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Still No Free Lunch

Crops are getting less nutritious and farming methods are partly to blame.

September 11, 2007, BOULDER, Colorado — Today's farmers raise more bushels of corn, pecks of apples, and pounds of broccoli from a given piece of land than they did decades ago. But those crops are often less nutritious, according to a new report released today from The Organic Center, "Still No Free Lunch: Nutrient levels in U.S. food supply eroded by pursuit of high yields."

"Our crops are more abundant [i.e., per acre yields are higher], but they are also generally less nutritious," said report author Brian Halweil, a senior researcher at the Worldwatch Institute and a member of the Organic Center's scientific advisory board. Historical records from the U.S. Department of Agriculture show that everyday fruits and vegetables—from collard greens to tomatoes to sweet corn—often have lower levels of some vitamins and less iron, calcium, zinc, and other micronutrients than they did 50 years ago.

The most compelling data supporting the general decline in nutrient levels in crops comes from contemporary studies where researchers have grown modern plant varieties side-by-side with historic, generally lower-yielding cultivars, using similar production practices and levels of inputs, like nitrogen fertilizer. Several such studies have found that the modern-era varieties produce 10 to 25 percent lower levels of iron, zinc, protein, calcium, vitamin C, and other essential nutrients per pound of produce or grain.

For instance, looking at 63 spring wheat cultivars grown between 1842 and 2003, researchers at Washington State University found declines in the concentrations for all eight minerals studied, with an 11 percent decline for iron, 16 percent decline for copper, 25 percent decline for zinc, and 50 percent decline for selenium.

"To get our recommended daily allowance of nutrients, we have to eat many more slices of bread today than people had to eat in the past," said Halweil. "Less nutrition per calorie consumed affects consumers in much the same way as monetary inflation. That is, we have more food, but it's worth less in terms of nutritional value."

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Because of the impressive and ongoing increases in per acre yields, the decline in the nutrient content per serving of food or bushel of grain has gone largely unnoticed by agricultural scientists, farmers, public health officials, and policymakers. The decline in nutrients over the last few decades has unfolded alongside significant changes in the composition of the average American diet.

Not only are consumers getting less nutrients per serving of food today, many people are also consuming a far larger share of their daily caloric intake from highly processed junk foods high in added fat, sugars, and salt. According to The Organic Center's Chief Scientist Dr. Charles Benbrook, "Less nutrient-dense foods, coupled with poor food choices, go a long way toward explaining today's epidemics of obesity and diabetes."

Reversing Nutrient Decline

Plants bred to produce higher yields tend to devote less energy to other factors, like sinking deep roots and generating health-promoting compounds known as phytochemicals. Farming practices have worked hand-in-hand with plant breeding in setting the stage for nutrient decline. Modern conventional agriculture production practices, such as close plant spacing, heavy use of chemical fertilizers, and reliance on pesticides, tend to produce fast-growing, high-yielding crops, but also plants that do not absorb a comparable quantity of many nutrients, and often have poorly developed and unhealthy root systems.

The good news is that recent research shows that existing varieties of a given crop often vary widely in terms of their mineral and vitamin content, so it should be possible for crop breeders to draw on the genetic diversity within plant species to make our food more nutritious.

Moreover, backing a bit back down the yield curve through strategic changes in farming systems should help reverse the decline in nutrient content. For instance, although organic farming results in somewhat lower yields in many cases, studies show that it also tends to produce crops with higher concentrations of micronutrients, phytochemicals, and other health-promoting compounds.

Organic sources of soil nutrients, like manure or cover crops, offer more balanced mixtures of nutrients, and tend to release nutrients more gradually. As a result, according to Benbrook, "Plants develop more robust root systems that more aggressively absorb nutrients from the soil, and produce crops with higher concentrations of valuable nutrients and phytochemicals."

"This intimate relationship between soil quality, crop yields, and food nutritional quality is farming's equivalent of no free lunch," Benbrook continued. "This study

highlights the benefits of building soil quality in improving crop nutritional quality, whether on organic or conventional farms."

The nutritional advantage of organic food ranges from a few percent to sometimes 20 percent or more for certain minerals, and on average, about 30 percent in the case of antioxidants. Some studies have reported even more dramatic differences in concentrations of specific phytochemicals—for example, nearly twice as much of two common antioxidants in organic tomatoes compared to conventional tomatoes.

"This advantage will vary depending on the crop, soil quality, and growing conditions," said Halweil. "And there will be some cases where conventional crops have higher nutritional quality than nearby organic crops, especially as organic farmers find ways to push yields to or above the levels on conventional farms."

Improving the nutritional quality of our crops on a per serving basis will be an important part of addressing larger nutritional and health problems, particularly as the baby-boom generation ages. This report and others from the Center have stressed the benefits of food that delivers more nutrition per calorie consumed.

According to Alan Greene, M.D., chair of the Center's Scientific and Technical Advisory Committee, "For many of our most costly and common health problems in the years ahead, progress in reducing the frequency and severity of disease will depend increasingly on improving food nutritional quality and patterns of dietary choice, rather than simply an ever-widening dependence on drug-based therapies and surgery."

Editor's Note – The Center can provide photos and additional information, and arrange interviews with key scientists. Contact Dr. Charles Benbrook at 541-828-7918, or via email cbenbrook@organic-center.org.

About The Organic Center

The Organic Center is a non-profit organization dedicated to understanding the health and environmental benefits of organic food and farming systems. The Center's program of sponsored research strives to better understand how organic farming can improve food safety and quality in order to:

- Document and quantify the current benefits associated with organic food and farming systems;
- Expand the scope and increase the frequency of existing benefits; and
- Create new benefits in the future.

The reports of the Center, including "Still No Free Lunch," are accessible free of charge on our website: http:// www.organic-center.org. For more information on the work of The Organic Center, contact 303-499-1840.