Hot Topic – Organic Versus Conventional Food Production: Sowing the Seeds of Thought

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2009 ADA FNCE
Denver, Colorado
October 18th 2009

Presentation Objectives:

1) Review selected findings from the Organic Trade Association (OTA) and KIWI Magazine's *2009 U.S. Families' Organic Attitudes and Beliefs Study*.

2) Explain costs and benefits associated with organically- versus conventionally-produced foods.

2009 U.S. Families' Organic Attitudes & Beliefs Study

June 2009

A joint project of

Organic TRADE ASSOCIATION™

2009 OTA/KIWI U.S. Families' Organic Attitudes & Beliefs Study[1]

*This benchmarking study was conducted to:**

- Measure the extent to which families are incorporating organic choices into their lifestyle and profile households who choose organic.
- Determine factors that influence families' choice to purchase organic or not and gauge the influence of price, children & other factors on purchase decision.

**These are two of the seven OTA/KIWI study objectives.*

OTA/KIWI STUDY METHODOLOGY

- The target audience consists of KIWI Magazine's Parents' Advisory Board (PAB), supplemented with a national online panel of US households.
- Panelists were invited to participate in a web survey via email and provided an appropriate incentive to do so.
- All respondents were screened to be 18 and over with at least one child under the age of 18 in the household and to have sole or shared responsibility for household grocery store purchases.

METHODOLOGY (cont'd)

- Data collection took place between Monday April 6th 2009 and Monday April 13th 2009.
- A total of 1197 usable surveys were completed, including 602 KIWI PAB panelists and 595 national panelists.
- Data from both panels were combined & weighted to reflect the demographics of US households online.
- The total sample of 1197 reflects the target population of US households online at a confidence interval of +/- 3% at the 95% confidence level.

SUMMARY OF KEY FINDINGS

Profiling US families who buy organic

- Approximately three quarters (73%) of US families have purchased at least some organic products. However, in many product categories most parents choose organic products ‘only sometimes’, particularly in the case of non-food categories.

- Length of time in the organic market is a useful tool for segmenting parents and reveals a compelling profile of organic buyer groups as well as an interesting profile of parents who choose not to buy organic products.

US families who buy organic

Newly Organic parents (32%) (n = 387)….

• Began purchasing organic in the past two years, & are often quite knowledgeable about organic.

• Least likely among organic buyers to shop in natural food chain stores or local health/natural food stores.

• Have most likely entered the organic market in part due to the growing number of organic choices being presented by conventional grocers.

US families who buy organic

Experienced Organic parents (20%) (n = 239)

•Have between 2 and 5 years experience in the organic market.

• Are slightly more educated, wealthier and racially diverse compared to Newly Organic parents.

• Experienced organic shoppers purchase organic in a broad range of categories and shop more frequently in non-conventional grocery outlets.

US families who buy organic

Seasoned Organic parents (21%) (n = 248)

- Are the most experienced organic buyers with at least 5 years in the market and in some cases more than 15 years of experience.
- Are primarily Caucasian, highly educated, and wealthy.
- They buy organic in more categories more frequently and in more varied retail outlets.

US families who buy organic

- The largest category of organic buyers, *Newly Organic* parents (representing 32% of parents), are younger than other organic buyer groups with younger children.

- These younger parents (*Newly Organic*) are more active when it comes to incorporating organic into their and their children's lives, both in terms of product choices, as well as topics of discussion and environmental/social activities.

US families who buy organic

Overall, parents' primary motivation to choose organic is health related – 55% of parents who buy organic do so because they believe them to be 'healthier for me and/or my children.' Parents of very young children in particular (under 3 years old) are more likely than other parents to incorporate organic into their children's lives and do so most often for heath-related reasons.

US families who don't buy organic

Non-Buyers (27%) (n = 323) or parents who have never purchased organic products, are least likely to see 'food' as a component of any health maintenance activities and are less likely to integrate *any* health-related activities into their and their family's daily lives.

US families who don't buy organic (cont'd)

Although these parents will frequently point to 'price' as a primary reason why they do not buy organic, findings reveal a deeper inertia among *Non-Buyers*, driven in large part by a lack of interest in the subjects of health, food, and even environmental and social consciousness.

Costs and Benefits – *Organic Versus Conventional Foods*

Costs to Consumers:

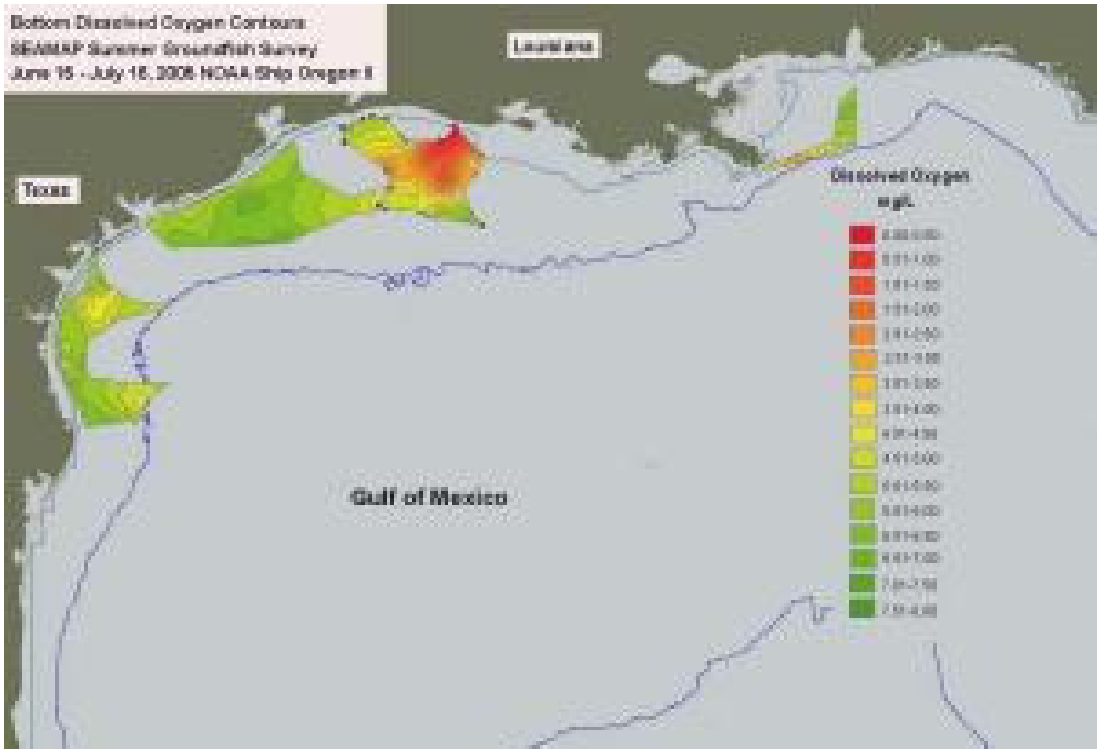
- Organic foods are more expensive in the marketplace due, in part, to smaller production scale, lack of supplies for some raw materials, higher labor costs as well as additional production costs (including certification costs).[2-3]

Costs and Benefits – *Organic Versus Conventional Foods*

Market Price Does Not Reflect All Costs

- Many of the costs associated with intensive conventional agriculture production are externalized, that is, they are not included in the final market price of a food product (e.g., environmental and public health costs associated with agricultural pesticide use and farmland runoff containing synthetic fertilizers and livestock waste linked to the "dead zone" in the Gulf of Mexico).[4-6]

Gulf of Mexico “Dead Zone”



Dark red areas have the lowest oxygen content (0-.5 mg/l). (Credit: NOAA)

- Forms each spring and summer off the Louisiana and Texas coasts when oxygen levels drop too low to support most life forms in the bottom and near bottom waters – negatively affecting the $2.8 billion Gulf fishing industry.

Organic Food Production – Benefits
Increased Biodiversity & Ecosystem Services

"*Biodiversity is the variety of life at different levels of biological organization, such as the genetic, species, and ecosystem levels" (FAO, 2008).*[7]

"Organic agriculture is a holistic production management system that promotes and enhances agro-ecosystem health, including biodiversity, biological cycles and soil biological activity. It emphasizes the use of management practices in preference to the use of off-farm inputs, taking into account that regional conditions require locally adapted systems." (Codex Alimentarius Commission,1999)[7]

Why is Biodiversity Important to Food and Nutrition Professionals? (cont'd)

- About half of the 100 most prescribed medications in the Unites States are derived from nature.[8]

- Ecosystem disruption may impede progress in medicine and biomedical research through the loss of unidentified species in the earth's soil, oceans, polar regions and other habitats.[8]

Why is Biodiversity Important to Food and Nutrition Professionals?

- According to the UN FAO (2008), agricultural biodiversity will be an important element in the development of production strategies needed to meet the challenges of climate change.[7]

- Climate change may result in increased heat-related morbidity & mortality, degraded air quality, greater dangers from hurricanes, dwindling water supplies and increased food- and water-borne diseases.[9]

Selected Regional Vulnerabilities to Climate-Related Impacts (EPA, 2008)[9]

US Census Regions	Degraded Air Quality	Heat Waves	Drought	Extreme Rainfall w/ Flooding
Mid Atlantic	X	X	X	X
South Atlantic	X	X	X	X
West South Central	X	X	X	X

Selected Regional Vulnerabilities to Climate-Related Impacts (EPA, 2008)[9]

US Census Regions	Degraded Air Quality	Heat Waves	Drought	Extreme Rainfall w/ Flooding
West North Central		X	X	X
Mountain	X	X	X	
Pacific	X	X	X	X

Why is Biodiversity Important to Food and Nutrition Professionals? (cont'd)

- Soil biota and biodiversity –

- Soil organisms contribute a wide range of essential services to the sustainable functioning of all ecosystems by acting as the primary "driving agent" of nutrient cycling and regulating the dynamics of soil organic matter, soil carbon sequestration, and greenhouse gas emissions.[7]

Why is Biodiversity Important to Food and Nutrition Professionals? (cont'd)

- Predators, parasitic wasps, and micro-organisms play a key role in controlling agricultural pests and disease. Many methods of pest control, including both traditional and modern methods, rely on biodiversity.[7]

- Biodiversity is a necessary component of sustainable rural development, food security and poverty alleviation.[7,10]

Organic Farmers Are Both Custodians and Users of Biodiversity at all Levels[7]

GENE Level – Endemic and locally adapted seeds & breeds are preferred for their greater resistance to diseases and *resilience* to climatic stress.

SPECIES Level – Diverse combinations of plants & animals optimize nutrient & energy cycling for agricultural production.

ECOSYSTEM Level – Reliance on natural pest control maintains species diversity and avoids emergence of pests resistant to synthetic pesticides. Absence of use of synthetic chemical inputs creates habitats suitable for wildlife.

Organic Food Production – Benefits
Increased Biodiversity & Ecosystem Services

- Most studies and meta-analyses show that biodiversity is enhanced on organic compared to conventional farms.[11-15]

- Higher levels of biodiversity on organic farms make these farms more *resilient* to unpredictable weather patterns that may result from climate change (e.g., flooding, droughts).[16]

Organic Food Production – Benefits
Increased Biodiversity & Ecosystem Services

- A recent study found significant differences b/t organic and conventional fields for the economic values of certain ecosystem services - including services provided by *shelterbelts - (barriers made up of one or more rows of trees or shrubs).*[17]

- Shelterbelts benefit crops and farm animals by improving crop yields and quality, and provide shelter & pollen/nectar resources to pollinators & natural enemies that perform biological control of pests and diseases.[17]

Organic Food Production – Benefits
Reduced Energy Use

- Organic agriculture uses significantly less energy than comparable non-organic agriculture.[16,18]

"Organic agriculture holds great potential for pioneering energy reduction strategies through the framework of organic standards. Organic principles, which emphasize environmental stewardship, farm-level self-sufficiency and incorporation of externalities can be leveraged to develop strategies for limiting use of fossil fuel-based energy in organic agriculture." (FAO, 2007) [18]

Organic Food Production – *Reduced Greenhouse Gas (GHG) Emissions*

- According to the UN FAO, "[w]ith lower energy inputs, organic systems contribute less to greenhouse gas emissions and have a greater potential to sequester carbon in biomass than conventional systems."[18]

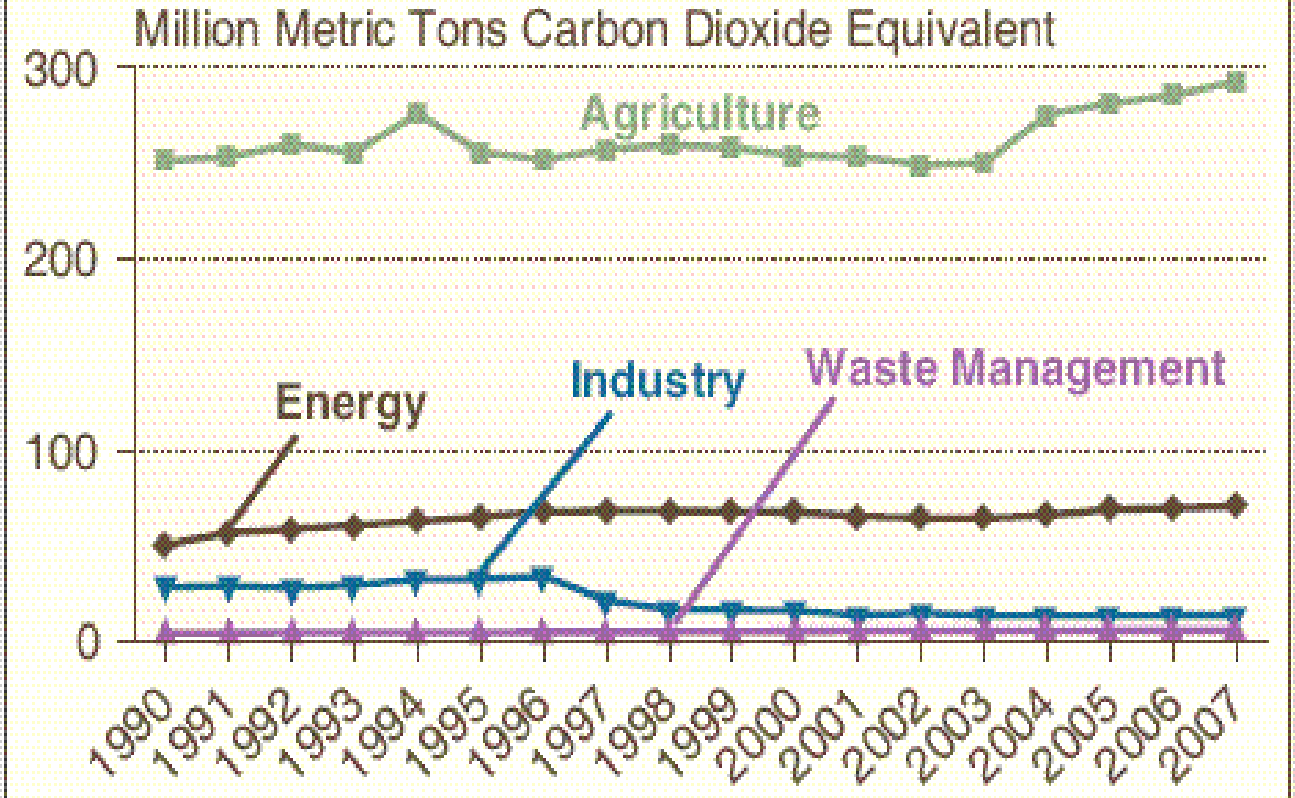
- Long-term field experiments show that organic matter is higher in organically managed than conventionally managed soil.[16,19] Humus (the well-decomposed part of soil organic matter) helps mitigate climate change by sequestering carbon by acting as a sink (i.e., by removing CO_2 from the atmosphere and fixing it in the soil).[16]

Nitrous Oxide (N_2O) Emissions

- The U.S. EPA estimates that agriculture is responsible for 2/3 (67%) of all domestic N_2O emissions.· A main contributor to N_20 emissions is nitrogen fertilization of soils.[20]

- Annual U.S. N_20 emissions rose from 1990 to 1994 then fell from 1994 to 2003. They began rising sharply from 2003 to 2007, largely as a result of increased use of synthetic fertilizers.[21]

Figure 18. U.S. Nitrous Oxide Emissions by Source, 1990-2007



Source: EIA estimates.

Organic Food Production – *Reduced Greenhouse Gas (GHG) Emissions*

- Researchers in Canada found that a national transition to organic crop production (for canola, corn, soy, and wheat) would consume, on average, 39% as much energy and generate 77% of the global warming emissions associated with current national production of these crops.[22]

- The authors reported the differences were due almost exclusively to the differences in fertilizers used in organic versus conventional farming.[22]

Organic Food Production –
Increased Profits for Farmers

- The *Wall Street Journal* (WSJ)[23] reports that, valued at $20 million, India's organic farming sector is a sliver of the $26 billion global market. But with its promise of higher profit margins and lower production costs, organic farming provides an alternative to this debt spiraling by eliminating a farmer's dependence on expensive pesticides."

Organic Food Production –
Increased Profits for Farmers

- For example, an organic farmer in India reports:

"[He] is no longer subjected to high up-front rates for chemical [synthetic] fertilizers and insecticides. In addition, he draws healthy seeds directly from the previous year's crop rather than invest in genetically modified ones."[23]

"Plus, cutting out the middle-men and selling his products directly to the textile mills across the country earns him 20% more for his organic cotton…His margins for cotton farming are now 75%...compared to the 40% India average."[23]

Organic Food Production –
Increased Profits for Farmers

- In India, there are still barriers to entering the organic market, including the high cost of the certification fee.[23]

- State subsidies provided to small organic farmers to cover profit-loss during their initial shift to organic farming (instead of applying for existing government debt-relief schemes) could help them (small organic farmers) turn a profit.[23]

Organic Food Production – *Enhanced Food Security*

- Organic agriculture relies on 5 capital assets for addressing factors that contribute to food insecurity (**natural**, **social, human, physical,** and **financial capital**).[24]

- <u>Organic farming can increase access to food on several levels</u>:

1.) increases the quantity of food produced per farm;

2.) allows farmers to sell food surpluses at local markets (leading to higher incomes); and

3.) enables new and different groups in a community to become involved in agricultural production and trade.

Key Improvements to Food Security by Organic Farming Case Studies in Africa[24] (n = 15)

Improvement to:	Mechanism:	No. of case studies showing improvement	%
Amount of food available	Increase in food produced; Increase in yields (food crops, livestock)	12	80 (92)*
Natural capital	Benefits to soil, water, & fertility	14	93

*For two case studies, increasing food production was not included in project objectives. Hence, total number of case studies here is thirteen.

Key Improvements to Food Security by Organic Farming Case Studies in Africa[24] (n = 15)

Improvement to:	Mechanism:	No. of case studies showing improvement	%
Social capital	Built partnerships; increased community cooperation	14	93
Human capital	Increased knowledge and skills (of farmers); Health & education benefits	15	100

Key Improvements to Food Security by Organic Farming Case Studies in Africa[24] (n = 15)

Improvement to:	Mechanism:	No. of case studies showing improvement	%
Physical capital*	Improvements to infrastructure and markets	6	40
Financial capital	Increased farmers' incomes	13	87

* Greater government investment in research & extension services and policy and institutional supports would help overcome these constraints.

Benefits of Organic Food Production - Reduced Exposure to Pesticides

- Recent research demonstrated that dietary intake represents the major source to organophosphorus (OP) pesticides in young children.[25]

- By substituting organic fresh fruits & vegetables for corresponding conventional items, the median urinary metabolite concentrations for malathion and chlorpyrifos (OP pesticides) were reduced to non-detectable or nearly non-detectable levels.[26]

Principles for Evaluating Health Risks in Children Associated with Exposure to Chemicals (WHO, 2007)

- The WHO report noted that the stage of a child's development may be just as important as the magnitude of the exposure. For example, it states: "neurotoxic insults during development that result in no observable phenotype at birth or during childhood could manifest later in life as earlier onset of neurodegenerative diseases such as [Parkinson's Disease]."[27]

Principles for Evaluating Health Risks in Children Associated with Exposure to Chemicals (WHO, 2007)

- Several studies support WHO's report showing that exposure in utero, post-natal, or in childhood affect the substantia nigra* causing damage or increasing susceptibility to additional exposures and neurodegenerative damage in adulthood.[28-31]

*The substantia nigra is a small area of the brain containing a cluster of black-pigmented nerve cells that produce dopamine, which is then transmitted to the striatum (part of the basal ganglia). Its destruction is associated with Parkinson's disease.[32]

Children Vulnerable to OP Pesticides Until At Least Age Seven (Huen et al., 2009)

- A prospective study of 448 Mexican-American children found that young children have significantly lower levels of a key enzyme PON1, (Paraoxonase 1), than previously believed.[33]

- Lower levels of PON1 – an enzyme involved in protection against OP pesticides and oxidative stress – persisted in young children past age two through at least seven years of age.[33]

Pregnant Women and Children More Vulnerable to OP Pesticides

- Among pregnant women with measurable levels of chlorpyrifos (an OP pesticide) in their blood, women with lower PON1 levels had children with smaller head circumferences at birth.[34]

- Higher maternal OP exposure was also associated with decreased child birth weight - among mothers with a certain P01 genotype.[35]

- Exposures to OP pesticides can produce long-term neurobehavioral deficits in children.[36,37]

OP Pesticide Exposure and Oxidative Stress

- PON1 genotypes and PON1 enzyme levels have been associated with numerous health outcomes related to organophosphorus (OP) pesticide exposure and oxidative stress such as: Alzheimer's disease,[38] Parkinson's disease,[39] cardiovascular disease,[40,41] and preterm birth.[42]

Health Outcomes Related to OP Pesticide Exposure

- Adigun *et al.* (2009) found that neonatal exposure to OP pesticides altered the trajectory of hepatic cell signaling in a manner consistent with the observed emergence of pre-diabetes-like metabolic dysfunction.[43]

- These researchers reported that "our findings extend the Barker hypothesis [2003]…to include otherwise nonsymtomatic chemical exposures that may produce similar outcomes without the precondition of fetal/neonatal growth restriction."[43]

Health Outcomes Related to OP Pesticide Exposure (cont'd)

- Based on their findings (Adigun *et al*., 2009), these researchers highlight that there is "the need to explore the possibility that developmental exposure to common chemical contaminants contribute to the explosive worldwide increase in diabetes and obesity."[43]

Shoppers' Guides – Reducing Exposure to Pesticides

- *Environmental Working Group's Shopper's Guide to Pesticides*. Available at:

  http://www.foodnews.org/walletguide.php




- *The Organic Center's Organic Essentials Pocket Guide for Reducing Pesticide Dietary Exposure*. Available at:

  http://www.organic-center.org

Summary:
Benefits of Organic Food Production

- Increased biodiversity & ecosystem services (i.e., nature's services)
- Reduced energy use
- Reduced GHG emissions
- Increased profits (& potential profits) for farmers
- Enhanced food security
- Reduced exposure to synthetic pesticides (e.g., Organophosphorus (OP) pesticides) for high-risk groups such as young children.

Summary: Costs of Organic Foods

Costs to Consumers:

- Organic foods are more expensive in the marketplace due, in part, to smaller production scale, lack of supplies for some raw materials, higher labor costs as well as additional production costs (including certification costs).

Purchasing Organic Foods – *How to Keep Costs Down ($)*

- Purchase in-season, locally-produced organic foods from farmers' markets, farm stands, grocery co-operatives, and on-line stores.
- Buy organic produce and other food items (e.g., eggs & meats) through a community supported agriculture (CSA) farm.
- To find a CSA farm, farmers' market, farm stand or grocery co-operative, go to: www.localharvest.org
- Buy organic foods in bulk. Packaging can drive up food costs.
- Purchase organic foods from discount retailers

Disclosures

- Member, Scientific & Technical Advisory Board, The Organic Center (voluntary role); Consultant (November 2008 – March 2009) (www.organic-center.org)

- Organic Valley Family of Farms (honorarium) (www.organicvalley.coop)