Claims of improved safety of organic food has largely focused on pesticide residues.^[5] These concerns are driven by the facts that "(1) acute, massive exposure to pesticides can cause significant adverse health effects; (2) food products have occasionally been contaminated with pesticides, which can result in acute toxicity; and (3) most, if not all, commercially purchased food contains trace amounts of agricultural pesticides."^[5] However, as is frequently noted in the scientific literature: "What does not follow from this, however, is that chronic exposure to the trace amounts of pesticides found in food results in demonstrable toxicity. This possibility is practically impossible to study and quantify;" therefore firm conclusions about the relative safety of organic foods have been hampered by the difficulty in proper study design and relatively small number of studies directly comparing organic food to conventional food.^{[4][5][8][48][84]}

Additionally, the Carcinogenic Potency Project,^[85] which is a part of the US EPA's Distributed Structure-Searchable Toxicity (DSSTox) Database Network,^[86] has been systematically testing the carcinogenicity of chemicals, both natural and synthetic, and building a publicly available database of the results^[87] for the past ~30 years. Their work attempts to fill in the gaps in our scientific knowledge of the carcinogenicity of all chemicals, both natural and synthetic, as the scientists conducting the Project described in the journal, *Science*, in 1992:

Toxicological examination of synthetic chemicals, without similar examination of chemicals that occur naturally, has resulted in an imbalance in both the data on and the perception of chemical carcinogens. Three points that we have discussed indicate that comparisons should be made with natural as well as synthetic chemicals.

- 1) The vast proportion of chemicals that humans are exposed to occur naturally. Nevertheless, the public tends to view chemicals as only synthetic and to think of synthetic chemicals as toxic despite the fact that every natural chemical is also toxic at some dose. The daily average exposure of Americans to burnt material in the diet is ~2000 mg, and exposure to natural pesticides (the chemicals that plants produce to defend themselves) is ~1500 mg. In comparison, the total daily exposure to all synthetic pesticide residues combined is ~0.09 mg. Thus, we estimate that 99.99% of the pesticides humans ingest are natural. Despite this enormously greater exposure to natural chemicals, 79% (378 out of 479) of the chemicals tested for carcinogenicity in both rats and mice are synthetic (that is, do not occur naturally).
- 2) It has often been wrongly assumed that humans have evolved defenses against the natural chemicals in our diet but not against the synthetic chemicals. However, defenses that animals have evolved are mostly general rather than specific for particular chemicals; moreover, defenses are generally inducible and therefore protect well from low doses of both synthetic and natural chemicals.
- 3) Because the toxicology of natural and synthetic chemicals is similar, one expects (and finds) a similar positivity rate for carcinogenicity among synthetic and natural chemicals. The positivity rate among chemicals tested in rats and mice is ~50%. Therefore, because humans are exposed to so many more natural than synthetic chemicals (by weight and by number), humans are exposed to an enormous background of rodent carcinogens, as defined by high-dose tests on rodents. We have shown that even though only a tiny proportion of natural pesticides in plant foods have been tested, the 29 that are rodent carcinogens among the 57 tested, occur in more than 50 common plant foods. It is probable that almost every fruit and vegetable in the supermarket contains natural pesticides that are rodent carcinogens.^[88]

While studies have shown via chemical analysis, as discussed above, that organically grown fruits and vegetables have significantly lower pesticide residue levels, the significance of this finding on actual health risk reduction is debatable as both conventional foods and organic foods generally have pesticide levels well below government established guidelines for what is considered safe.^{[4][5][6]} This view has been echoed by the U.S. Department of Agriculture^[66] and the UK Food Standards Agency.^[7]

A study published by the National Research Council in 1993 determined that for infants and children, the major source of exposure to pesticides is through diet.^[89] A study published in 2006 by Lu et al. measured the levels of organophosphorus pesticide exposure in 23 school children before and after replacing their diet with organic food. In this study it was found that levels of organophosphorus pesticide exposure dropped from negligible levels to undetectable levels when the children switched to an organic diet, the authors presented this reduction as a significant reduction in risk.^[90] The conclusions presented in Lu et al. were criticized in the literature as a case of bad scientific communication.^{[91][92]}

More specifically, claims related to pesticide residue of increased risk of infertility or lower sperm counts have not been supported by the evidence in the medical literature.^[5] Likewise the American Cancer Society (ACS) has stated their official position that "whether organic foods carry a lower risk of cancer because they are less likely to be contaminated by compounds that might cause cancer is largely unknown."^[93] Reviews have noted that the risks from microbiological sources or natural toxins are likely to be much more significant than short term or chronic risks from pesticide residues.^{[4][5]}

Microbiological contamination

In looking at possible increased risk to safety from organic food consumption, reviews have found that although there may be increased risk from microbiological contamination due to increased manure use as fertilizer from organisms like *E. coli* O157:H7 during organic produce production, there is little evidence of actual incidence of outbreaks which can be positively blamed on organic food production.^{[4][5][8]} The 2011 Germany *E. coli* O104:H4 outbreak was blamed on organic farming of bean sprouts.^{[94][95]}

Economics

Demand for organic foods is primarily driven by concerns for personal health and for the environment.^[96] Global sales for organic foods climbed by more than 170 percent since 2002 reaching more than \$63 billion in 2011^[97] while certified organic farmland remained relatively small at less than 2 percent of total farmland under production, increasing in OECD and EU countries (which account for the majority of organic production) by 35 percent for the same time period.^[98] Organic products typically cost 10 to 40% more than similar conventionally produced products, to several times the price.^[99] Processed organic foods vary in price when compared to their conventional counterparts.

While organic food accounts for 1–2% of total food production worldwide, the organic food sales market is growing rapidly with between 5 and 10 percent of the food market share in the United States according to the Organic Trade Association,^[100] significantly outpacing sales growth volume in dollars of conventional food products. World organic food sales jumped from US \$23 billion in 2002^[101] to \$63 billion in 2011.^[102]

Asia

Production and consumption of organic products is rising rapidly in Asia, and both China and India are becoming global producers of organic crops^[103] and a number of countries, particularly China and Japan, also becoming large consumers of organic food and drink.^{[5][104]} The disparity between production and demand, is leading to a two-tier organic food industry, typified by significant and growing imports of primary organic products such as dairy and beef from Australia, Europe, New Zealand and the United States.^[105]

China

- China's domestic organic market is the fourth largest in the world.^[106] The Chinese Organic Food Development Center estimated domestic sales of organic food products to be around US\$500 million per annum as of 2013. This is predicted to increase by 30 percent to 50 percent in 2014.^[106] As of 2015, organic foods made up about 1% of the total Chinese food market.^[107]
- China is the world's biggest infant formula market with \$12.4 billion in sales annually;^[108] of this, organic infant formula and baby food accounted for approximately 5.5 per cent of sales in 2011.^[106] Australian organic infant formula and baby food producer Bellamy's Organic have reported that their sales in this market grew 70 per cent annually over the period 2008-2013, while Organic Dairy Farmers of Australia, reported that exports of long-life organic milk to China had grown by 20 to 30 per cent per year over the same period.^[109]

Japan

- In 2010, the Japanese organic market was estimated to be around \$1.3 billion.^[110]

North America

United States

- In 2012 the total size of the organic food market in the United States was about \$30 billion (out of the total market for organic and natural consumer products being about \$81 billion)^{[112][113]}
- Organic food is the fastest growing sector of the American food industry.^[114]
- Organic food sales have grown by 17 to 20 percent a year in the early 2000s^[115] while sales of conventional food have grown only about 2 to 3 percent a year.^[116] The US organic market grew 9.5% in 2011, breaking the \$30bn barrier for the first time, and continued to outpace sales of non-organic food.^[114]
- In 2003 organic products were available in nearly 20,000 natural food stores and 73% of conventional grocery stores.^[117]
- Organic products accounted for 3.7% of total food and beverage sales, and 11.4% of all fruit and vegetable sales in the year 2009.^[104]
- As of 2003, two thirds of organic milk and cream and half of organic cheese and yogurt are sold through conventional supermarkets.^[118]
- As of 2012, most independent organic food processors in the USA had been acquired by multinational firms.^[119]
- In order for a product to become USDA organic certified, the farmer cannot plant genetically modified seeds and livestock cannot eat genetically modified plants. Farmers must provide substantial evidence showing there was no genetic modification involved in the operation.^[120]



As of October 2014, Trader Joe's is a market leader of organic grocery stores in the United States.^[111]

Canada

- Organic food sales surpassed \$1 billion in 2006, accounting for 0.9% of food sales in Canada.^[121] By 2012, Canadian organic food sales reached \$3 billion.^[122]
- Organic food sales by grocery stores were 28% higher in 2006 than in 2005.^[121]
- British Columbians account for 13% of the Canadian population, but purchased 26% of the organic food sold in Canada in 2006.^[123]

Europe

Denmark

- In 2012, organic products accounted for 7.8% of the total retail consumption market in Denmark, the highest national market share in the world.^[124] Many public institutions have voluntarily committed themselves to buy some organic food and in Copenhagen 75 % of all food served in public institutions is organic. A governmental action plan initiated in 2012-2014 aims at 60 % organic food in all public institutions across the country before 2020.^{[125]:4}
- In 1987, the first Danish Action Plan was implemented which was meant to support and stimulate farmers to switch from conventional food production systems to organic ones. Since then Denmark has constantly worked on further developing the market by promoting organic food and keeping prices low in comparison to conventional food products by offering farmers subvention and extra support if they choose to produce organic food. Then and even today is the bench mark for organic food policy and certification of organic food in the whole world. The new European Organic food label and organic food policy was developed based on the 1987 Danish Model.^[126]

Austria

- In 2011, 7.4% of all food products sold in Austrian supermarkets (including discount stores) were organic.^[127] In 2007, 8,000 different organic products were available.^[128]

Italy

- Since 2000, the use of some organic food is compulsory in Italian schools and hospitals. A 2002 law of the Emilia Romagna region implemented in 2005, explicitly requires that the food in nursery and primary schools (from 3 months to 10 years) must be 100% organic, and the food in meals at schools, universities and hospitals must be at least 35% organic.^[129]

Poland

- In 2005 7 percent of Polish consumers buy food that was produced according to the EU-Eco-regulation. The value of the organic market is estimated at 50 million euros (2006).^[130]

Romania

- 70%–80% of the local organic production, amounting to 100 million euros in 2010, is exported. The organic products market grew to 50 million euros in 2010.^[131]

Switzerland

- As of 2012, 11 per cent of Swiss farms are organic. Bio Suisse, the Swiss organic producers' association, provides guidelines for organic farmers.^[132]

Ukraine

- In 2009 Ukraine was in 21st place in the world by area under cultivation of organic food. Much of its production of organic food is exported and not enough organic food is available on the national market to satisfy the rapidly increasing demand.^[133] The size of the internal market demand for organic products in Ukraine was estimated at over 5 billion euros in 2011, with rapid growth projected for this segment in the future.^[134] Multiple surveys show that the majority of the population of Ukraine is willing to pay more to buy organic food.^{[135][136]} On the other hand, many Ukrainians have traditionally maintained their own garden plots, and this may result in underestimation of how much organically produced food is actually consumed in Ukraine.
- The Law on Organic Production was passed by Ukraine's parliament in April 2011, which in addition to traditional demands for certified organic food also banned the use of GMOs or any products containing GMOs.^[137] However, the law was not signed by the President of Ukraine^[138] and in September 2011 it was repealed by the Verkhovna Rada itself.^[139] Attempts to pass a new law on organic food production took place throughout 2012.^[140]

United Kingdom

- Organic food sales increased from just over £100 million in 1993/94 to £1.21 billion in 2004 (an 11% increase on 2003).^[141] In 2010, the UK sales of organic products fell 5.9% to £1.73 billion. 86% of households buy organic products, the most popular categories being dairies (30.5% of sales) and fresh fruits and vegetables (23.2% of sales). 4.2% of UK farmland is organically managed.^[142]

Latin America

Cuba

- After the collapse of the Soviet Union in 1991, agricultural inputs that had previously been purchased from Eastern bloc countries were no longer available in Cuba, and many Cuban farms converted to organic methods out of necessity.^[143] Consequently, organic agriculture is a mainstream practice in Cuba, while it remains an alternative practice in most other countries. Although some products called organic in Cuba would not satisfy certification requirements in other countries (crops may be genetically modified, for example^{[144][145]}), Cuba exports organic citrus and citrus juices to EU markets that meet EU organic standards. Cuba's forced conversion to organic methods may position the country to be a global supplier of organic products.^[146]

See also

- Agroecology
- Genetically modified food
- List of organic food topics
- List of foods
- Natural foods
- Organic beans
- Organic clothing
- Organic farming
- Permaculture
- Soil Association
- Whole foods

References

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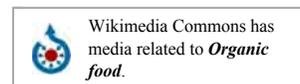
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External links

- Organic Consumers Association (<http://www.organicconsumers.org/>)
- Organic Information Center (<http://www.Organic.org/>)
- A World Map of Organic Agriculture (<http://orgprints.org/19535/1/Paull%26Hennig2011EJSS.pdf>)
- USDA National Organic Program (<http://www.ams.usda.gov/AMSv1.0/ams.fetchTemplateData.do?template=TemplateA&navID=NationalOrganicProgram&leftNav=NationalOrganicProgram&page=NOPNationalOrganicProgramHome&acct=nop>) Responsible for administering organic food production & labeling standards in the United States
- Organic certification and standards at gov.UK (<https://www.gov.uk/organic-certification-and-standards>)
- "Organics Olympiad 2011: Global Indices of Leadership in Organic Agriculture" (<http://orgprints.org/18860/1/Paull2011OlympiadJSDS.pdf>)—Journal of Social and Development Sciences



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