Healthy Earth, Healthy Eating:

PART 2

Only a Healthy Planet Can Support Healthy People

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In Part 1 of this article we explored the complex topic of the ecology of food and health, including food in the context of ecologically whole living systems, the origins of human diets, and how our modern diets differ from traditional hominin diets (visit http://www.teleosis.org/symbiosis and see our archives).

Now, in Part 2, we look at how the health of our water, soils, and forests affect the food we eat, how some of our favorite foods may be implicated in the process of global warming, some concerns about genetically modified foods, and the growing demand for organic foods. In alignment with previous knowledge about ecological systems, the food production systems found to be harmful to our health are also undermining the support systems of the planet on which our very lives depend.

PART 2

Water, Soil, and Forests

Nearly half the water consumed in this country is used for livestock, mostly cattle.
—*Audubon,* December 1999

The most effective single step we can take to ensure access to life-giving clean water is to adopt a plant-based diet.

Life on Earth depends on water. Yet our supply of clean water is disappearing.

All the water-saving measures combined—installing low-flow showerheads and sink fixtures, turning off water when brushing teeth except to rinse the brush, washing the car less often and so on—don't save nearly as much as can be saved by adopting a primarily plant-based diet. While it takes from 23-49 gallons of water to produce one pound of lettuce, potatoes, wheat, carrots, and apples, it takes from 815-5,214 gallons to produce a pound of chicken, pork, and beef, respectively. Looked at another way, if you live in California, you could save more water by not eating a pound of beef than you would by not showering for *six months!*

Many aquifers in the U.S. and around the world are being depleted at unprecedented rates. It is only during the last half-century that the use of powerful diesel and electric pumps have begun to empty aquifers in a matter of decades. According to Ed Ayers (1999), "Around the world, as more water is diverted to raising [cattle], pigs

More water is taken from the Ogallala aquifer each year for beef production than is used to grow all the fruits and vegetables in the *entire country!*

and chickens, instead of producing crops for direct consumption, millions of wells are going dry. India, China, North Africa and the United States are all running freshwater deficits, pumping more from their aquifers than rain can replenish."

The largest body of fresh water on Earth, an aquifer that stretches from South Dakota To Texas, provides nearly one-third of all the ground water used for irrigation in the U.S. Because it is a fossil aquifer, containing water from melted glaciers, it will not be replenished by rainfall. The water tables of this aquifer, called the Ogallala, are dropping dramatically and some wells are going dry. The alarming increase in draw from the Ogallala is directly related to the creation of factory farms and feedlot beef. Consider that more water is taken from this aquifer each year for beef production than is used to grow all the fruits and vegetables in the *entire country!* The fact that only 0.0001 percent of fresh water is readily accessible (Suzuki, 1997, p. 66.) suggests that this is a wildly inappropriate use of water.

The most effective single step we can take to ensure that our children's children—and uncountable plants and animals—have access to life-giving clean water is to move in the direction of adopting a plant-based diet. The current level of consumption of meat such as beef, pork and chicken, and the production systems now used to meet this demand, can be not only harmful to our health, but also devastating to the environment on which our lives depend.

When animals are raised in limited numbers in open fields or pastures, their manure biodegrades and enriches the soil. But with the huge numbers of animals being raised for food today in feedlots or confinement buildings, there is no economically feasible way to return the waste to the land. U.S. agriculture now depends increasingly on chemical fertilizers and pesticides. Without manure, and saturated with chemicals, soils are losing their texture and the ability to retain topsoil—the rich layer that is critical for food production. According to Ryan and Durning (1977), "The production of every quarter-pound hamburger in the United States causes the loss of five times the burger's weight in topsoil" (p. 55). Furthermore, 70% of land in the American West is used for grazing livestock. Much of this land is publicly owned. Seventy percent of the land in western national forests and 90% of Bureau of Land Management land are grazed by livestock for *private profit*.

Much of the waste from livestock finds its way into our waters. Schmid (1997) cited a *Time* magazine article that noted,

> Mass production of meat has become a staggering source of pollution . . . livestock waste has been implicated in massive fish kills and outbreaks of such diseases as pfiesteria, which causes memory loss, confusion and acute skin burning in people exposed to contaminated water. In the United States, livestock now produces 130 times as much waste as people do . . . . in populous areas their waste is tainting drinking water. (p. 241)

When large amounts of animal manure pollute waterways, oxygen is severely depleted. Fish suffocate from prolonged oxygen depletion, or may starve when prey (smaller fish) suffocates. This process is ruining areas throughout the country; it has resulted in an area of 7,000 square miles in the Gulf of Mexico south of Louisiana that is virtually dead—it can no longer support most forms of aquatic life.

Forests are essential sources of oxygen; they moderate climate, prevent floods, and are critical in preventing soil erosion. Forests provide fuel and wood for our homes. They purify and recycle our water and are home to millions of animals and plants. Forests worldwide are being devastated by activities such as shifting populations, power projects, logging, and road building. But another significant factor contributing to the destruction of the world's precious forests is beef cattle ranching. Rainforests contain 80% of the world's species of land vegetation and account for much of the planet's oxygen supply. Half of all species on Earth live in tropical rainforests. One-quarter of our medicines derive from raw materials found in rainforests. Yet every second, an area the size of a football field is destroyed forever (Agriculture 21, 1998). A major cause of this devastation can be traced to the eating habits of Americans and other Westerners: "The number one factor in elimination of Latin America's tropical rainforests is cattle-grazing . . . [We are seeing] the 'hamburgerization' of the forests" (Myers, 1987, pp. 127, 142). And in Central America, "two-thirds of these countries' rainforests have been cleared, primarily to raise cattle whose stringy, cheap meat is exported to profit the U.S. food industry" (Rainforest Action Network, 2000).

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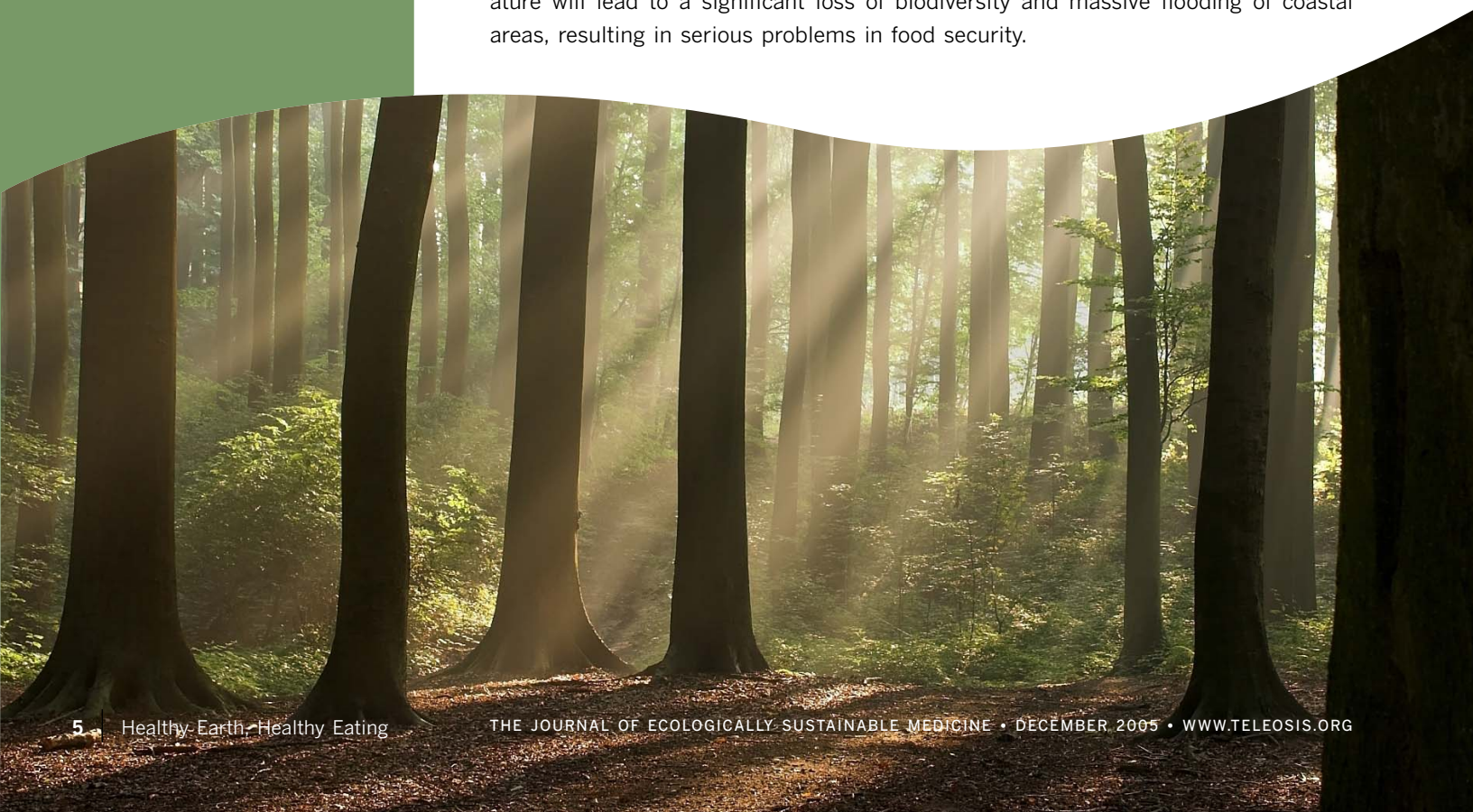
Global Warming

The last time you ate a juicy steak or roast chicken, you likely didn't think that you were contributing to global warming. But you may need to reconsider.

When we burn fossil fuels (coal, oil, and gas) and forests, we raise the level of carbon dioxide in the atmosphere. The 2001 Intergovernmental Panel on Climate Change report (IPCC, 2001) projected a globally averaged surface temperature on Earth to increase by 1.4 to 5.8°C between 1990 to 2100. This slight raise in temperature will lead to a significant loss of biodiversity and massive flooding of coastal areas, resulting in serious problems in food security.



According to geneticist David Suzuki, this genetically modified bacteria "could have ended all plant life on this continent."

Up until approximately 100 years ago, the level of carbon dioxide in the atmosphere had remained relatively constant, at about 280 parts per million. We now have reached 360 parts per million (p. 265, Robbins, 2001). Certain agricultural practices make a significant contribution to increased carbon dioxide levels. The tremendous amount of nitrogen fertilizers in the United States is a serious problem, because ammonium nitrate, the most common form of nitrogen fertilizer, is in essence congealed natural gas.

Robbins (2001) notes that, "Since beef requires the burning of 54 fossil fuel calories for the production of a calorie of protein, and soybeans require only two, people deriving their protein from soybeans are, in effect, consuming only 4 percent as much energy—and producing only 4 percent as much carbon dioxide—as people deriving their protein from beef" (p. 266). Corn and wheat require the burning of only three fossil fuel calories to produce a calorie of protein. Scientists as well as environmental activists acknowledge that the production of meat poses a serious problem relative to global warming: "results [of extensive research at the Fort Keogh Livestock and Range Reserve Laboratory at Miles City, Montana] reveal the high level of dependency of the U.S. beef cattle industry on fossil fuels" (Heitschmidt, 1996, pp. 1395-1405).

The methane produced in raising animals for meat is also a significant contributor to global warming. Second only to carbon dioxide, methane is the next most destabilizing gas to the planet's climate. Several sources bear this out.

> Methane is actually 24 times more potent a greenhouse gas than carbon dioxide, and its concentration in the atmosphere is rising even faster . . . Concentrations of atmospheric methane are nearly triple what they were when they began rising a century ago, and the primary reason is beef production. (Robbins, 2001, p. 267)

The EPA indicates that the world's livestock are responsible for 25% of the methane emissions that are based in human activity (Halweil, 1998). And in 1999, a report of the Union of Concerned Scientists concluded that the two most damaging things Americans do to the climate are drive vehicles that get poor gas mileage and eat beef (*San Francisco Chronicle,* 1999).

Genetically Modified Foods

Tomatoes with flounder genes, salmon with human genes, broccoli with bacteria and rat genes—these creations are no longer confined to the pages of a science fiction novel. Rather, they are the increasingly common result of the genetic engineering being carried out in the biotechnology industry. What is truly frightening is that products such as these genetically modified organisms (GMOs) may be found in nearly every supermarket in the country. In 1999, Monsanto's Roundup Ready (genetically modified) varieties of soybean comprised more than half of the soybean crop in America. One-third of the U.S. corn crop contains genes from viruses and petunias (Robbins, 2001, p. 328).

In contrast to techniques plant breeders have used for centuries, genetic engineering typically takes genes from one species and inserts them into another in order to transfer a desired trait. In violating the species barriers in this way we have opened ourselves up to unknown and unforeseeable consequences, because biotech companies are producing and introducing GMOs into our food supply *without any extended testing period.*

Fortunately, the crossing of the species barrier in nature happens very rarely, but when it does it can be disastrous. The 1918 flu pandemic, which killed over 22 million people worldwide, is thought to have been caused by horizontal gene transfer. And Mad Cow disease resulted from a horizontal transfer of an infectious protein that kills sheep (Robbins, 2001, p. 330). Noted molecular biologist Richard Strohman comments that genetic engineering "often doesn't work. And when you put a biological entity out into the environment, or into a human being, and you're not completely certain—and you can never be certain in this business, in my opinion—your ability to do damage is very, very high" (as cited in Suzuki & Dressel, 1999, p. 106).

One problem is that a bit of DNA from one organism inserted into another organism often can include genetic parasites, such as viruses. These parasites are specific to certain species and are contained by genetic species barriers. But genetic engineering transgresses these natural barriers. This is particularly troubling

Avoiding GMO Plant Products

(Adapted from Robbins, 2001, pp. 359-360)

Soybeans: Soy flour, soy oil, lecithin, soy protein isolate (TVP), any unidentified vegetable oil, and nearly all forms of margarine. The only soy products that are sure to be GMO-free are organic—or those labeled as "GMO-free" or "Non-GMO."

Corn: Corn accounts for the second largest transgenic acreage. Watch out for corn flour, cornstarch, corn oil, and corn sweeteners. Look for "GMO-free" or "Non-GMO."

Canola Oil: Most canola oil consumed in the U.S. comes from Canada; since much of Canada's crop is genetically engineered (exceptions are organic canola oil and a specialty product called SuperCanola), it's important to look for the "GMO-free" label.

Papaya: Most non-organic papayas grown in Hawaii are genetically engineered.

Cottonseed Oil: Since more than half the U.S. cotton crop is transgenic, products containing cottonseed Oil are almost certain to include genetically altered substances.

Squash: Some crookneck squash and zucchini now in stores have been genetically altered.

For a brand-name shopping guide to non-transgenic foods, visit www.safe-food.org

Two-thirds of the foods sold in American supermarkets now include genetically modified substances.

because in recent years reports are increasing of new pathogens arising from the horizontal (across species barriers) gene transfer that is the basis of genetic engineering. During the past quarter century, a number of diseases—including Ebola, AIDS, hepatitis C, hanta-virus, and Lyme disease—have emerged that appear to result from horizontal gene transfer. Robbins notes the comments of Gerald Wald, M.D., Nobel Laureate in Medicine and Professor of Biology at Harvard University, who said that genetic engineering:

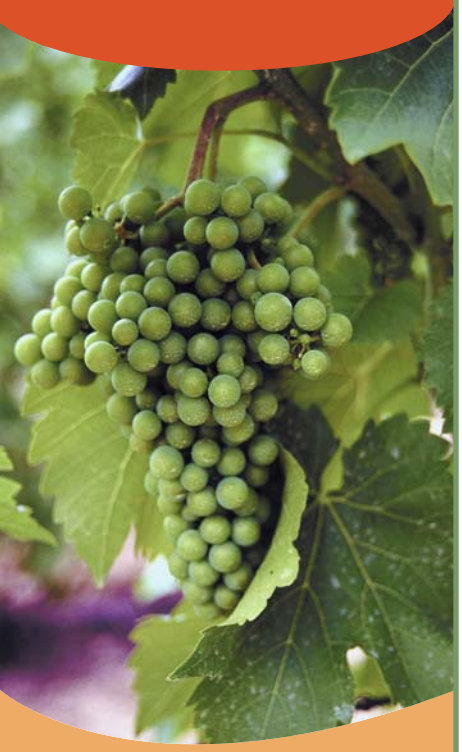
> faces our society with problems unprecedented, not only in the history of science, but of life on Earth. . . . Up to now, living organisms have evolved very slowly . . . Now whole proteins will be transposed overnight into wholly new associations, with consequences no one can foretell . . . Going ahead in this direction may be not only unwise, but dangerous. Potentially, it could breed new animal and plant diseases, new sources of cancer, and novel epidemics. (p. 331)

More than 20% of the planet's genetically modified acreage has been planted with crops engineered to produce pesticides in every cell of the plants throughout their entire life cycle (Lappe & Bailey, 1998, p. 23). A potato created by Monsanto, for example, kills any potato beetle that munches on it; this potato is itself required to be registered as a pesticide with the EPA. An even more disturbing example is that of a genetically engineered soil bacteria—*Klebsiella planticula*—which is used to break down wood chips, corn stalks, wastes from lumber businesses and agriculture, and to produce ethanol in the process. What initially seemed like a win-win proposition turned into a nightmare. During field-testing at Oregon State University, the engineered bacterium did exactly as promised, eliminating rotting organic waste and producing ethanol.

However, when some of the post-processed waste was added to actual living soil, something very unexpected happened. Seeds planted in soil mixed with the engineered Klebsiella sprouted, but then every single plant died (Hill, 1994). Researchers discovered that the genetically engineered Klebsiella was very competitive with native soil microorganisms, suppressing activities crucial to soil fertility. The bacteria killed much of the mycorrhysal fungi in the soil that helps make nutrients available to plant roots (Holmes, et al., 1998).

The worst part of the experiment, however, was yet to be realized. The genetically modified bacteria were able to persist in the soil. Had this modified bacteria been released, the genetically engineered Klebsiella could have become established and been impossible to eradicate. According to geneticist David Suzuki, this bacteria "could have ended all plant life on this continent" (Suzuki & Dressel, 1999, p. 1210).

Unfortunately, it isn't only plant products that contain GMOs. Ninety-five percent of the soy meal grown in the U.S., and almost that high a percentage of corn, are used as livestock feed. Thus, all non-organic meat, poultry, dairy or egg products marketed to the public contain genetically engineered substances (Lappe & Bailey, 1998, p. 147). And in some cases, without producers notifying consumers, the animals themselves are being genetically engineered to more easily accommodate the overcrowded and unsanitary conditions of factory farming:



The Dirty Dozen: Avoiding Pesticides

(it is especially important to buy these vegetables and fruits from an organic market, as they may contain high levels of pesticides)

- Apples
- Bell Peppers
- Celery
- Cherries
- Imported Grapes
- Peaches
- Pears
- Nectarines
- Potatoes
- Red Raspberries
- Spinach
- Strawberries

> The USDA has, without telling the public, been allowing into slaughterhouses and into the food chain, animals that have been involved in experiments making them transgenic. These are animals that have foreign genes in every one of their cells . . . these are animals with human genes; these are animals that have a variety of viruses in them. They did this without consulting Congress. They did this without making it public. These animals have been in the food chain now since 1995. (as quoted in Suzuki and Dressel, 1999, p. 106)

Two-thirds of the foods sold in American supermarkets now include genetically modified substances (Goldberg, 2000). Today in the United States, the only sure way to avoid eating genetically engineered food is to eat only organically grown food.

A Return to Organic Farming

Even as GMOs are being developed, organic agriculture has been emerging as a major force in world food production: "By the turn of the millennium, more than 17 million acres worldwide were planted with organic foods. Though this was less than a fifth of the area planted with transgenics, the number of acres dedicated to organic farming was 10 times what it had been only 10 years previously" (Robbins, 2001, p. 366). Organic farming has been one of the fastest growing segments of U.S. agriculture for over a decade (Economic Research Service, 2005). Rapidly growing consumer interest in organically grown foods has created many new markets for producers and the organic foods industry is undergoing a transformation. Organic foods are now sold in a wide variety of venues including farmers markets, natural product supermarkets, conventional supermarkets, and club stores. For the first time in 2000, more organic food was purchased in conventional supermarkets than in any other venue; organic foods are now sold in 73 percent of all conventional grocery stores. Growth in retail sales has equaled 20% or more annually since 1990.

According to the most recent USDA estimates, U.S. certified organic cropland doubled between 1992 and 1997 to 1.3 million acres. Fresh produce is the top-selling organic category, followed by nondairy beverages, breads and grains, packaged foods (frozen and dried prepared foods, baby food, soups and desserts) and dairy products (Dimitri & Greene, 2002). Certified organic cropland for grains, fruits, vegetables and other crops more than doubled from 1992 to 1997, and doubled again for many crops between 1997 and 2003.

Two organic livestock sectors—poultry and dairy—grew even faster. While adoption of organic farming systems showed strong gains between 1992 and 2003 and the adoption rate remains high, the overall adoption level is still low—only about 0.4 percent of all U.S. cropland and 0.1 percent of all U.S. pasture was certified organic in 2003. Obstacles to adoption by farmers include high managerial costs and risks of shifting to a new way of farming, limited awareness of organic farming systems, lack of marketing and infrastructure, and inability to capture marketing economies. Yet many producers are transitioning to organic farming practices in order to lower input costs, conserve nonrenewable resources, capture high-value

markets, and boost farm income, especially as prices fall for staple commodities (Economic Research Service, 2005).

It's good news that organic products have made their way into mainstream markets. Unfortunately, this has also meant that national standards for these products—and in fact the very definition of the term *organic*—have come under the intense pressures of the marketplace. There has been controversy over the use of artificial substances in certified-organic products since federal organic standards were put into effect in 2002. In November, however, the Organic Trade Association—which represents mainstream producers of organic products, including Dole, Kraft, and Horizon—lobbied the Senate to attach an amendment to the 2006 agriculture appropriations bill that would make it legal for certain synthetic substances to continue to be used in the preparation, processing, and packaging of organic products that receive the USDA seal. The proposed amendment would in effect negate a recent federal court ruling that determined synthetics should *not* be permitted in the processing of certified-organic products (Little, 2005).

What this means, according to the Organic Consumers Association, (2005), is that "for the first time, the Secretary [of Agriculture] will have the power to expedite petitions for access to the list of substances that are commercially unavailable in organic form. The industry has requested that 517 more synthetic substances be approved. This could pave the way for hundreds of synthetic ingredients being allowed in products "labeled USDA Organic."" The urgent message is that those committed to truly organic agriculture must remain constantly vigilant and active.

In addition to dramatically increasing consumer demand for organic foods, many countries are enacting laws to limit or eliminate genetic engineering of foods. Despite U.S. government opposition, the landmark Cartagena Protocol on Biosafety, giving countries the right to refuse entry to genetically altered seeds, crops, animals, and microbes, was put into force in 2003 (IISD, 2003). This was an historic first agreement of nations in attempting to prevent environmental problems before they begin (Halweil, 2001).

Unfortunately for Americans, this country lagged in the growth of organic farming compared to most other countries; in 1999 only 0.2% of the nation's crops were organic (Halweil, 2000, p. 120). Lack of government support is a major part of the problem; in the late 1990s, less than one-tenth of one percent of USDA research projects related in any way to organic agriculture. And it took a grassroots citizen protest to stop the Department of Agriculture from defining organic standards in a way that would have allowed genetically engineered foods, as well as foods that had been irradiated and grown with heavy metal-laden sewage sludge, to be classified as organic.

The advantages of organic agriculture include reduced soil erosion, greatly improved soil health, significantly less contribution to global warming, dramatically reduced water pollution, and better nutrition. A study in the *Journal of Applied Nutrition* indicated that the mineral content of organically grown apples, potatoes, pears, wheat, and sweet corn ranged from 60-390% higher than their conventionally grown counterparts (Smith, 1993). Many studies have found that yields from organic production are comparable to conventional systems, especially over the long term. A comprehensive study on the feasibility of organic agriculture conducted by the Center for the Study of Biological Systems at Washington University in St. Louis found that

Seasonal Availability Sites

- www.eatwellguide.org
- www.cuesa.org/seasonality
- www.localharvest.org

Growth in retail sales of organic foods has equaled 20% or more annually since 1990.

organic farms yielded, in dollars per acre, exactly the same returns as conventional farms. In terms of yield, the organic farms were down about 10%; however, since American agriculture grows much of its food for animals that are turned into meat products, even a small reduction in meat consumption would make up for this difference and allow us to enjoy the benefits of organic agricultural practices. Just a few of these benefits include better health for humans, reduced species extinction, cleaner air, fewer pesticides, and the elimination of dangerous genetic engineering.

It is clear from even this brief overview of some of the issues—and politics—involved in the ecology of food and health, the complexities and challenges are many. But the ever-growing numbers of people who understand the benefits of organic food and ancestral diets—those who have transformed the market for organic foods from a niche to one of the fastest growing segments of U.S. agriculture—are making the connections and demanding radical changes in how we think about food, agricultural practices, and our relationship with the life-sustaining Earth.

Tips on Healthy Eating

Plan a balanced meal using . . .

Color: green, red, orange or yellow, white, and brown

Flavor: something sour, bitter, sweet, spicy, and salty in each

Texture and shape: hearty starches (grains or tubers), protein (beans or animal food), roots, leaves (including upward-growing leafy greens), and fruits

Notice Your Own Reactions to Foods:

Problem: difficult bowel movements, hard stools, straining
Solution: more fiber and exercise

Problem: excessive mucous in respiratory system, sinus or nasal congestion, postnasal drip
Solution: reduce or eliminate dairy products

Problem: abnormal redness on skin—pimples, rashes, small blemishes
Solution: try reducing sugar (even too much fruit or honey) in diet

The advantages of organic agriculture include reduced soil erosion, greatly improved soil health, significantly less contribution to global warming, dramatically reduced water pollution, and better nutrition.

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