



## Organic Food Production Talking Points

### Hunger and Environmental Nutrition Dietetic Practice Group of the American Dietetic Association

[www.HENdpg.org](http://www.HENdpg.org)

**Mission:** Leading the future in sustainable and accessible food and water systems through dietetics education, research, and action.

**Vision:** HEN members are the most valued source of nutrition services to promote access to nutritious food and clean water from a secure and sustainable environment.

May 2006

Revised April 2007

Hunger  
and  
environmental  
nutrition®



A Dietetic Practice Group of  
**American  
Dietetic  
Association**

# Hunger and Environmental Nutrition DPG

## Introduction

Organic food is the fastest growing segment of the food industry. More organic food is entering the mainstream food distribution system and consumers are becoming interested in the origins of their food. They are asking more sophisticated questions and searching for information about the food supply from food and nutrition professionals.

The purpose of this document is to provide food and nutrition professionals, ADA Media Representatives and Spokespersons with information that they can utilize to speak knowledgeably about organic food production when speaking with the news media. Organic foods are products of a holistic system that is closely regulated and monitored by law:

- Organic Foods Production Act of 1990, Public Law 101-624 (<http://agriculture.senate.gov/Legislation/Compilations/AgMisc/OGFP90.pdf>).

Water, soil and air quality, environmental preservation and enhancement, biodiversity, humane animal treatment, safety for farm labor, and energy conservation are all integral to an organic system. Nutrition is one component of the system and an emerging area of research in this field.

The information in this document is presented in two forms. Following the introduction there is a user friendly single page of concise talking points drawn from the research. The talking points are divided into information about organic farming systems that have a large body of research followed by information about areas that require further research. The second section contains more detailed explanations and specific annotated references to the literature that support the basic concepts presented in the talking points.

This document was prepared by an Ad Hoc committee of members from the Hunger and Environmental Nutrition DPG#15 ([www.hendpg.org](http://www.hendpg.org)):

- Helen Costello, MS, RD, LD, 2006-2007 HEN DPG Chair
- Mary Jo Forbord, RD
- Alison Harmon, PhD, RD
- Keecha Harris, DrPH, RD
- Christine McCullum-Gomez, PhD, RD, LD
- Anne Patterson, RD, LDN

The committee wishes to acknowledge and thank our external content reviewers:

- James Riddle, Past-Chair of the United States National Organic Standards Board (NOSB) and Organic Outreach Coordinator, University of Minnesota ([www.organicecology.umn.edu](http://www.organicecology.umn.edu)).
- Chuck Benbrook, PhD, Chief Scientist, The Organic Center ([www.organic-center.org](http://www.organic-center.org)). Former Executive Director, Board of Agriculture, National Academy of Sciences.

This document was created June, 2006 and revised April, 2007.

## Organic Food Production Talking Points Revised April 2007

Concepts	Evidence-Based Facts	Requires Additional Research
<b>BENEFITS OF ORGANIC FARMING TO THE ENVIRONMENT</b>	<ul style="list-style-type: none"> <li>• An organic food production system creates healthy soils, the foundation for healthy crops.</li> <li>• Farming practices in an organic system include growing diverse crops and includes a crop rotation plan utilizing cover crops which are beneficial plants that prevent soil erosion, which enhance soil fertility and disrupt, weed, pest, and disease cycles.</li> <li>• Eliminates synthetic fertilizers thereby reducing nitrogen and phosphorous contamination of groundwater.</li> <li>• Conserves fossil fuel energy.</li> <li>• Reduces the use of pesticides that persist in the environment.</li> </ul>	
<b>BENEFITS OF ORGANIC FARMING TO THE FARMER</b>	<ul style="list-style-type: none"> <li>• Economic savings by using on farm inputs: crop rotations, composting.</li> <li>• Reduces exposure from persistent pesticides to farm labor and family members.</li> <li>• Organically produced foods contain fewer pesticide residues.</li> <li>• Exposure to conventional pesticides can have negative effects on both female and male fertility.</li> <li>• In developing countries, organic farming improves community and household food security.</li> <li>• Sustainable prices for organic products help farmers reinvest in the operations and encourage young people to enter farming.</li> </ul>	<ul style="list-style-type: none"> <li>• Current and emerging research shows that crop yields are consistent with or better than the same crop grown in conventional agriculture.</li> <li>• Better solutions are needed for some weed and plant disease problems, especially in hot and humid regions of the country.</li> </ul>
<b>BENEFITS OF ORGANIC FARMING TO THE CONSUMER</b>	<ul style="list-style-type: none"> <li>• Certain plants cultivated in an organic system contain higher levels of antioxidants.</li> <li>• Children who consume organic diets have reduced exposure to organophosphorous pesticides as measured by urine concentration in cross-over diet studies.</li> <li>• Research demonstrates improved flavor in organic strawberries versus conventionally produced.</li> <li>• Research demonstrates improved flavor in organically versus conventionally produced strawberries and improved taste in organically versus conventionally produced apples.</li> </ul>	<ul style="list-style-type: none"> <li>• Emerging research demonstrates improved taste in organically grown versus conventionally grown fruit.</li> <li>• While research is promising to suggest that plants cultivated in an organic systems are higher in certain nutrients, additional research is needed.</li> <li>• Organic production regulations do not allow the use of antibiotics in livestock. New research demonstrates that antibiotics are taken up in plants fertilized with animal manure from treated animals.</li> </ul>

\* A complete set of references can be obtained at [www.HENdpg.org](http://www.HENdpg.org).

# Hunger and Environmental Nutrition DPG

## Philosophy and Definitions of Organic Farming

- Submitted by Christine McCullum-Gomez, PhD, RD, LD

Organic farming systems rely on ecologically based practices, such as biological pest management and composting; and virtually exclude the use of synthetic chemicals, antibiotics, and hormones in crop production; and prohibit the use of antibiotics and hormones in livestock production (Greene and Kremen, 2003). Under organic farming systems, the fundamental components and natural processes of ecosystems – such as soil organism activities, nutrient cycling, and species distribution and competition – are used as farm management tools. Farmers adopt these systems as a way to lower input costs, conserve non-renewable resources, capture high-value markets, and boost farm income (Greene and Kremen, 2003).

Consumer demand is rising worldwide for organically produced foods, providing new market opportunities for farmers and marketing actors in both developed and developing countries. In 1991, the Codex Alimentarius Commission (CAC), a joint Food and Agriculture Organization (FAO)/World Health Organization (WHO) Food Standards Programme, began developing guidelines for the production, processing, labeling, and marketing of organically produced food. CAC guidelines on organic food take into account the current regulations in several countries as well as private standards applied by producer organizations. According to the Codex Alimentarius Commission (CAC), *“organic agriculture is a holistic management system which promotes and enhances agro-ecosystem health, including biodiversity, biological cycles, and soil biological activity.”* (Yussefi and Willer, 2003).

In the U.S., The Organic Foods Production Act of 1990 established national U.S. standards for organically produced foods in order to facilitate domestic marketing efforts. The final U.S. organic rule went into effect in October 2002. Organic crops cannot be irradiated, genetically engineered, or fertilized with sewage sludge. Farmland used to grow organic crops is prohibited from being treated with synthetic pesticides and herbicides for at least 3 years prior to harvest (Greene and Kremen, 2003). Several states and community-based organizations are investigating ways to facilitate production and marketing for locally-grown organic food. For example, “Sustain,” a public interest group based in Chicago, Illinois has started an initiative to build a regional organic food system in Illinois, Wisconsin, Michigan, and Indiana (Slama, 2002).

## Benefits of Organic Farming to the Environment

- Organic farming practices reduce groundwater pollution from nitrogen and phosphorus fertilizers, and improve soil fertility (Greene and Kremen, 2003).
- Growing an array of crops remains one of the hallmarks of successful organic farming. Diverse rotations improve soil fertility and break up pest cycles (Sustainable Agriculture Network, 2003).
- A 2-10 fold energy savings on switching to low-input/organic agriculture (The Independent Science Panel, 2005).
- 5-15% global fossil fuel emissions offset by sequestration of carbon in organically managed soils (The Independent Science Panel, 2005).
- Results from a Washington state study found that organic apple production was more environmentally sound and energy efficient than apples produced by other agricultural systems (conventional and integrated pest management apple production) (Reganold et al., 2001).

## Benefits of Organic Farming to the Farmer

- Results of a Washington state study found that organic apple production provided similar yields and higher profitability compared to apples produced by other agricultural systems (conventional and integrated pest management apple production) (Reganold et al., 2001).
- Organic systems produced better yields of corn and soybeans under severe drought conditions and also gave better environmental stability under flood conditions (Lotter, Seidel, & Liebhart, 2003)

- Scientists from Iowa State University reported that by the 3rd year, there was no significant difference between organic and conventional yields (soybeans and corn). And by the 4th year, organic soybeans and corn exceeded conventional yields (Delate and Cambardella, 2004)
- Organic agriculture is important to the food security of poor farmers and peasants located in environmentally fragile or market-marginalized areas. For example, Cuba reached self-sufficiency in fruits and vegetables through organic agriculture: about 7,000 organic urban gardens produce almost 20 kg of food per square meter (Hattam, 2002).
- Organic systems in Southwest Ethiopia have allowed people once dependent on food aid to increase their yields by 60%, enough food to feed themselves and even have surplus to sell at local markets (Hattam, 2002).
- Organic agriculture reduces farmers' occupational exposure to conventional pesticides, which may have negative health effects, such as: increased risk of prostate cancer (Alavanja et al, 2003); adverse effects on male and female fertility (Kumar, 2004; Sanchez-Pena et al, 2004; Petrelli & Figa-Talamance, 2001); and negative reproductive outcomes. (Garry, et. al., 2002, Schreinemachers, 2003).

## Benefits of Organic Farming to the Consumer

- Results from a Washington state study found that organic apple production provided better-tasting fruit than apples produced by other agricultural systems (conventional and integrated pest management apple production) (Reganold et al., 2001).
- Research demonstrates improved flavor in organic versus conventionally produced strawberries (Theur, 2006).
- At the Lincoln Elementary School in Olympia, Washington, the Organic Choices Salad Bar program increased fruit and vegetable servings by 27% by staff and students (Flock et al, 2003).
- Statistically significant differences have been reported in antioxidant levels in organic produce compared to conventional produce (in 13 out of 15 cases) (Benbrook, 2005a).
- Magkos et al. (2003) concluded there is a trend towards higher ascorbic acid content in organically grown leafy vegetables and potatoes and a lower protein concentration but of higher quality in some organic vegetables and cereal crops. However, these authors cautioned that there are only a few well-controlled studies that are capable of making valid comparisons, and, therefore, the compilation of results is difficult and generalization of conclusions regarding organically-produced versus conventionally-produced products should be made with caution (Magkos et al., 2003).
- Higher levels of Vitamin C (or ascorbic acid) have been reported for organic peaches (Carbonaro et al, 2002), organic tomatoes (Caris-Veyrat et al, 2004) and organic kiwifruit (Amodio et al, 2007) compared to their conventional counterparts.
- Organically-produced foods contain fewer pesticide residues (1/3 as many) compared to conventionally-grown foods (Baker et al., 2002).
  - A review of pesticide research published by the Ontario College of Family Physicians (Sanbourn et al, 2004) recommended that people reduce their exposure to pesticides whenever possible. This review concluded that there are consistent links to pesticides with serious illnesses such as cancer, reproductive problems, and neurological diseases, among others. It also was concluded that children are particularly vulnerable to pesticides (Sanborn et al, 2004). Children represent a sensitive population in terms of exposure to pesticides because they have higher rates of metabolism, less-mature immune systems, unique diets, and distinct patterns of activity and behavior when compared to adults (National Research Council, 1993).
- Recent work has indicated that children's diets may contain pesticides at levels above the acute population-adjusted reference dose (Fenske et al, 2002).
  - Consumption of organic fruits, vegetables, and juice can reduce children's exposure of organophosphorus pesticides from above to below the U.S. Environmental Protection's current guidelines, thereby shifting the exposures from a range of uncertain risk to a range of negligible risk (Curl et al, 2003). Organophosphorus pesticides are of particular concern because of their acute toxicity and widespread use, both residentially and agriculturally (WHO, 1986).

- A recent study found that organic diets significantly lower children's dietary exposure to organophosphorus pesticides (OP) commonly used in agricultural production (Lu et al, 2006). These authors concluded that an organic diet provides a dramatic and immediate effect against exposures to organophosphorus pesticides that are commonly used in agricultural production (Lu et al, 2006). The use of organic fertilizers may result in lower nitrate levels of some crops (Bourn and Prescott, 2002; Woese et al, 1997).
- Longer shelf lives and resistance to common spoilage organisms (Theur, 2006).

## Food Safety & Health Issues

- Studies investigating claims that eating organic foods increases exposure to micro-biological contaminants have found no evidence to support them (FAO, 2004). A scientific review article published in *Critical Reviews in Food Science and Nutrition* concluded that, "there is no evidence that organic foods may be more susceptible to microbiological contamination than conventional foods." (p. 1) (Bourn and Prescott, 2002).
- A more recent study found that *E. coli* prevalence in certified organic produce was not statistically different from that in conventional samples (Mukherjee et al, 2004). Note: among the organic farms included in this study, 8 were certified by accredited agencies and the rest – 24, were not certified organic producers. While there was no significant difference in *E. coli* percentages between conventional and certified organic produce, the percentage of *E. coli*-positive samples was higher in organic produce compared to conventional produce when the authors did not differentiate the produce from the certified, accredited organic farms with farms that only reported using organic practices.
- All organic foods must meet the same quality and safety standards applied to conventional foods. These include the CODEX General Principles of Food Hygiene and food safety programmes based on the Hazard Analysis and Critical Control Point (HACCP) system, where required by national regulations. Often, however, the standards of the individual organic certification body are even stricter (FAO, 2004).
- Organic farmers who use raw animal manure on crops for human consumption must wait at least 120 days between application of manure and harvest of crops (National Organic Rule.205-203(c) ). There are no comparable restrictions on the use of manure by non-organic farmers.
- The Food and Agriculture Organization (FAO) of the United Nations recently stated that "studies have not shown that consuming organic products leads to a greater risk of mycotoxin contamination." (FAO, 2004). FAO also has noted that, "it is important to have good agricultural, handling, and processing practices, as required by both organic and conventional agriculture, in order to minimize the potential for mold growth." Furthermore, a recent scientific review that compared mycotoxins in conventionally-produced and organically-produced foods concluded that mycotoxins are found about twice as frequently in conventionally-produced foods compared to organically-produced foods, at about twice the level (Benbrook, 2005b).
- According to Finamore et al 2004, "the majority of studies aimed at investigating the risk for health of organic foods have compared the amount of microorganisms, toxins, or pesticide residues present in organically and conventionally produced foods. Only a few studies have evaluated the effect of the consumption of organic versus conventional food on health, by analyzing mortality rate, body and organ weight, reproductive performance, and fertility of animals (Linder, 1973; Aehnelt and Hahn, 1978; Plocheberg, 1989; McSeehy, 1975; Scott, Greaves, & Scott, 1960). The results of these studies have indicated a slight improvement of these parameters after animals have been fed with organic compared to conventional food."(Finamore et al, 2004, p. 7426).
- Finamore et al (2004) found no higher risk of introducing toxic compounds with organic compared to conventional wheat that could affect fundamental cell functions, such as gut mucosal immune response and liver function, even in a condition of protein-energy malnutrition that induces greater susceptibility to the effects of toxic substances. The data of proliferative capacity of protein energy malnourished rats - when rat serum was used - showed an adverse effect of conventional wheat despite the lower content of deoxynivalenol (DON), a variety of mycotoxin (Finamore et al, 2004; p. 7430). These authors concluded that the conventional wheat sample tested represented a higher risk for lymphocyte function compared to the organically-grown wheat sample, at least in vulnerable conditions (Finamore et al, 2004; p. 7425).
- Results from a study by Kumara, et al (2005) show that plants absorb antibiotics from undigested antibiotics found in animal manure. The use of antibiotics in organic livestock are not permitted and thereby ensures that during on-farm nutrient cycling antibiotics do not contaminate the ground water, or plant soil amendments.

# Hunger and Environmental Nutrition DPG

## References

- Aehnelt, E, Hahn, J. Animal fertility: a possibility for biological quality-assay of food and feeds? *BioDynamics* 1978;125:36-47.
- Alavanja, MCR, Samanic, C, Dosemeci, M, Lubin, J, Tarone, R, Lynch, CF, Knott, C, Thomas, K, Hoppin, JA, Barker, J, Conble, J, Sandler, DP, Blair, A. Use of agricultural pesticides and prostate cancer risk in agricultural health study cohort. *Am J Epidemiol* 2003;157:800-814.
- Amodio, ML, Colelli, G, Hasey, JK, et al. A comparative study of composition and postharvest performance of organically and conventionally grown kiwifruits. *J Sci Food Agric*. Published online March 27, 2007.
- Baker, BP, Benbrook, CM, Groth, E, Lutz Benbrook, K. Pesticide residues in conventional, integrated pest management (IPM)-grown and organic foods: insights from three US data sets. *Food Additives and Contaminants* 2002;19(5):427-446.
- Benbrook, CM. *Elevating Antioxidant Levels in Foods through Organic Farming and Food Processing*. State of Science Review, Organic Center for Education and Promotion. 2005a. Available at: <http://www.organic-center.org>
- Benbrook, CM. *Breaking the Mold – Impacts of Organic and Conventional Farming Systems on Mycotoxins on Food and Livestock Feed*. State of Science Review, The Organic Center for Education and Promotion. 2005b. Available at: <http://www.organic-center.org>
- Bourn, D, Prescott, J. A comparison of the nutritional value, sensory qualities and food safety of organically and conventionally produced foods. *Critical Reviews in Food Science and Nutrition* 2002;42(1):1-34.
- Carbonaro, M, Mattera, M, Nicoli, S, Bergamo, P, Cappelloni, M. Modulation of antioxidant compounds in organic vs. conventional fruit (peach, *Prunus persica* L., and pear, *Pyrus communis* L.). *J Agric Food Chem*. 2002;50:5458-5462.
- Caris-Veyrat, C, Amiot, MJ, Tyssandier, V, et al. Influence of organic versus conventional agricultural practice on the antioxidant microconstituent content of tomatoes and derived purees; consequences on antioxidant plasma status in humans. *J Agric Food Chem*. 2004;52:6503-6509.
- Curl, C, Fenske, RA, Elgethun, K. Organophosphorus pesticide exposure of urban and suburban preschool children with organic and conventional diets. *Environmental Health Perspectives* 2003;111:377-382.
- Delate, K, Cambardella, CA. Organic production. Agroecosystem performance during transition to certified organic grain production. *Agronomy Journal*. 2004;96:1288-1298.
- Fenske, RA, Kedan, G, Lu, CA, et al. Assessment of organophosphorus pesticide exposure in the diets of pre-school children in Washington state. *J Expo Anal Environ Epidemiol*. 2002;12:21-28.
- Finamore, A, Serena Britti, M, Roselli, M, et al. Novel approach for food safety evaluation. Results of a pilot experiment to evaluate organic and conventional foods. *J Agric. Food Chem*. 2004;52:7425-7431.
- Flock, P, Petra, C, Ruddy, V, Peterangelo, J. *A Salad Bar Featuring Organic Choices: Revitalizing the School Lunch Program*. April 2003, Olympia, WA.
- Food and Agriculture Organization of the United Nations (FAO) Frequently asked questions on organic agriculture. 2004, pp. 1-10. Available at: <http://www.fao.org/organicag/fram11-e.htm>
- Garry, VF, Harkins, ME, Erickson, LL, Long-Simpson, LK, Holland, SE, Burroughs, BL. Birth defects, season of conception, and sex of children born to pesticide applicators living in the Red River Valley of Minnesota, USA. *Environ Health Perspect* 2002;110(suppl 3): 441-449.
- Greene C, Kremen A. *U.S. Organic Farming in 2000-2001: Adoption of Certified Systems*. U.S. Department of Agriculture, Economic Research Service, Resource Economics Division, Agriculture Bulletin No. 780, Washington DC; 2003.
- Hattam, C. *Organic Agriculture and Sustainable Agriculture and Rural Development*. Food and Agriculture Organization; May 2002. Available at: [http://www.fao.org/organicag/doc/oa\\_sard.htm](http://www.fao.org/organicag/doc/oa_sard.htm)
- Kumar, S. Occupational Exposure Associated with Reproductive Dysfunction. *J. Occup. Health*. 2004;46:1-19.
- Kumara, K., Gupta, SC, Baidoob, SK, Chandera, Y, and Rosena, CJ. Antibiotic uptake by plants from soil fertilized with animal manure. *J Environ Qual* 2005; 34:2082-2085.

# Hunger and Environmental Nutrition DPG

- Linder, MC. A review of the evidence for food quality differences in relation to fertilization of the soil with organic and mineral fertilizers. *BioDynamics* 1973;107:1-12.
- Lotter, DW, Seidel, R, Liebhart, W. The performance of organic and conventional cropping systems in an extreme climate year. *American Journal of Alternative Agriculture* 2003;18(3):146-154.
- Lu, C, Toepel, K, Irish, R, Fenske, RA, Barr, DA, Bravo, R. Organic diets significantly lower children's dietary exposure to organophosphorus pesticides. *Environ Health Perspect.* 2006; 114:260-263.
- Magkos F, Arvaniti F, Zampelas A. Organic food: nutritious food or food for thought? A review of the evidence. *Int J Food Sci Nutr.* 2003;54(5):357-371.
- McSeehy, TW. Reproductive performance of rabbits on organic and inorganic leys. *Plant Food Hum. Nutr.* 1975;25:193-203.
- Mukherjee, A, Speh, D, Dyck, E, Diez-Gonzalez, F. Preharvest evaluation of Coliforms, *Escherichia coli*, *Salmonella*, and *Escherichia coli* 0157:H7 in organic and conventional produce grown by Minnesota farmers. *Journal of Food Protection* 2004;67(5):894-900.
- National Research Council (NRC). *Pesticides in the Diets of Infants and Children*. Washington DC: National Academy Press; 1993.
- Petrilli, G. and Figa-Talamanca, I. Reduction in fertility in male greenhouse workers exposed to pesticides. *Eur. J. Epidemiology.* 2001;17:675-677.
- Plocheberg, K. Feeding experiments. A criterion for quality estimation of biologically and conventionally produced foods. *Agric Ecosyst. Environ.* 1989;27:419-428.
- Reganold, JP, et al. Sustainability of three apple production systems. *Nature* 2001;410: 926-30.
- Sanbourn, M, Cole, D, Kerr, K, et al. *Pesticides Literature Review: Systematic Review of Pesticide Human Health Effects*. Ontario, Canada: Ontario College of Family Physicians; April 2004. Available at: <http://www.ocfp.on.ca>
- Sanchez-Pena, LC, Reye, BE, Lopez-Camillo, L, Recio, R, Moran-Martinez, J, Cebrian, ML, and Quintanilla-Vega. Organophosphorous pesticide exposure alters sperm chromatin structure in Mexican agricultural workers. *Toxicology and Applied Pharmacology.* 2004;190:108-113.
- Schreinemachers, DM. Birth malformations and other adverse perinatal outcomes in four U.S. wheat producing states. *Environ Health Perspect.* 2003;111(9):1259-1264.
- Scott, PP, Greaves, JP, Scott, MG. Reproduction in laboratory animals as a measure of the value of some natural and processed foods. *J. Reprod. Fertil.* 1960;1:130-138.
- Slama, J. *The Land of Organic Opportunity: Steps to Building a Regional Organic Food System Serving Chicago*. Sustain: Chicago, Illinois; 2002. Available at: <http://www.sustainusa.org/localorganic>
- Sustainable Agriculture Network. *Opportunities in Agriculture: Transitioning to Organic Production*. Sustainable Agriculture Network, The National Outreach Arm of USDA-SARE; October 2003.
- Theur, RC. *Taste of Organic Food: Do Organic Fruits and Vegetables Taste Better than Conventional Fruits and Vegetables?* State of Science Review. Organic Center. September 2006. [www.organic-center.org/reportfiles/Taste SSR October final.pdf](http://www.organic-center.org/reportfiles/Taste_SSR_October_final.pdf)
- The Independent Science Panel: Promotion of Science for the Public Good; 2005. Available at: <http://www.indsp.org/SustainableWorldInitiative.php>
- Woese, K, Lange, D, Boess, C, Bogl, KW. A comparison of organically and conventionally grown foods – results of a review of the relevant literature. *J Sci Food Agric.* 1997;74:281-293.
- World Health Organization (WHO). *Organophosphorus Insecticides: A General Introduction, Volume 63*. New York: World Health Organization; 1986.
- Yussefi, M, Willer, H. *The World of Organic Agriculture 2003 – Statistics and Future Prospects*. International Federation of Organic Agriculture Movements (IFOAM), Tholey-Theley; 2003. Available at: <http://www.ifoam.org>.