

Healthy Soil, Healthy Farms, Healthy Food, Healthy Peopleⁱ

John Ikerdⁱⁱ

Change, fundamental change, is no longer just an option for the American food system; it is an absolute necessity. We simply cannot afford the growing physical, social, and economic costs of diet related infirmities, illnesses, and diseases. Most people don't make fundamental changes in their lives until three conditions are present. First, they must conclude that what they are doing is not working for them and will not likely work in the future. Second, they must have a clear idea of what they could do differently that would make their lives better. Finally, they must believe that is possible to make the transition from what they are doing now to what they would rather do instead. Major changes in life are always risky and sometimes difficult and painful. Lacking any one of the three conditions, most people will just keep on doing what they have been doing, which America can no longer afford.

There is a growing public awareness that something is fundamentally wrong with the American food system. For decades organic food advocates have been calling attention to growing health problems associated with the widespread use of pesticides,¹ hormones,² and endocrine disruptors³ in the production and manufacturing of food. The maladies include various forms of cancers, obesity, attention deficit disorder, and a growing variety of food allergies. Foods recalled for contamination with E-Coli O157:H7, Salmonella, and various agrichemical contaminants have become almost commonplace in the U.S. the most recent being a recall of more than a half-billion eggs. All of these problems are associated with the large-scale, specialized, standardized, corporately controlled food production that dominates the American food system. In spite of persistent claims by the food industry and government to the contrary, it's becoming increasingly evident that much if not most of America's food is not good for public health and much of it is simply not fit to eat.

The tipping point of public concern may well be the growing epidemic of obesity in America. Obesity is not simply a matter of personal inconvenience or embarrassment; it is closely linked to a whole host of diet related diseases, including diabetes, heart disease, hypertension, and cancer. Most recent statistics classify two-thirds of American adults and nearly one-third of children and teens as obese or overweight. Since 1980, the number of obese adults has doubled. Since 1970, the number of obese children ages 6-11 has quadrupled, and the number of obese adolescents ages 12-19 has tripled.^{4,5}

A 2010 report by the Robert Wood Johnson Foundation, *F As In Fat; How Obesity Threatens America's Future*, documents how the growing prevalence of obesity has continued unabated, in spite of a host of programs mounted by government and nonprofit organizations to

ⁱ Prepared for presentation at the 2010 Aronia Berry Festival Sawmill Hollow Organic Farms, Missouri Valley, IA, September 18-19, 2010.

ⁱⁱ John Ikerd is Professor Emeritus, University of Missouri, Columbia, MO – USA; Author of, *Sustainable Capitalism*, <http://www.kpbooks.com>, *A Return to Common Sense*, <http://www.rtedwards.com/books/171/>, *Small Farms are Real Farms*, Acres USA, <http://www.acresusa.com/other/contact.htm>, *Crisis and Opportunity: Sustainability in American Agriculture*, University of Nebraska Press <http://nebraskapress.unl.edu>; and *A Revolution of the Middle and the Pursuit of Happiness*, on line at <http://sites.google.com/site/revolutionofthemiddle/>. Email: JEIkerd@centurytel.net; Website: <http://faculty.missouri.edu/ikerdj/> or <http://www.johnikerd.com>.

combat it. President Barak Obama's White House Task Force on Childhood Obesity is but the latest of many.⁶ In terms of economic costs, obesity related illnesses are projected to claim about one in five dollars spent for health care in America by 2020 -erasing virtually all of the gains made in improving public health over the past several decades.⁷ Health care in America already consumes more than 17-percent of our GDP,⁸ nearly three times as much as the 7-percent claimed by agriculture/food.⁹ With an aging population, growing public demand for public healthcare, and a ballooning federal budget deficit, America simply cannot afford the continuing economic costs of obesity.

On March 26, 2010 Jamie Oliver, an outspoken British chef turned activist, called for a “food revolution” in America.¹⁰ The occasion was the premier of a six-episode reality show on ABC Television. The show was filmed in Huntington, West Virginia -supposedly the unhealthiest city in the unhealthiest country in the world. The premise of the show was that people's physical health is linked directly to the foods they eat. In the first episode, Oliver pointed out that today's children are the first generation whose members are expected to live shorter lives than their parents. It's not the kids' fault; they eat what parents and other adults choose to feed them, or at least allow them to eat. Too often, this means whatever is cheapest, quickest, and most convenient. The pursuit of quick, convenient, cheap food has made Americans the most overfed and undernourished people in the world. It's time for a “food revolution.”

A question yet to be resolved is how we are going to fight this revolution. Are we going to allow the food industry to continue to blame diet related health problems on overweight people? Or instead, are we going to place a fair share of the blame where it belongs -on the food industry? In addressing the problem of obesity, we are confronted with dueling hypotheses. The conventional hypothesis promoted by the food industry is that obesity is a problem of people, specifically the psyche or physiology of fat people. They claim that people, in their quest for self-gratification, choose unhealthy lifestyles and unhealthy foods. As a consequence, they eat more calories and burn fewer calories than is consistent with good health. An equally logical alternative hypothesis, which remains largely unexamined, is that obesity is a problem of society, including social and economic pressures, but particularly with the pervasiveness of calorie-dense foods. Most Americans have only limited access to the physical activities and the healthful, nutrient-dense foods they otherwise would choose, by instinct, for good health.

Depending on which hypothesis is correct, the solutions to obesity and other diet related health problems are very different. If the conventional hypothesis is true, people need to be educated and/or trained to make the right food choices. The assumption is that nothing is basically wrong with the food system; the problem is the inability of people to make good food choices. The obesity problem then can be solved by fixing people -by educating people and encouraging greater self discipline or perhaps finding a new super diet drug. If the alternating hypothesis is true, the whole food system needs to be fixed -changed so as to give people access to a variety of nutrient-dense and energy-dense foods. The alternative assumption is nothing is wrong basically with people; the problem is that the food system deprives people of the opportunity and motivation to cultivate and to trust their basic food instincts.

Even if obesity results from a medical problem for some people, their medical problem may well be a consequence of their eating food with chemical additives or agrochemical residues, or

eating manufactured “food-like substances” -such as high-fructose corn syrup and partially-hydrogenated vegetable oils. The odds favor the alternative hypothesis, that obesity and other diet related problems can be solved only by fixing the food system -by giving people access to a variety of safe, healthful, nutritious foods and cultivating both their intellect and instincts to help them make healthy food choices.

During the first half of the twentieth century, as people became less physically active and they ate fewer calories, according to a 2000 USDA report of consumption patterns.¹¹ Americans were consuming roughly 10% fewer calories per person per day in the late 1950s than in early 1900s. Per capita calorie consumption leveled off during the 1960s, even though physical activity obviously continued decline. In the early 1970s, the number of total calories in the average American diet began a persistent upward trend, while physical activities of all types continued to decline. Calories from fats increased 22%, calories from carbohydrates increased 19%, but calories from proteins also increased by 16%. Between 1980 and 2004, total daily calories per capita from all sources, including alcohol, increased by 21%. The logical consequence is the well-publicized expansion of the American waistline, with alarming increases in numbers of Americans who are overweight or obese. The basic nature of the human species obviously hasn't evolved that much in a span of one-hundred years. For the first fifty-some years of the last century, we worked less and ate less. For the last fifty-some years, we have worked less and ate more. The human species hasn't changed much but the food system certainly has.

In the USDA study, products derived from corn and soybeans stood out as major contributors to higher calorie diets. Both of these crops are heavily dependent of commercial fertilizers and pesticides and are rely on irrigation and other intensive farming methods. High-fructose corn syrup has replaced cane and beet sugar as the sweetener of choice. Increased consumption of carbonated beverages has also meant increased consumption of high-fructose corn syrup. Soybean oil has replaced lard and butter as the fat of choice, finding a growth market in the deep fryers of the fast food industry. In fact a significant portion of increased calorie consumption has resulted from increased spending for food eaten away from home relative to food prepared at home. Fast food franchises have thrived economically by selling large portions of foods high in sweets, fats, and salt and are coming under increased public scrutiny from those concerned with public health.

Some nutritionists have pointed to the need for Americans to consume more fruits and vegetables, which are important sources of vitamins and minerals. More than 40% of Americans eat no fruits or vegetables on any given day. However, trends in fruit and vegetable consumption have been basically flat over the past 30 years, with intermittent blips and minor year to year variations. Going back to 1919, per capita fruit consumption has essentially doubled, but the total increase has been in canned, frozen, and other processed fruits. Over the same period, commercial vegetable production has increased by roughly one-third. Contrary to public perceptions, the increase in vegetable consumption was accounted for entirely by vegetables other than potatoes. The most dramatic drop in vegetable consumption has been for vegetables consumed from home gardens. Home gardens accounted for about 25% of per capita vegetable consumption in 1919, rose to more than 50% during World War II, but account for less than 3% of vegetable consumption today. The decrease in vegetables from home gardens has more than offset the increase in commercial vegetable consumption. Perhaps the resulting change in

nutritional quality of vegetables over time is more significant than the change in quantity. It's not likely that subsidizing fruits and vegetables to make them cheaper would solve the nutrition problem. We quite likely would just end up with new industrial "food-like substances" produced from fruits and vegetables, high in calories and lacking in nutrient density.

The most likely source of America's diet/health problem is likely the industrial, corporate food system in general. The upward trend in per capita calorie consumption corresponds directly with the industrialization of American agriculture. Agriculture of the 1950s was still dominated by diversified family farms producing foods primarily for local and regional markets. Most farms still relied primarily on healthy soils to produce healthy plants and animals to provide food for healthy people. Chemical fertilizers and pesticides, developed from World War II warfare technologies, were just coming on the scene and were seen as the key to agricultural prosperity and national food security.

Every significant USDA program implemented since the 1950s, including agricultural research and education in the Land Grant University system, in one way or another has facilitated the industrialization of American agriculture. Government crop subsidies are but the tip of the iceberg of government support for agricultural industrialization. By the year 2000, agriculture was dominated by large specialized corn, soybean, cotton, wheat, and rice farms and large-scale confinement animal feeding operations. Farms had become factories without roofs and fields and feed lots biological assembly lines. With industrial agriculture, the health of the soil didn't matter all that much, and apparently neither did the health of people.

The industrialization of the food system has made our food quick, convenient and cheap, but in the process it has made foods 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 animals 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. For example, wild animals naturally balance their diets, unless we humans interfere by feeding them. (Livestock bred for confinement feeding appear to have lost this ability.) However, when livestock are offered a premixed feed containing fixed quantities of various nutrients, they 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. In addition, 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%.¹² Another study published in the *Journal of Applied Nutrition* in 1993 showed nutritional deficiencies for conventional foods relative to organic foods.¹³ 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 conventionally grown 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.¹⁴ 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 much the blame for obesity. The industrialization of the entire food system -processing, manufacturing, and distribution -has coincided with the industrialization of agriculture. The large 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 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 in nutrient density.

Some scientists would label these conclusions as the ranting of a “speculative food faddist or a pseudo-medical.” However, the scientific community should do the soils/food research before assigning labels to food critics. A book on this subject, *Soil, Grass, and Cancer*¹⁵ was 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, it 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 Voisin's 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 tests with animals. The work of early soil scientists such as Voisin 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 with 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 a social and ethical responsibility to reexamine potential relationships between the health of our soils and the health of our people. They may well find that the only to restore biochemical health to people is to restore biochemical health to soils.

The indictment of industrial agriculture has been well documented over the years. Best-selling books, such as *Fast Food Nation*¹⁶ and *Omnivore's Dilemma*,¹⁷ awakened mainstream society to the dramatic changes that have been taking place in our food system. Video documentaries such as *Future of Food*,¹⁸ *Broken Limbs*,¹⁹ *Food Inc.*²⁰ and *Fresh; the Movie*²¹ provide gripping images of the negative ecological and social impacts of an industrial food system on nature, society, and on the future of humanity. The HBO Network has a new multi-documentary project underway linking the rise in obesity and other diet related health problems to the industrialization of agriculture. They all tell the same story of a food system that pollutes, extracts, and exploits in the process of generating profits -a food system lacking in environment, social, and economic integrity. What we have been doing obviously isn't working and isn't going to work in the future. It time for a food revolution.

It's time for fundamental change in our food system, but change to what? People won't change until they have a realistic vision of a new and fundamentally better food system for the future. Thankfully that vision has been emerging over the past 20-years or more under the conceptual umbrella of sustainable agriculture. The new sustainable farmers may claim labels

such as organic, low-input, alternative, biodynamic, holistic, permaculture, practical farmers, or just plain family farmer, but they are all pursuing a common purpose. They are creating farming systems that can meet the needs of the present without diminishing opportunities for the future. They are guided by a commitment to create a permanent agriculture -an agriculture that has ecological, social, and economic integrity. I like to refer to them as the new American Farmers.²²

Since retiring from the University of Missouri more than ten years ago, I have had the privilege of speaking at 25-35 different venues a year, and most of those were conferences attended by these new sustainable farmers. These new farmers are on a new frontier of farming, and life is rarely easy for the pioneers on any frontier. However, these new farm families tend to be much more hopeful, if not optimistic, about the future than are mainstream farmers today. They face many frustrations, and some fail along the way, because no one really knows how to do what they are doing. But, more and more of these new farmers are finding ways to succeed.

In general, sustainable farmers succeed by focusing on the weaknesses of industrial agriculture. Instead of specializing, they diversify. Instead of standardizing, they individualize. And instead of consolidating into larger operations, they form interdependent relationships with other farmers and with their customers. They don't compete with industrial agriculture; they do the things industrial agriculture is inherently incapable of doing.

There are no blueprints for sustainable farming. Each sustainable farming operation is unique. However, some general characteristics of successful sustainable farming operations are beginning to emerge from the diverse experiences of these new farmers. First, they understand that a growing number of consumers want something fundamentally different than what they are finding in the supermarkets and franchise restaurants today. Their products may be natural, organic, pesticide free, hormone and antibiotic free, free-range, grass-based, or any number of traits that differentiate their products from industrial foods. Second, they establish personal connections and relationships with their customers through farmers markets, CSAs, or other forms of direct marketing. Their customers are their friends and neighbors. Third, these new farmers challenge the stereotype of the farmer as a fiercely independent competitor -they cooperate and form personal relationships other farmers to share equipment, process and market their products, to do together the things that they can't do as well alone. Fourth, to these new farmers, farming is as much a way of life as a way to make a living. To them, the farm is a good place to live -a healthy environment, a good place to raise a family, and a good way to be a part of a caring community. Fortunately, for many, their products are better and their costs are less because by following their passion they end up doing what they do best. They are able to earn a decent income, but more important, they have a higher quality of life because they are living a life that they love.

Perhaps most important to human health and long run well-being, these new farmers are stewards of the land. They understand that they can create a sustainable, permanent agriculture only by restoring the health and productivity of the soil. Ultimately, the fossil energy that supports the productivity of industrial agriculture will be too scarce and expensive to use to manufacture nitrogen fertilizer. When humanity returns to solar energy as the only source of sustainable food energy, farmers will again be reliant on the chemical and biological health of soils to support the healthy plants that must sequester the solar energy needed to provide food for healthy animals, including healthy humans. In these new farmers who are committed to restoring

health to the soil is the vision of the new food system needed to restore health to people -healthy soils, healthy foods, healthy people. This is a new vision for the future worthy of taking the risk and enduring the inevitable difficulties of fundamental change.

The final requisite for change is hope: the realization that a new and better food system is possible, even if not easy and quick. The story of hope is also told through the voices and images of these new American farmers and the customers who support them. Some of their stories are told in the books and documentaries cited previously, which tend to focus on a few *celebrity farmers*, such as *Joel Salatin*²³ (*Polyface Farms, Inc.*) of Swope, VA and *Will Allen*²⁴ (*Growing Power Inc.*) of Milwaukee, WI. However, there are tens of thousands of these new farmers scattered across the country. At least six “sustainable agriculture” conferences in the U.S. and Canada draw 1,500 to 2,500 people each year. Those attending include farm families and their customers and friends. Conferences drawing 500 to 700 people are becoming almost commonplace and virtually every state in the U.S. has an organic or sustainable agriculture organization, most hosting conferences that draw 100 to 250 people annually.

People tend to underestimate the importance of the sustainable food movement because they associate it with farmers markets and community supported agricultural organizations or CSAs - and more recently, with home and community gardens. While these will continue to be important, the sustainable food movement is probably most accurately defined by the growing number of retail food stores, restaurants, and institutional food buyers who are committed to sourcing as much food as possible from local growers. The total sales of all alternative foods - natural, organic, local... - probably still amount to something less than 10% of total retail food sales. However, natural/organic/local foods have been the fastest growing segment of the food system over the past two decades, roughly doubling in size every three to four years. It will only take the right spark at the right time to ignite a food revolution.

Making natural/organic/local/sustainable food accessible and affordable to all people may seem a bit idealistic, at least at first. However, only fifty years ago, most food in America was grown locally on healthy soils. Construction on the interstate highway system had just begun and supermarkets and franchise restaurants were just beginning to catch on. By the 1960s, supermarket chains had replaced the local “mom and pop” grocers, by the 1970s, fast food franchises were “freeing housewives from their kitchens” and by the 1990s, industrial agribusinesses had replaced family farms as the nation's major food producers. In the 2000s, our food system is being transformed from national to global. All of this happened in only fifty years.

In an ever-changing world, it seems logical to assume that changes in the food system over the next fifty years will be at least as great as in the past fifty years. With the depletion of fossil energy, risks of global climate change, growing social and economic inequity, and other threats to ecological, social, and economic sustainability, it seems likely that future changes will be in a direction fundamentally different from those of the past. This new food system is at least as advanced today as the industrial food economy was fifty years ago. In even the possibility of creating a new healthy, sustainable food system, there is every reason for hope.

In the words of Vaclav Havel -philosopher, reformer, and former president of the Czech Republic. *Hope is not the same as joy when things are going well, or willingness to invest in enterprises that are obviously headed for early success, but rather an ability to work for something to succeed. Hope is definitely not the same thing as optimism. It's not the conviction that something will turn out well, but the certainty that something makes sense, regardless of how it turns out. It is this hope, above all, that gives us strength to live and to continually try new things, even in conditions that seem hopeless. Life is too precious to permit its devaluation by living pointlessly, emptily, without meaning, without love and, finally, without hope.*²⁵

Restoring health to our soils, our farms, our food system, and to the American people will not be quick or easy, but thousands, perhaps millions, of people have already committed their lives working to make it happen. In their commitment, there is hope. The links among healthy soils, healthy foods, and healthy people certainly makes sense; in this, there is hope. The defenders of the industrial food system are powerful and there may be no cause for optimism, but in even the possibility of a healthier, happier America there is hope. Change is no longer just an option in America; it is an absolute necessity. It's time for a food revolution in America. Life is simply too precious to permit it to be devalued by living pointlessly, emptily, without meaning, without love, and finally, without hope.

End Notes

- ¹ For a list of references, see *The Issue of Pesticides, Sustainable Table, Serving up healthy food choices*, <http://www.sustainabletable.org/issues/pesticides/> .
- ² *Smart Guide, Hormones in the Food system*, Institute for Agriculture and Trade Policy, Food and Health Program, <http://www.iatp.org/iatp/publications.cfm?accountID=421&refID=106678> .
- ³ Fred Vomsaal, Programmed for obesity: early exposure to common chemicals can permanently alter metabolic system, Research and the Arts, University of Missouri, <http://rcp.missouri.edu/articles/vomsaal-obesity.html> .
- ⁴ National Center for Health Statistics. "Prevalence of Overweight, Obesity and Extreme Obesity among Adults: United States, Trends 1960-62 through 2005-2006." *NCHS E-Stats*, December 2008. http://www.cdc.gov/nchs/data/hestat/overweight/overweight_adult.htm .
- ⁵ Ogden CL, Carroll MD, and Flegal KM. "High Body Mass Index for Age among U.S. Children and Adolescents, 2003-2006." *Journal of the American Medical Association*, 299(20): 2401-2405, 2008.
- ⁶ Robert Wood Johnson Foundation, *F As In Fat; How Obesity Threatens America's Future*, http://www.pbhfoundation.org/pbh_direct_new/jul09_2010/Obesity2010Report.pdf .
- ⁷ Cost Of Treatment For Obesity-Related Medical Problems Growing Dramatically, *Rand Corporation*, <http://www.rand.org/news/press/04/03/09.html> .
- ⁸ Center for Medical and Health Services, *NHE Fact Sheet*, https://www.cms.gov/NationalHealthExpendData/25_NHE_Fact_Sheet.asp .
- ⁹ The 20th Century Transformation of U.S. Agriculture and Farm Policy, USDA, Economic Research Service, www.ers.usda.gov/publications/eib3/eib3.htm .
- ¹⁰ *Jamie Oliver's Food Revolution*, <<http://abc.go.com/shows/jamie-olivers-food-revolution>>
- ¹¹ Major Trends in U.S. Food Supply – 1909-1999, *A Century of Change in America's Eating Habits*, Economic Research Service, USDA, <http://www.ers.usda.gov/publications/foodreview/jan2000/frjan2000b.pdf>
- ¹² 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.
- ¹³ Bob Smith, 1993, Organic Foods vs Supermarket Foods: Element Levels, *Journal of Applied Nutrition*, 45:35-39.
- ¹⁴ WM Jarrell and RB Beverly, 1981, "The Dilution Effect in Plant Nutrient Studies," *Advances in Agronomy*, 34:197-224.
- ¹⁵ Andre Voisin, *Soil, Grass, and Cancer* (London; Crosby Lockwood & Son Ltd., 1959), pp 24-27.
- ¹⁶ Eric Schlosser, *Fast Food Nation: The Dark Side of the All-American Meal* (New York: Houghton Mifflin, 2001).
- ¹⁷ Michael Pollan, *The Omnivore's Dilemma: A Natural History of Four Meals* (New York: Penguin Press, 2006).
- ¹⁸ *The Future of Food* <<http://www.thefutureoffood.com/>>
- ¹⁹ *Broken Limbs*, <<http://www.brokenlimbs.org/endorsements.html>>
- ²⁰ *Food Inc.*, <<http://www.foodincmovie.com/>>
- ²¹ *Fresh; the Movie* <<http://www.freshthemovie.com/>>
- ²² For 50 real life examples, see "The New American Farmer – Profiles in Agricultural Innovation," the SARE Program, USDA, Washington DC. (\$10 US – call: 802-656-0484 or e-mail: sanpubs@uvm.edu , also available free on line at <http://www.sare.org/newfarmer>)
- ²³ *Polyface Farms Inc.* <<http://www.polyfacefarms.com/>>
- ²⁴ *Growing Power*, <<http://www.growingpower.org/>>
- ²⁵ Vaclav Havel.1990. *Disturbing the Peace* (New York: Random House inc.), Chapter 5.