Soil, Food, and Obesity

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I regularly learn more than I teach as I travel around the country talking with people about sustainable agriculture. At a recent event in Ontario, Canada the event sponsor gave me an insightful little book written more than 50-years ago. The title might suggest it was written by a "speculative food faddist or a pseudo-medical crank at his very worst," as was suggested by the writer of the forward. Instead, *Soil, Grass, and Cancer*[i] was written by Andre Voisin, one of the world's most respected soil scientists of his time. He is better known for his book, *Grass Productivity*, a widely used reference by today's grass farmers. Voisin was a contemporary of William Albrecht, another revered source of wisdom among sustainable agriculture advocates, who was head of the Soils Department at the University of Missouri during the 1950s.

The basic premise of the book is that the health of soils cannot be determined by chemical analysis, no matter how sophisticated, because the chemical and biological interrelationships in soils are simply too complex. The only means of determining whether a soil is truly healthy is to examine the health of plants grown in the soil. Furthermore, the only way to determine the health of plants is to examine the health of animals, including humans, who eat the plants. A truly healthy soil will produce healthy plants, healthy animals, and healthy people. Conversely, whenever people have diet related health problems, there's a pretty good chance they are eating foods made from unhealthy plants or animals raised on unhealthy soils.

Voisin cites some of the most advanced medical research of the time linking various diseases, including some cancers, to the dysfunctional division and growth of living cells in the body. He also cites the most advanced agricultural science of the time, linking these cellular dysfunctions to various nutrient deficiencies in the feed eaten by afflicted animals. These cellular dysfunctions were then linked to nutrient deficiencies in the soils on which the feed crops were grown. In summarizing the linkages, he quoted the ancient proverb, "The same soil makes both corn and man," which he restates in "more scientific, modern terms" as "Animals and men are biochemical photographs of the soil."

Voisin quoted Albrecht's conclusion, "for assaying food values, no instrument as yet invented by man is so delicate and so perfect as the living organism." Neither Albrecht nor Voisin, two of the most prominent agricultural scientists of their time, was content with any analytical method for determining the quality of soils or feeds that had not been confirmed by actual feeding test with animals.

Perhaps it's time to return to this kind of skepticism, or realism, in our relationship with food. Obesity is epidemic in America, a nation that boasts of the world's best food system. At least two-thirds of American adults are overweight, half of whom are obese, according the latest national health statistics. Almost one-third of children are already overweight with half of that total also rated as obese. Obesity has been linked to diabetes, heart disease, hypertension, and various types of cancer. When related diseases are included, obesity becomes the most important health risk facing American society. Costs of health care in the U.S. have skyrocketed over recent decades – triggering a demand for health care reform. If recent trends continue, more than

40% of American adults will be obese by the end of the current decade and obesity will account for about one-fifth of all expenditures for health care. There is little hope of restraining costs of health care unless the epidemic of obesity is reversed.

Some people consider obesity to be a failure of individual will – a lack of ability to push away from the table. However, a 2005 Institute of Medicine report, *Preventing Childhood Obesity: Health in the Balance,* characterized obesity as the result of an interaction of individual behavior and genetic predisposition within an "obesogenic society." They concluded that the prevalence of inexpensive, energy-dense, nutrient-poor foods and beverages, along with the predominance of a sedentary lifestyle influences people to overeat, be inactive, and over time become overweight and obese.

The industrialization of the food system has made our food quick, convenient and cheap, but as food has become more abundant it has become more "energy-dense and nutrient-poor." For example, problems of obesity and diabetes are more common among people with lower incomes, who logically tend to seek foods providing the cheapest source of energy – meaning the most calories for the fewest dollars. Because of time constraints, many such people also rely heavily on highly processed and ready-to-eat foods, including "fast foods." On such diets, people can easily end up eating far more calories than they need without getting enough overall nutrition to meet the minimum requirements of a healthy diet.

When normal livestock are offered a wide variety of foodstuffs containing a variety of carbohydrates, fats, vitamins, minerals, and other nutrients, most will naturally select a healthy balanced diet. (Livestock bred for confinement feeding appear to have lost this ability.) When offered a premixed feed containing fixed quantities of various nutrients, livestock tend to consume more of some nutrients than they need in an apparent attempt to meet their minimum requirements of others. If we humans have this same basic tendency, whenever our food choices are limited, we might well consume more of some nutrients than we need because we are not getting enough of others. In other words, the lack of a few key micronutrients in our diets might leave us feeling hungry even though we are consuming far more calories than is consistent with good health. Many Americans may fall into sedentary lifestyles because they are overfed and undernourished.

One prominent academic study compared nutrient levels in 43 garden crops in 1999 with levels documented in benchmark nutrient studies conducted by USDA in 1950. The scientists found declines in median concentrations of six important nutrients: protein –6%, calcium –16%, phosphorus –9%, iron –15%, riboflavin –38%, and vitamin C –2%.[ii] Another study published in the Journal of Applied Nutrition in 1993 showed nutritional deficiencies for conventional foods relative to organic foods.[iii] Organically grown apples, potatoes, pears, wheat, and sweet corn, purchased over a two-year period, averaged 63% higher in calcium, 73% higher in iron, 118% higher in magnesium, 91% higher in phosphorus, 125% higher in potassium, and 60% higher in zinc than conventional foods purchased at the same time.

Other studies have shown that yield-enhancing technologies – fertilizers, pesticides, plant density, and irrigation – reduce the nutrient content of field crops by amounts generally consistent with the results for the 50-year nutrient declines and differences between conventional

and organic crops.[iv] These results should come as no surprise to anyone who understands that today's industrial agriculture derives profits primarily from *quantity* factors: acres farmed, head produced, yields per acre, rates of gain, and efficiency of large-scale production. *Quality* factors typically are less important to profits and are most often associated with cosmetic appearance rather than nutrition.

The food processing and distribution industry also must share the blame for obesity. The corporations that process and market our foods are concerned about profits – not diet or health. Food industry marketers know that humans have a natural taste preference, probably a genetic predisposition, for foods that are high in fat, sugar, and salt. Preferences essential for the survival and health of our primitive ancestors now make us vulnerable to economic exploitation. It's easier to market foods high calorie foods, particularly when those foods are cheaper to produce. The primary sources of those cheap calories are plants and animals from farms relying on modern yield-enhancing technologies, rather than inherent soil fertility. Soils lacking natural fertility produce foods lacking nutrient density.

Regardless, we have major health problems in American today. The average American now spends almost twice as much for health care as they spend for food. The fact that our spending on health care has risen while our spending for food has declined is not likely a coincidence. Something is fundamentally wrong. If we keep focusing on cheap food we are quite likely to keep getting more unhealthy people.

Some scientists would label these conclusions as the ranting of a "speculative food faddist or a pseudo-medical crank at his very worst." However, my challenge to the scientific community is to do the research before assigning labels to food critics. The work of early soil scientists such as Viosin and Albrecht has stood the test of time as far as most advocates of sustainable agriculture are concerned. Their thinking still represents the frontiers of knowledge of how to work in harmony nature to produce healthy animals and healthy crops by maintaining healthy soils.

"Animals and men are biochemical photographs of the soil." "For assaying food values, no instrument as yet invented by man is so delicate and so perfect as the living organism." Perhaps the current epidemic of obesity is a biochemical photograph of American soils. Today's soil scientists have an ethical responsibility to reexamine potential relationships between the health of our soils and the health of our people. Perhaps restoring the health of our soils is the key to restoring the physical health of our nation.

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[i] Andre Voisin, *Soil, Grass, and Cancer* (London; Crosby Lockwood & Son Ltd., 1959), pp 24-27.
[ii] Donald Davis, Melvin Epp, and Hugh Riordan, 2004,"Changes in USDA Food Composition Data for 43 Garden Crops, 1950 to 1999" *Journal of American College of Nutrition*, 23:669-682.
[iii] Bob Smith, 1993, Organic Foods vs Supermarket Foods: Element Levels, *Journal of Applied Nutrition*, 45:35-39.
[iv] WM Jarrell and RB Beverly, 1981, "The Dilution Effect in Plant Nutrient Studies," *Advances in Agronomy*, 34:197–224.