Economics[edit]

The economics of organic farming, a subfield of agricultural economics, encompasses the entire process and effects of organic farming in terms of human society, including social costs, opportunity costs, unintended consequences, information asymmetries, and economies of scale.

Labour input, carbon and methane emissions, energy use, eutrophication, acidification, soil quality, effect on biodiversity, and overall land use vary considerably between individual farms and between crops, making general comparisons between the economics of organic and conventional agriculture difficult.[91][92]

In the European Union "organic farmers receive more subsidies under agri-environment and animal welfare subsidies than conventional growers".[93]

Geographic producer distribution[edit]

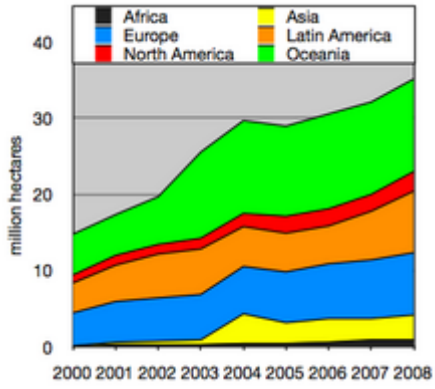
The markets for organic products are strongest in North America and Europe, which as of 2001 are estimated to have $6 and $8 billion respectively of the $20 billion global market.[60]:6 As of 2007 Australasia has 39% of the total organic farmland, including Australia's 11,800,000 hectares (29,000,000 acres) but 97% of this land is sprawling rangeland (2007:35). US sales are 20x as much.[60]:7 Europe farms 23% of global organic farmland (6,900,000 ha (17,000,000 acres)), followed by Latin America and the Caribbean with 20% (6,400,000 ha (16,000,000 acres)). Asia has 9.5% while North America has 7.2%. Africa has 3%.[94]

Besides Australia,[95] the countries with the most organic farmland are Argentina (3.1 million hectares (7.7 million acres)), China (2.3 million hectares (5.7 million acres)), and the United States (1.6 million hectares (4.0 million acres)). Much of Argentina's organic farmland is pasture, like that of Australia (2007:42). Spain, Germany, Brazil (the world's largest agricultural exporter), Uruguay, and England follow the United States in the amount of organic land (2007:26).

In the European Union (EU25) 3.9% of the total utilized agricultural area was used for organic production in 2005. The countries with the highest proportion of organic land were Austria (11%) and Italy (8.4%), followed by the Czech Republic and Greece (both 7.2%). The lowest figures were shown for Malta (0.2%), Poland (0.6%) and Ireland (0.8%).[96][97] In 2009, the proportion of organic land in the EU grew to 4.7%. The countries with the highest share of agricultural land were Liechtenstein (26.9%), Austria (18.5%) and Sweden (12.6%).[98] 16% of all farmers in Austria produced organically in 2010. By the same year the proportion of organic land increased to 20%.[99] In 2005, 168,000 hectares (420,000 acres) of land in Poland was under organic management.[100] In 2012, 288,261 hectares (712,310 acres) were under organic production, and there were about 15,500 organic farmers; retail sales of organic products were EUR 80 million in 2011. As of 2012 organic exports were part of the government's economic development strategy.[101]

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.[102] Consequently, organic agriculture is a mainstream practice in Cuba, while it remains an alternative practice in most other countries.[103][104] Cuba's organic strategy includes development of genetically modified crops; specifically corn that is resistant to the palomilla moth.[103]

Growth[edit]



Organic farmland by world region (2000–2008)

In 2001, the global market value of certified organic products was estimated at US$20 billion. By 2002, this was US$23 billion and by 2015 more than US$43 billion.[105] By 2014, retail sales of organic products reached US$80 billion worldwide.[106] North America and Europe accounted for more than 90% of all organic product sales.[106] In 2018 Australia accounted for 54% of the world's certified organic land with the country recording more than 35,000,000 verified organic hectares (86,000,000 acres).[107]

Organic agricultural land increased almost fourfold in 15 years, from 11 million hectares (27 million acres) in 1999 to 43.7 million hectares (108 million acres) in 2014.[106] Between 2013 and 2014, organic agricultural land grew by 500 thousand hectares (1,200,000 acres) worldwide, increasing in every region except Latin America.[106] During this time period, Europe's organic farmland increased 260 thousand hectares (640,000 acres) to 11.6 million hectares (29 million acres) (+2.3%), Asia's increased 159 thousand hectares (390,000 acres) to 3.6 million hectares (8.9 million acres) (+4.7%), Africa's increased 54 thousand hectares (130,000 acres) to 1.3 million hectares (3.2 million acres) total (+4.5%), and North America's increased 35 thousand hectares (86,000 acres) to 3.1 million hectares (7.7 million acres) total (+1.1%).[106] As of 2014, the country with the most organic land was Australia (17.2 million hectares (43 million acres)), followed by Argentina (3.1 million hectares (7.7 million acres)), and the United States (2.2 million hectares (5.4 million acres)).[106] Australia's organic land area has increased at a rate of 16.5% per annum for the past eighteen years.[107]

In 2013, the number of organic producers grew by almost 270,000, or more than 13%.[106] By 2014, there were a reported 2.3 million organic producers in the world.[106] Most of the total global increase took place in the Philippines, Peru, China, and Thailand.[106] Overall, the majority of all organic producers are in India (650,000 in 2013), Uganda (190,552 in 2014), Mexico (169,703 in 2013) and the Philippines (165,974 in 2014).[106]

In 2016, organic farming produced over 1 million metric tons (980,000 long tons; 1,100,000 short tons) of bananas, over 800 thousand metric tons (790,000 long tons; 880,000 short tons) of soybean, and just under 500 thousand metric tons (490,000 long tons; 550,000 short tons) of coffee.[108]

Productivity[edit]

Studies comparing yields have had mixed results.[109] These differences among findings can often be attributed to variations between study designs including differences in the crops studied and the methodology by which results were gathered.

A 2012 meta-analysis found that productivity is typically lower for organic farming than conventional farming, but that the size of the difference depends on context and in some cases may be very small.[110] While organic yields can be lower than conventional yields, another meta-analysis

published in Sustainable Agriculture Research in 2015, concluded that certain organic on-farm practices could help narrow this gap. Timely weed management and the application of manure in conjunction with legume forages/cover crops were shown to have positive results in increasing organic corn and soybean productivity.

Another meta-analysis published in the journal *Agricultural Systems* in 2011 analyzed 362 datasets and found that organic yields were on average 80% of conventional yields. The author's found that there are relative differences in this yield gap based on crop type with crops like soybeans and rice scoring higher than the 80% average and crops like wheat and potato scoring lower. Across global regions, Asia and Central Europe were found to have relatively higher yields and Northern Europe relatively lower than the average.[111]

Long term studies[edit]

A study published in 2005 compared conventional cropping, organic animal-based cropping, and organic legume-based cropping on a test farm at the Rodale Institute over 22 years.[112] The study found that "the crop yields for corn and soybeans were similar in the organic animal, organic legume, and conventional farming systems". It also found that "significantly less fossil energy was expended to produce corn in the Rodale Institute's organic animal and organic legume systems than in the conventional production system. There was little difference in energy input between the different treatments for producing soybeans. In the organic systems, synthetic fertilizers and pesticides were generally not used". As of 2013 the Rodale study was ongoing[113] and a thirty-year anniversary report was published by Rodale in 2012.[114]

A long-term field study comparing organic/conventional agriculture carried out over 21 years in Switzerland concluded that "Crop yields of the organic systems averaged over 21 experimental years at 80% of the conventional ones. The fertilizer input, however, was 34 – 51% lower, indicating an efficient production. The organic farming systems used 20 – 56% less energy to produce a crop unit and per land area this difference was 36 – 53%. In spite of the considerably lower pesticide input the quality of organic products was hardly discernible from conventional analytically and even came off better in food preference trials and picture creating methods."[115]

Profitability[edit]

In the United States, organic farming has been shown to be 2.7 to 3.8 times more profitable for the farmer than conventional farming when prevailing price premiums are taken into account.[116] Globally, organic farming is 22–35% more profitable for farmers than conventional methods, according to a 2015 meta-analysis of studies conducted across five continents.[117]

The profitability of organic agriculture can be attributed to a number of factors. First, organic farmers do not rely on synthetic fertilizer and pesticide inputs, which can be costly. In addition, organic foods currently enjoy a price premium over conventionally produced foods, meaning that organic farmers can often get more for their yield.

The price premium for organic food is an important factor in the economic viability of organic farming. In 2013 there was a 100% price premium on organic vegetables and a 57% price premium for organic fruits. These percentages are based on wholesale fruit and vegetable prices, available through the United States Department of Agriculture's Economic Research Service.[118] Price premiums exist not only for organic versus nonorganic crops, but may also vary depending on the venue where the product is sold: farmers' markets, grocery stores, or wholesale to restaurants. For many producers, direct sales at farmers' markets are most profitable because the farmer receives the entire markup, however this is also the most time and labour-intensive approach.[119]

There have been signs of organic price premiums narrowing in recent years, which lowers the economic incentive for farmers to convert to or maintain organic production methods.[120] Data from 22 years of experiments at the Rodale Institute found that, based on the current yields and production costs associated with organic farming in the United States, a price premium of only 10% is required to achieve parity with conventional farming.[120] A separate study found that on a global scale, price premiums of only 5-7% were needed to break even with conventional methods.[117] Without the price premium, profitability for farmers is mixed.[60]:11

For markets and supermarkets organic food is profitable as well, and is generally sold at significantly higher prices than non-organic food.[121]

Energy efficiency[edit]

Compared to conventional agriculture, the energy efficiency of organic farming depends upon crop type and farm size.[92][122]

Two studies – both comparing organically- versus conventionally-farmed apples – declare contradicting results, one saying organic farming is more energy efficient, the other saying conventionally is more efficient.[122][123]

It has generally been found that the labor input per unit of yield was higher for organic systems compared with conventional production.[122]

Sales and marketing[edit]

Most sales are concentrated in developed nations. In 2008, 69% of Americans claimed to occasionally buy organic products, down from 73% in 2005. One theory for this change was that consumers were substituting "local" produce for "organic" produce.[124][125]

Distributors[edit]

The USDA requires that distributors, manufacturers, and processors of organic products be certified by an accredited state or private agency.[126] In 2007, there were 3,225 certified organic handlers, up from 2,790 in 2004.[127]

Organic handlers are often small firms; 48% reported sales below $1 million annually, and 22% between $1 and $5 million per year.[128] Smaller handlers are more likely to sell to independent natural grocery stores and natural product chains whereas large distributors more often market to natural product chains and conventional supermarkets, with a small group marketing to independent natural product stores.[127] Some handlers work with conventional farmers to convert their land to organic with the knowledge that the farmer will have a secure sales outlet. This lowers the risk for the handler as well as the farmer. In 2004, 31% of handlers provided technical support on organic standards or production to their suppliers and 34% encouraged their suppliers to transition to organic.[126] Smaller farms often join in cooperatives to market their goods more effectively.

93% of organic sales are through conventional and natural food supermarkets and chains, while the remaining 7% of U.S. organic food sales occur through farmers' markets, foodservices, and other marketing channels.[129]

Direct-to-consumer sales[edit]

In the 2012 Census, direct-to-consumer sales equalled $1.3 billion, up from $812 million in 2002, an increase of 60 percent. The number of farms that utilize direct-to-consumer sales was 144,530 in 2012 in comparison to 116,733 in 2002.[130] Direct-to-consumer sales include farmers'

markets, community supported agriculture (CSA), on-farm stores, and roadside farm stands. Some organic farms also sell products direct to retailer, direct to restaurant and direct to institution.[131] According to the 2008 Organic Production Survey, approximately 7% of organic farm sales were direct-to-consumers, 10% went direct to retailers, and approximately 83% went into wholesale markets. In comparison, only 0.4% of the value of convention agricultural commodities were direct-to-consumers.[132]

While not all products sold at farmer's markets are certified organic, this direct-to-consumer avenue has become increasingly popular in local food distribution and has grown substantially since 1994. In 2014, there were 8,284 farmer's markets in comparison to 3,706 in 2004 and 1,755 in 1994, most of which are found in populated areas such as the Northeast, Midwest, and West Coast.[133]

Labour and employment[edit]

Organic production is more labour-intensive than conventional production.[134] Increased labor cost is one factor that contributes to organic food being more expensive.[134] Organic farming's increased labor requirements can be seen in a good way providing more job opportunities for people. The 2011 UNEP Green Economy Report suggests that "[a]n increase in investment in green agriculture is projected to lead to growth in employment of about 60 per cent compared with current levels" and that "green agriculture investments could create 47 million additional jobs compared with BAU2 over the next 40 years".[135]

Much of the growth in women labour participation in agriculture is outside the "male dominated field of conventional agriculture". Organic farming has a greater percentage of women working in the farms with 21% compared to farming in general with 14%.

World's food security[edit]

In 2007 the United Nations Food and Agriculture Organization (FAO) said that organic agriculture often leads to higher prices and hence a better income for farmers, so it should be promoted. However, FAO stressed that organic farming could not feed the current human population, much less the larger future population. Both data and models showed that organic farming was far from sufficient. Therefore, chemical fertilizers were needed to avoid hunger.[136] Other analysis by many agribusiness executives, agricultural and environmental scientists, and international agriculture experts concluded that organic farming would not only increase the world's food supply, but might be the only way to eradicate hunger.[137]

FAO stressed that fertilizers and other chemical inputs can increase production, particularly in Africa where fertilizers are currently used 90% less than in Asia.[136] For example, in Malawi the yield has been boosted using seeds and fertilizers.[136]

Also NEPAD, a development organization of African governments, announced that feeding Africans and preventing malnutrition requires fertilizers and enhanced seeds.[138]

According to a 2012 study from McGill University, organic best management practices show an average yield only 13% less than conventional.[139] In the world's poorer nations where most of the world's hungry live, and where conventional agriculture's expensive inputs are not affordable for the majority of farmers, adopting organic management actually increases yields 93% on average, and could be an important part of increased food security.[137][140]

Capacity building in developing countries[edit]

Organic agriculture can contribute to ecological sustainability, especially in poorer countries.[141] The application of organic principles enables employment of local resources (e.g., local seed varieties,

manure, etc.) and therefore cost-effectiveness. Local and international markets for organic products show tremendous growth prospects and offer creative producers and exporters excellent opportunities to improve their income and living conditions.[142]

Organic agriculture is knowledge intensive. Globally, capacity building efforts are underway, including localized training material, to limited effect. As of 2007, the International Federation of Organic Agriculture Movements hosted more than 170 free manuals and 75 training opportunities online.[*citation needed*]

In 2008 the United Nations Environmental Programme (UNEP) and the United Nations Conference on Trade and Development (UNCTAD) stated that "organic agriculture can be more conducive to food security in Africa than most conventional production systems, and that it is more likely to be sustainable in the long-term"[143] and that "yields had more than doubled where organic, or near-organic practices had been used" and that soil fertility and drought resistance improved.[144]

Millennium Development Goals[edit]

The value of organic agriculture (OA) in the achievement of the Millennium Development Goals (MDG), particularly in poverty reduction efforts in the face of climate change, is shown by its contribution to both income and non-income aspects of the MDGs. These benefits are expected to continue in the post-MDG era. A series of case studies conducted in selected areas in Asian countries by the Asian Development Bank Institute (ADBI) and published as a book compilation by ADB in Manila document these contributions to both income and non-income aspects of the MDGs. These include poverty alleviation by way of higher incomes, improved farmers' health owing to less chemical exposure, integration of sustainable principles into rural development policies, improvement of access to safe water and sanitation, and expansion of global partnership for development as small farmers are integrated in value chains.[145]

A related ADBI study also sheds on the costs of OA programs and set them in the context of the costs of attaining the MDGs. The results show considerable variation across the case studies, suggesting that there is no clear structure to the costs of adopting OA. Costs depend on the efficiency of the OA adoption programs. The lowest cost programs were more than ten times less expensive than the highest cost ones. However, further analysis of the gains resulting from OA adoption reveals that the costs per person taken out of poverty was much lower than the estimates of the World Bank,[146] based on income growth in general or based on the detailed costs of meeting some of the more quantifiable MDGs (e.g., education, health, and environment).[147]

Externalities[edit]

Agriculture imposes negative externalities upon society through public land and other public resource use, biodiversity loss, erosion, pesticides, nutrient pollution, subsidized water usage, subsidy payments and assorted other problems. Positive externalities include self-reliance, entrepreneurship, respect for nature, and air quality.[*citation needed*] Organic methods differ from conventional methods in the impacts of their respective externalities, dependent on implementation and crop type. Overall land use is generally higher for organic methods, but organic methods generally use less energy in production.[92][148] The analysis and comparison of externalities is complicated by whether the comparison is done using a per unit area measurement or per unit of production, and whether analysis is done on isolated plots or on farm units as a whole.[149]

Measurements of biodiversity are highly variable between studies, farms, and organism groups. "Birds, predatory insects, soil organisms and plants responded positively to organic farming, while non-predatory insects and pests did not. A 2005 review found that the positive effects of organic farming on abundance were prominent at the plot and field scales, but not for farms in matched landscapes."[150]

Other studies that have attempted to examine and compare conventional and organic systems of farming and have found that organic techniques reduce levels of biodiversity less than conventional systems do, and use less energy and produce less waste when calculated per unit area, although not when calculated per unit of output. "Farm comparisons show that actual (nitrate) leaching rates per hectare[/acre] are up to 57% lower on organic than on conventional fields. However, the leaching rates per unit of output were similar or slightly higher." "On a per-hectare[/-acre] scale, the CO_2 emissions are 40 – 60% lower in organic farming systems than in conventional ones, whereas on a per-unit output scale, the CO_2 emissions tend to be higher in organic farming systems."[149][151]

It has been proposed that organic agriculture can reduce the level of some negative externalities from (conventional) agriculture. Whether the benefits are private, or public depends upon the division of property rights.[152]