

Why Eat Organic

Jim Riddle

January 12, 2012

http://www.extension.org/organic_production



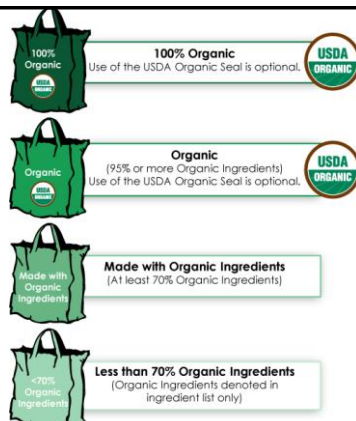
Why Eat Organic



Jim Riddle

Organic Outreach Coordinator - University of Minnesota
Southwest Research and Outreach Center

www.organicecology.umn.edu
www.eorganic.info



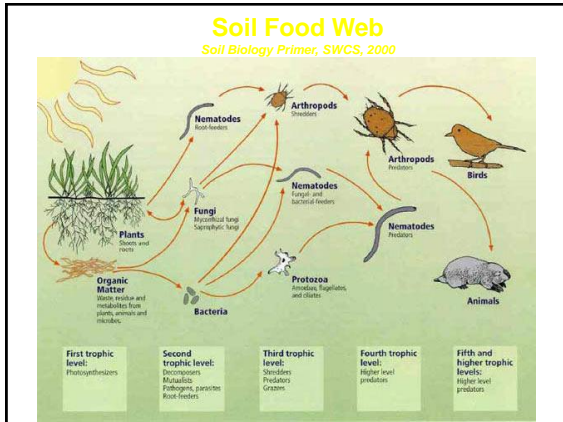
205.2 Terms defined "Organic production"

"A production system that is managed ... to respond to site-specific conditions by integrating cultural, biological, and mechanical practices that foster cycling of resources, promote ecological balance, and conserve biodiversity."

Fundamental Organic Principle

Healthy soil ⇒ healthy plants ⇒
healthy animals ⇒ healthy
people ⇒ healthy earth





ISU - Organic Production Increases Yields and Builds Soil Quality

Results from the ongoing study of conventional and organic cropping systems by Iowa State researchers show that organic systems increase yields and improve soil quality.

By the fourth year in an organic crop rotation, organic corn and soybean yields rose above conventionally managed fields. The improving performance in the organic plots is attributed to soil quality improvements: more soil organic matter, enhanced microbial activity in more diverse communities of organisms, and reduced soil acidity.

<http://extension.agron.iastate.edu/organicag/rn.html>

ARS - Organic Builds Soil Better Than No-Till

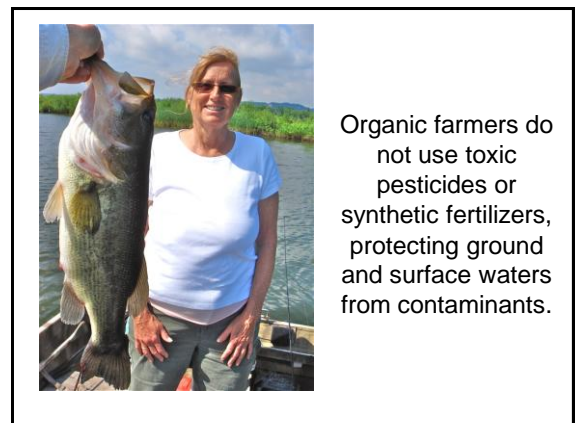
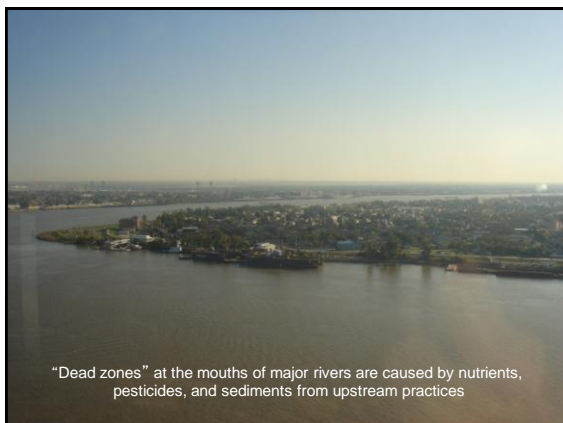
Long-term USDA-ARS research at Beltsville, Maryland, has shown that organic farming can build soil organic matter better than conventional no-till farming.

From 1994 to 2002, ARS researcher John Teasdale compared minimal-tillage organic corn, soybean, and wheat with the same crops grown conventionally with no-till.

Teasdale's study showed that organic farming built up soil better than conventional no-till because use of manure and cover crops more than offsets losses from tillage.

In addition, Teasdale and ARS soil scientist Michel Cavigelli showed that after 10 years, corn yields were higher in diverse organic rotations that included a perennial legume.

<http://www.ars.usda.gov/is/AR/archive/jul07/soil0707.htm>



Nitrates and Groundwater

University of Minnesota researchers found that alternative cropping systems, including organic, reduced the amount of water lost in tile drainage by 41 percent compared to a conventional corn-soybean rotation.

Alternative farming practices also reduced nitrate-nitrogen losses by between 59 percent and 62 percent.

Journal of Environmental Quality, July-August 2007.

Proceedings of the National Academy of Sciences March 21, 2006

In long-term research at Washington State, nitrogen (N) losses to groundwater and the atmosphere were reduced in organic orchards, relative to conventional orchards. Annual nitrate leaching was 4.4-5.6 times higher in conventional plots than in organic plots.

The organically farmed soils exhibited higher potential denitrification rates, greater denitrification efficiency, higher levels of organic matter, and greater microbial activity than the conventionally farmed soils.

The study demonstrates that organic practices support more active and efficient soil microbial communities, shift the balance of N₂ emissions and nitrate losses, and reduce environmentally damaging nitrate losses. These benefits boost the overall efficiency of nitrogen utilization within an organic system, and point the way toward improved environmental and economic farming system performance.

Drought Tolerance

A paper by Rodale Institute researchers, Don Lotter, Rita Seidel, and Bill Liebhardt, describes not only how the organic system gives better yields of corn and soybeans under severe drought conditions, but also shows how the organic system gives better environmental stability under flood conditions, by allowing less runoff and harvesting more water for groundwater recharge.

The authors showed that in five out of six of the drought years during the 21-year experiment, corn yields were significantly higher in the organic treatments than in the conventional treatment.

The higher yields in the organic treatments are believed to be due to the higher water holding capacity of soils in the organic treatments. Better colonization of roots by beneficial mycorrhizal fungi in organic crops may also play a role.

American Journal of Alternative Agriculture, September 2003



Organic farmers do not use genetically engineered products - seeds, planting stock, insecticides, inoculants, or growth hormones.



Scientists in North Dakota have now found that genetically engineered canola has escaped and cross-pollinated with wild relatives, creating transgenic weeds that are resistant to herbicides.

PLoS One. 2011;6(10):e25736. Epub 2011 Oct 5.
<http://www.plosone.org/article/info:doi/10.1371/journal.pone.0025736>

GM Bt Toxin Found in Midwest Streams

According to researchers from Notre Dame, Loyola, Indiana and Southern Illinois Universities, Bt corn residues and associated Cry1Ab proteins are widely distributed and persistent in the headwater streams of the Corn Belt landscape, and can be measured in the water column 6 months after harvest.

"Occurrence of maize detritus and a transgenic insecticidal protein (Cry1Ab) within the stream network of an agricultural landscape"
<http://www.pnas.org/content/early/2010/09/22/1006925107.full.pdf>

Bt Corn Harms Aquatic Organisms

Researchers at Indiana University have found that genetically engineered Bt corn harms aquatic insects and disrupts stream ecosystems. Caddisfly larva experienced high mortality and stunted growth when exposed to Bt corn pollen and crop residues.

Proceedings of the National Academies of Sciences
(Vol. 104, No. 41)



Corn rootworm resistance to Bt hybrids expressing the Cry3Bb1 toxin has now been documented by Iowa State University researchers.

Gassmann AJ, Petzold-Maxwell JL, Keweshan RS, Dunbar MW (2011)
"Field-Evolved Resistance to Bt Maize by Western Corn Rootworm."
<http://www.plosone.org/article/info:doi%2F10.1371%2Fjournal.pone.0022629>

Monarch Declines

Published research attributes decreasing Monarch butterfly populations to the loss of milkweed from the widespread use of "Roundup Ready" crops on millions of acres in the U.S.



Decline of monarch butterflies overwintering in Mexico: is the migratory phenomenon at risk? Insect Conservation and Diversity 2011.
<http://onlinelibrary.wiley.com/doi/10.1111/j.1752-4598.2011.00142.x/abstract>



Nearly 20 glyphosate-resistant weed species have been identified in the United States, with glyphosate-resistant horseweed, waterhemp and giant ragweed found throughout Illinois and Iowa. Weed scientists recommend applications of Atrazine, Simazine, 2,4-D, and other herbicides, in addition to glyphosate, for control.

Weed Science, Oct-Dec 2011
<http://web.extension.illinois.edu/ajmpu/news/news26408.html>



The U.S. Geologic Survey has shown that rainwater in 8 Midwestern states consistently contains over 100% of the Safe Drinking Water limit for Atrazine and Alachlor



Atrazine, alachlor, and other synthetic pesticides are not allowed in organic production. Numerous studies have shown that organic foods have lower levels of pesticide residues than non-organic foods.



Many farm families adopt organic practices to protect their family's health

Reduce Pesticide Exposure

According to USDA pesticide detection data, conventional crops were six times as likely as organic to contain multiple pesticide residues.

California Dept. of Health found pesticide residues in 31 percent of conventional foods and only 6.5 percent of organic samples, and found multiple residues nine times as often in conventional samples.

Consumers' Union tests found pesticide residues in 79 percent of conventional food samples and 27 percent of organic samples, with multiple residues ten times as common in the conventional food.

The levels of residues found in organic samples were also consistently lower than levels of the same pesticides found in conventional samples, in all three sets of residue data.

Food Additives and Contaminants, May 2002
B. P. Baker; C. M. Benbrook; E. Groth; K. Lutz Benbrook

Environmental Health Perspectives

Researchers at the University of Washington found that a diet composed of predominantly organic food "provides a dramatic and immediate protective effect against exposures to organophosphorous (OP) pesticides."

Twenty-three children were enrolled in the study, which included three phases of testing for OP insecticide metabolites in urine.

Phase one - diet of conventionally grown foods.

Phase two - five days of a predominantly organic diet.

Phase three - return to a conventional diet.

All 23 children had OP insecticide metabolites in their urine in phase one, while levels were below the limit of detection during phase two, following the consumption of mostly organic food for just five days.

Once the children were back on the conventional food diet, the levels of insecticide metabolites in urine returned to those found in phase one.

The researchers concluded that, "consuming food grown using organic production methods can virtually eliminate exposures to a dangerous class of insecticides known to disrupt neurological development in infants and children."

Environmental Health Perspectives, Jan. 15, 2008
<http://ehp03.niehs.nih.gov/article/lookupArticle.action?articleURI=info:doi/10.1289/ehp.10912>

Prenatal Pesticide Exposure

According to three recent studies funded by the National Institutes of Health, children whose mothers were exposed to common pesticides are more likely to experience problems with cognitive development, including lower IQ and impaired memory and reasoning. The studies examined individuals from a range of ethnic backgrounds, and those who lived in both rural and urban settings.

Environmental Health Perspectives, April 21, 2011
<http://ehp03.niehs.nih.gov/article/info:doi/10.1289/ehp.1003185>

President's 2010 Cancer Panel Report

Urges consumers to choose foods grown without pesticides or chemical fertilizers, antibiotics, and growth hormones to help decrease risks of contracting cancer. "Exposure to pesticides can be decreased by choosing, to the extent possible, food grown without pesticides or chemical fertilizers. Similarly, exposure to antibiotics, growth hormones, and toxic run-off from livestock feedlots can be minimized by eating meat raised without these medications."

"Reducing Environmental Cancer Risk: What We Can Do Now," Dr. LaSalle Leffall, Jr., Howard University, and Dr. Margaret L. Kripke, M.D. Anderson Cancer Center in Houston, 2010.

Feed for organic animals must be 100% organic



Ruminants must have access to pasture during grazing season for at least 120 days/year with >30% dry matter intake.



Organic Milk

Studies have indicated that conjugated linoleic acids (CLA) naturally present in dairy products may have anti-diabetic, anti-mutagenic, anti-carcinogenic and anti-atherosclerotic effects on human health. Researchers in Germany, comparing the CLA content in organic and conventional milk, showed higher CLA, β -carotene, and α -tocopherol content in organic dairy products. The study also found significant differences in the CLA of cream from organic versus conventional milk.

3rd Quality Low Input Food (QLIF) Congress: Improving Sustainability in Organic and Low Input Food Production Systems, University of Hohenheim, Germany, March 20-23, 2007.
<http://orgprints.org/10119/>

Organic Milk and Meat Enhance the Nutritional Quality of Mom's Breast Milk

Mothers consuming mostly organic milk and meat products were found to have about 50 percent higher levels of rumenic acid in their breast milk. This Conjugated Linoleic Acid (CLA) is responsible for most of the health benefits of CLAs in milk and meat. The authors report that the greater reliance of organic beef and dairy farmers on pasture and forage grasses increases the levels of CLAs in milk and beef, and in turn in the breast milk of women eating organic animal products.

British Journal of Nutrition, June 2007



Taste and Nutrition

Journal of the American Chemical Society 2007

Ten-Year Comparison of the Influence of Organic and Conventional Crop Management Practices on the Content of Flavonoids in Tomatoes - UC Davis

Ten-year mean levels of quercetin and kaempferol in organic tomatoes were 79% and 97% higher than those in conventional tomatoes.

The levels of flavonoids increased over time in samples from organic treatments, whereas the levels of flavonoids did not vary significantly in conventional treatments.



How about Spuds?

Research published in 2005 comparing organic and conventional potatoes indicated lower nitrate content, higher vitamin C, and elevated concentrations of glycoalkaloids in potato varieties grown in organic farming systems.

Quality of organically and conventionally grown potatoes: Four-year study of micronutrients, metals, secondary metabolites, enzymic browning and organoleptic properties. Journal of Food Additives and Contaminants: Part A, 22(6), 514-534.

Grapefruit Too?

A study was published comparing conventional and organic production of pink grapefruit in Texas. Organic grapefruit had higher levels of ascorbic acid, certain health-promoting flavonoids, and sugars, and was lower in nitrates (a desirable nutritional attribute). It also had thinner, more yellow peels that would have graded "U.S. Fancy," a quality grade above the conventional fruit. Plus, the organic fruit had higher specific gravity, which is regarded as commercial advantage.

Journal of Agricultural and Food Chemistry (Vol. 55, 2007)



Antioxidants in Pears and Peaches

Researchers found a parallel increase in polyphenol content of organic peaches and pears as compared with corresponding conventional samples. Ascorbic and citric acids were higher in organic peaches than conventional, whereas α -tocopherol increased in organic pears. The data strongly suggest that metabolic changes, resulting in an improvement in the antioxidant defense system of the plant, occurred as a consequence of organic cultivation practices.

*Modulation of antioxidant compounds in organic vs conventional fruit (Peach, *Prunus persica* L. and Pear, *Pyrus communis* L.). Journal of Agricultural and Food Chemistry, 50(19), 5458-5462*



Blueberries



Researchers from the USDA and Rutgers University tested blueberries grown on five organic and conventional farms in New Jersey that shared the same soil, weather, and harvesting conditions. The effect of cultivation practices on fruit quality and antioxidant capacity in Bluecrop variety (*Vaccinium corymbosum* L.) of highbush blueberries was evaluated from random samples.

Results showed that organic blueberries had a significantly higher sugar content (fructose and glucose), malic acid, total phenolics, total anthocyanins, and antioxidant activity than fruit grown conventionally.

Fruit quality, antioxidant capacity, and flavonoid content of organically and conventionally grown Blueberries (2008) Journal of Agricultural and Food Chemistry, 56 (14), 5788-5794

Tomato Juice

Researchers in Spain have shown that organic tomato juice has statistically higher levels of antioxidants. "There appear to be genuine differences in the bioactive components of organic and conventional tomato juice not previously reported."



Food Chemistry, Vol 130 Issue 1
<http://www.sciencedirect.com/science/article/pii/S030814611009642>

Catsup Advisory Board

USDA scientists found that organic brands of catsup contained 57 percent higher levels of the health-promoting antioxidant lycopene, compared to six national brands.

The team also found twice the level of antioxidant activity in organic catsup compared to catsup sold in fast food restaurants and/or vending machines.

On average the organic brands had about two-thirds higher total antioxidant capacity compared to the major national brands.

Journal of Agricultural and Food Chemistry, Volume 52, Number 26, December 29, 2004

Journal of Wine Research, Vol. 14 # 2-3

A study of wines found that among 15 varieties of red wine, organic wines had the greatest concentrations of antioxidant activity and the highest level of total healthy polyphenols.

Contamination with mycotoxins was over three times higher in conventionally grown varieties compared to organic wines.

The study found that the combination of farming practices used by organic grape growers reduced the risk of mycotoxin formation.

www.organic-center.org
www.leopoldi.iastate.edu/organic/index.html



Lower Rates of Salmonella Infections

Scientists in the U.K. surveyed 454 commercial chicken farms in 2004-2005, of which 54% were positive for *Salmonella*. About one-quarter of the isolates were resistant to one or more antibiotics.

On conventional farms with caged hens, 23.4% of the farms tested positive for *Salmonella*, compared to just 4.8% in free-range organic flocks. The research also showed that the bigger the holding size of chicken barns, the greater the *Salmonella* infection rate. Farms with 30,000 birds or more in one barn had four-times the infection rate of organic farms with the maximum size barn allowed by the Soil Association (5,000 birds or less).

L.C. Snow et al., "Survey of the prevalence of Salmonella species on commercial laying farms in the United Kingdom," The Veterinary Record, October 6, 2007.

More on Salmonella

Scientists at the University of Georgia have found that 38.8% of conventional chickens tested were infected with *Salmonella*, while only 5.6% of organic birds were infected.

27.5% of conventional feed tested contained *Salmonella*, compared to 5% of organic feed tested.

39.7% of the *Salmonella* isolates from the conventional chickens were resistant to six antibiotics, while zero percent of isolates from organic birds were resistant.

Food Pathogens and Disease, Volume 7, Number 11, 2010.

Effect of Conventional and Organic Production Practices on the Prevalence and Antimicrobial Resistance of Campylobacter spp. in Poultry

Ohio State University, 2006

"Less than 2% of *Campylobacter* strains isolated from organically raised poultry were resistant to fluoroquinolones, while 46% and 67% of *Campylobacter* isolates from conventionally raised broilers and conventionally raised turkeys, respectively, were resistant to these antimicrobials."



Biodiversity Enhancement

Organic farming increases biodiversity at every level of the food chain – all the way from bacteria to mammals. This is the conclusion of the largest review ever done of studies from around the world comparing organic and conventional agriculture.

The study reviewed data from Europe, Canada, New Zealand and the US. Neither of the two groups of researchers who did the study – one from English Nature, a government agency which champions wildlife conservation, and one from the Royal Society for the Protection of Birds – has a vested interest in organic farming.

Biological Conservation (vol 122, p 113)

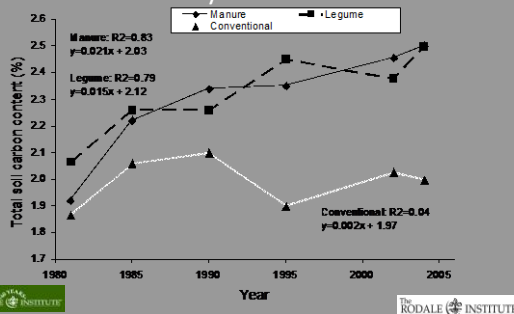
2007 USDA Ag Census

- 20,437 organic farms in US
- 2,577,418 organic acres
- Average organic sales = \$93,850
- Average age – all farmers – 57.1
- Average age – organic – 53.2



Organic farming practices, with soil-building crop rotations, cover crops, and the use of manure are excellent at sequestering carbon

Long term Soil Carbon Accumulation in Organic and Conventional Farming Systems



International Report on Organic Farming and Climate Change: "Organic Farming Can Help Mitigate Climate Change"

The International Trade Centre, the joint technical cooperation agency of the United Nations Conference on Trade and Development (UNCTAD) and the World Trade Organization, released a draft technical paper focusing on organic agriculture and mitigation and adaptation to predictable and unpredictable impacts of climate change.

The paper is based on a review of peer-reviewed scientific literature and concludes that, "organic agriculture has much to offer in both mitigation of climate change through its emphasis on closed nutrient cycles and is a particularly resilient and productive system for adaptation strategies."

Organic agriculture and the global food supply

Organic methods could produce enough food on a global per capita basis to sustain the current human population, and potentially an even larger population, without increasing the agricultural land base. This conclusion is based on a global dataset of 293 yield ratios for plant and animal production.

Data from temperate and tropical agroecosystems suggest that leguminous cover crops could fix enough nitrogen to replace the amount of synthetic fertilizer currently in use.

These results indicate that organic agriculture has the potential to contribute quite substantially to the global food supply, while reducing the detrimental environmental impacts of conventional agriculture.

Renewable Agriculture and Food Systems: 22(2); 86–108 June 2007

ORGANIC AGRICULTURE and FOOD SECURITY

The Food and Agriculture Organization of the United Nations cites research showing that, in subsistence agricultural systems, the adoption of organic practices results in increased yields up to 180 percent. The authors state, "Organic agriculture offers advantages in terms of enhancing food production where it is most needed by decreasing dependence on external inputs and increasing agro-ecosystem performance."

UN-FAO Organic Agriculture and Food Security, 2007.

<http://ftp.fao.org/docrep/fao/meeting/012/ah952e.pdf>

Access to Land and the Right to Food, 2011.

<http://www.srfood.org/index.php/en/component/content/article/984-access-to-land-and-the-right-to-food>



We are all part of the web of life



Find the slides and recording of this presentation at
<http://www.extension.org/pages/61954>

Register for upcoming webinars and view recorded
eOrganic webinars at
http://www.extension.org/organic_production

Additional questions? Ask them at
<http://www.extension.org/ask>

We need your feedback! Please fill out our follow-up
email survey!

