



Today's Bumper Yields of Fruits, Vegetables and Grains Deliver Fewer Nutrients and Less Intense Flavors

High yields and jumbo produce deliver more water, starch, and sugar per serving, but less vitamins, minerals and antioxidants.

Today's farmers raise many more bushels of corn, pecks of apples, and pounds of broccoli from a given piece of land than they did decades ago. In fact, over the past 50 years, farmers have doubled or tripled the yield of most major grains, fruits and vegetables. Higher yields have been made possible by the combination of new plant varieties and increasing reliance on fertilizer, pesticides, irrigation, and sophisticated machinery.

But as yields have been pushed higher, nutrient density has often slipped. Ounce for ounce, today's high-yield crops are less nutritious and deliver fewer nutrients per serving and calorie consumed, according to a new report from The Organic Center entitled "Still No Free Lunch: Nutrient levels in U.S. food supply eroded by pursuit of high yields."

For example, there have been double-digit percentage declines of iron, calcium, selenium and other vital nutrients in many contemporary, high-yield crops compared to older varieties and/or lower-yielding fields. In general, the higher the yield of wheat, corn and soybeans, the lower the protein and oil content. High tomato yields come with lower levels of vitamin C and the cancer-fighting compounds lycopene and betacarotene.

Higher levels of production on livestock farms have also resulted in erosion of nutrient density. For example, the average amount of milk produced by a dairy cow has quadrupled in the last century to roughly 22,000 pounds today. But this milk is less concentrated with fat and protein.

Nutrient decline has occurred because the focus of plant and animal breeders,

farmers, and agribusiness has been on increasing yields, not on food nutritional quality. The reason for this focus is clear – farm commodity markets, federal farm policy, and those funding agricultural research have rewarded yield increases above all else.

Why is renewed focus on nutritional quality so important? Because improving the nutritional quality of our crops on a per serving basis is a necessary step in addressing larger nutrition and health problems. Farmers and the food industry must be challenged to deliver more nutrition per calorie consumed, and government should support farming systems that move in this direction.

NUTRIENT DENSITY
is a measure of the concentration of nutrients per ounce, per serving, or per calorie of food.

How Do High Yields Shortchange Nutrients and Taste?

Breeders have programmed crops to, for instance, grow closer together (i.e., more plants per acre, like the densely planted corn field in the photo, upper right), produce larger fruits and more grain and less straw per plant. Pushed to produce by chemical fertilizers, pesticides, and irrigation, modern plant varieties also tend to grow faster and reach a larger size compared to older varieties grown in lower-yield systems. One reason is that faster-growing crops have less time to extract nutrients from the soil and move them up stalks and into leaves and the portion of a crop that the farmer harvests and a consumer eats.

The result? Modern, high-yield varieties tend to devote less energy to sinking deep roots and generating health-promoting phytochemicals, including some vitamins and hundreds of antioxidants. There still is no free lunch – crops that are bred primarily for higher yields cannot be expected to also excel at meeting other goals, such as enhancing nutrient density, warding off disease, and resisting drought.

STILL NO FREE LUNCH

Solutions and Alternatives

Organic farming is one approach that can help reverse the trend towards lower nutrient concentrations. The difference in nutrient density in organic food, compared to conventionally grown crops, ranges from a few percent to sometimes over 20 percent for certain minerals, and on average, about 30 percent for antioxidants. A study at Washington State University compared the mineral content of wheat grown organically and conventionally, and found that the organic crops had higher concentrations of copper (16 percent), magnesium (5 percent), manganese (3 percent), phosphorus (7 percent), and zinc (8 percent).

Although organic farming usually results in somewhat lower yields, it can deliver clear-cut food quality and safety advantages. Organic crops are, on average, more nutrient dense, they tend to taste better and store longer, and virtually eliminate pesticide dietary risks. This trifecta of benefits is particularly valuable for the young and old, and people fighting illness or trying to slow the progression of disease.

The Center is often asked whether the premium prices charged for organic food are worth it. In the case of ripe, delicious, and nutrient dense organic fruits and vegetables, the price premium is rarely a significant deterrent to sales. "Consumers are yearning for old-school flavors. A lack of supply of ripe organic produce holds back sales far more often than premium prices," according to Chuck Benbrook, the Center's Chief Scientist.

IMPACTS ON TASTE

Part of what gives foods their flavor and aroma are the same antioxidant nutrients that help protect plants against insects, diseases, and other sources of environmental stress. Tomato varieties that score highest in flavor tests have higher levels of antioxidants. As tomato yields increase, the density of these compounds decreases.



Eat MORE Calories to Get the Same Nutrition????

"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," says Brian Halweil, a senior researcher at the Worldwatch Institute and the report's author. "Less nutrition per calorie consumed affects consumers in much the same way as monetary inflation. We have more food, but it's worth less in terms of nutritional value."



Further erosion in nutrient density should be avoided for several reasons. Americans need to consume foods that deliver more nutrients per calorie consumed. Science has yet to identify, much less understand, the nutritional benefits linked to thousands of phytochemicals produced by plants. Just as the loss of species erodes biological diversity, the erosion of nutrients in plants reduces the richness of the human diet, and along with it, food's ability to promote healthy development and graceful aging.

Plus, the relative levels, or ratios of nutrients in food, may also play important roles in human nutrition and health promotion. Modern farming has greatly changed the balance across nutrients in food, and done so with little understanding of the consequences.

What we surely **do not need** are staple crops delivering more sugar and starch per serving, and lower levels of vitamins, minerals, and antioxidants.

Dietary deficiencies cost more than \$120 billion each year in healthcare costs and lost productivity.

Numerous studies have shown that nutrient-rich foods help reduce the risk of cancers, cardiovascular disease, stroke, diabetes, arthritis, bone disease, and birth defects. Many other health problems are triggered or made worse by nutrient deficiencies



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Access Brian Halweil's Critical Issue Report, "**Still No Free Lunch: Nutrient levels in U.S. food supply eroded by pursuit of high yields**", at www.organic-center.org under "State of Science", and then "Nutritional Quality".