
CARNICERIA MERC

CHAPTER TWO

Core Food System Problems

The overall patterns by which we produce, process, distribute, and eat food can be called food systems. An ideal food system would provide all of the people it served with a diet that supported optimal health, without diminishing dietary prospects for future generations. The current global food system falls well short of this ideal in both nutritional support and sustainability. It is neither supporting optimal health for all the people nor protecting the natural resource base so that future generations can produce their food.

NUTRITIONAL PROBLEMS

There are about 6.7 billion humans on the planet and it is widely assumed that we will reach a peak population of around 9 billion by the middle of the 21st century. We each need about 1.8 kg (4 lb) of food a day. Typically that food contains small amounts of several minerals, vitamins, and antioxidants, plus the major components shown in Chart 2–1 on page 12.

Traditional malnutrition

Approximately half of the world's people experience serious health problems tied to their diet. Roughly one billion suffer directly from simple hunger or under-nutrition, the lack of enough food to meet the physical demands of life. Despite the Green Revolution, genetically modified crops, and several decades of large-scale well-intentioned programs to eradicate hunger, in some ways the problem may actually be getting worse. While the percentage of people who are undernourished may be declining somewhat, the overall number of hungry people in the world is not. The roughly one billion people who are chronically hungry in 2010 exceed the entire number of humans alive in 1800.

A far larger number of people, perhaps 2 to 2½ billion, live with a dietary shortage of one or more vital nutrients. While they may have an adequate intake of calories, these people suffer from the "hidden hunger" of micronutrient deficiencies. The most common and troubling of these are iron deficiency anemia, and deficiencies of vitamin A, folate, iodine, and zinc. A shortfall of tiny amounts of these essential micronutrients deprives people of the energy required to work, play, or learn to their potential, and leaves them far more vulnerable to a range of debilitating illnesses and birth defects.

Hunger, whether visible or hidden, affects mainly people who live in the tropics. They typically earn less than two dollars a day and spend most of that on cheap starchy staple foods in order to subsist. These cheap staples by themselves don't have an adequate range of nutrients to support good mental and physical health. Increases in the price of rice, wheat, and corn have pushed many of these people into even more desperate situations. According to the U.N. Food and Agriculture Organization global food prices hit a new record high in February, 2011, more than two and a half times higher than in 1990 when they began keeping these records.

CHART 2–1
TYPICAL DAILY FOOD CONSUMPTION

NUTRIENT	DAILY CONSUMPTION
Water	1.4 kg (3 pounds)
Starch	255 g (9 ounces)
Protein	85 g (3 ounces)
Fat	85 g (3 ounces)
Sugars	57 g (2 ounces)
Fiber	28 g (1 ounce)

Alongside those who are undernourished or micronutrient deficient is the multitude of people whose access to adequate food is not secure. Food security for a family means that all of the members always have access to enough food for an active healthy life. People with low or intermittent income are the most likely to lack food security. Often a slight shift in circumstances, such as an injury or illness, a new child, or some sort of economic or political disruption is enough to push them into the ranks of the undernourished.

Industrial food malnutrition

The other face of the human nutrition problem is the "new improved" malnutrition brought on by the global industrialized corporate food system. With few exceptions, wherever modern industrial foods have supplanted traditional diets, the rates of several diet-related chronic diseases have soared. The new problem of malnutrition in many societies expresses itself in the increasing prevalence of coronary disease, obesity, diabetes, high blood pressure, stroke, and many types of cancer, rather than as a shortage of food or susceptibility to infection. These tend to be mainly problems related to poor food choices. Those poor food choices typically amount to eating too many calorie-dense foods with refined fats and carbohydrates, and too few nutrient-dense fruits and vegetables.

It is tempting to view other people as simply too weak-willed to resist that extra chocolate bar. The sheer numbers, however, suggest a more fundamental food system problem. The number of overweight people now stands at about 1.1 billion, about the same as the number of undernourished people. This problem is getting increasingly serious, and is damaging the health and long-term prospects of younger people each year. Even in China one child in ten is now obese.

SUSTAINABILITY PROBLEMS

A system that is robust enough to provide food for at least 10,000 years could be called durable or sustainable. We are still a relatively young species, far from matching the dinosaurs' impressive run of hundreds of millions of years. Among all the various human activities, maintaining our food system has by far the greatest impact on natural environments. Functioning food systems are perhaps the top priority of any society. When one fails it needs to be repaired or replaced quickly or there is trouble. Ours is currently under stress.

Obviously, providing secure access to a well-balanced diet for billions of people is a prodigious undertaking. It is estimated that the current world food production is sufficient to provide each person with 2,700 calories per day. This would be more than adequate if distribution were equitable. In practice a great many people are consuming less than 1,800 calories a day; barely enough to stay alive. In addition to the issue of uneven distribution, it is not

clear that we can continue producing this much food without incurring irreparable damage to our food producing ecosystems.

Not only are there now more people alive than ever before, but they are living much longer and they are demanding more foods higher up the trophic pyramid. It is very difficult to imagine that the current global food system will be able to meet the dietary demands of nine billion people without profound damage to the Earth's natural resource base. Below are six important trends that need to be addressed, if not resolved, in order to make a graceful transition to a more sustainable food system.

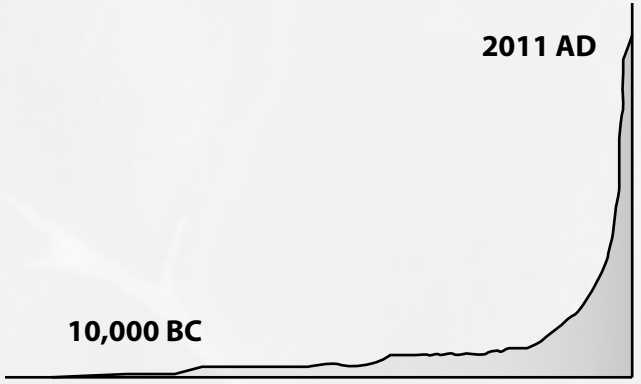
Rising energy costs

The modern food system uses phenomenal amounts of energy, mainly from non-renewable petroleum and natural gas, to produce, process, and distribute our food. Most of the fertilizer and other agrichemicals on which our industrialized food system depends are manufactured from fossil fuels (oil, coal, and natural gas). The tractors that work the land and the trucks that transport the food burn gasoline and diesel fuel derived from oil. The reserves of petroleum are rapidly being drawn down and are not being replaced. The crude oil that was most convenient to exploit has been exploited. Increasingly we will be drilling deeper for lower grade oil in more difficult circumstances. The low-hanging fruit has already been picked. The catastrophe of crude oil gushing for months into the Gulf of Mexico in the summer of 2010 was one of the costs of drilling deeper in more difficult circumstances. The demand for concentrated supplies of energy is growing, and expanding economies are competing for the dwindling resources. All of these factors are combining to drive up the price of petroleum-based products and services. Industrial foods are petroleum-based products.

The impact of rising oil prices on the food system is often made worse, not better, when people try to substitute bio-fuels for petroleum. Bio-fuels are derived from living plants and could in theory become renewable energy resources. Unfortunately, bio-fuel crops are generally grown unsustainably as commercial monocrops. Bio-fuel crops are also competing for land with food crops. This is especially troubling in sub-Saharan Africa where a massive land grab by wealthier foreigners is well underway. This threatens to further diminish the food resource available to the world's most malnourished population.

Climate Change

The problem of fossil energy costs is greatly exacerbated by the impact burning these fuels is having on the global climate. Oil, coal, and natural gas are ancient reserves of concentrated carbon captured from the air by green plants millions of years ago. Burning them now is adding enough carbon to the air to change the atmosphere's chemistry. This relatively sudden



Human Population Growth

addition of carbon increases the "greenhouse effect" of our atmosphere, trapping more solar energy and raising the Earth's temperature. Large climate systems are extraordinarily complex, and accurately projecting changing climate patterns for an entire planet is beyond our capacity.

Despite some regrettable fumbling, the best available science is nearly unanimously expecting big trouble. While some temperate-zone agriculture may see a temporary benefit from the changing climate, overall the changes will likely be disruptive, especially in the tropics. Warmer temperatures may well cause the flooding of low-lying land as polar ice melts. These coastal lands are among the most populated and the most productive in terms of food production. Beyond coastal flooding, global warming is expected to destabilize weather patterns, spawning more frequent and powerful storms and making agriculture a much less predictable and more difficult endeavor. This is not a good weather forecast if we need to double our food production in fifty years.

Water

Water is even more critical to food production than oil, though it is not consumed in the way that oil is burned. It is constantly recycled through evaporation and rainfall. The value of water can be greatly diminished by contamination; and underground aquifers can be depleted by withdrawing water faster than they are recharged by rainfall. According to the World Bank, worldwide demand for fresh water is doubling every 21 years and more than half the world's population resides in areas with water shortages.

Nearly 70% of the water we use is for irrigating food crops. A lack of water is now or will soon be the factor most limiting food production in much of the world. Again, the growing demand for meat, milk, and eggs intensifies the problem, since their production requires far more water than an equal amount of plant-based foods (mainly for irrigating feed crops). The very high levels of food production required by the middle of the twenty-first century will necessitate large increases in irrigation, but most of the convenient sources of ground and surface water are already being used at rates that are not sustainable. Desalinating sea water is not a good option since it is energy intensive.

Soil

We live on a ball that is roughly 13,000 km (8,000 mi) in diameter. Two-thirds of the ball's surface is covered with salt water. On the remaining portion is a remarkably thin skin of soil upon which almost all terrestrial life depends. The most important layer, composed of broken-down rock, organic matter, air, and water is called topsoil and ranges from only a few centimeters up to a meter or so thick. Soil physically supports plants and is the matrix from which most water and nutrients are derived. Modern

agriculture, with its focus on vast monocrops of annual plants, has contributed to the erosion or degradation of about half of all of the Earth's best food-growing land. Where the soil has not been literally washed into the sea, it has often lost much of its organic matter and with it, important structural properties. Soluble synthetic fertilizers and frequent plowing have reduced the topsoil's ability to absorb and to retain water. Much of the soil that we will need to produce bumper crops for the next fifty years is already depleted in one or more minerals essential to plant growth.

Biodiversity

Human beings currently make up less than one percent of the animal biomass on the planet, yet we use between thirty two and forty percent of the net photosynthetic productivity of the Earth's plants. This disproportionate pattern of use doesn't leave enough resources available for the millions of other species with whom we share the Earth. In his book *The Future of Life*, biologist E. O. Wilson predicted that half of all species will suffer extinction within fifty years if current land use patterns continue. The cost of doubling the food supply available to humans would likely be dire in terms of biodiversity. Not only is it unethical to drive so many fellow species to extinction, but the rich mosaic of diverse species provides many ecological services that are essential to support human populations.

Urbanization

Roughly 50% of the world's population now lives in urban areas. Both the percentage and absolute numbers of city dwellers are growing. Much of the push for urbanization comes from the rapid mechanization of agriculture. Many countries have tried to emulate the agricultural development of the United States, with its emphasis on huge, highly-mechanized monoculture farms. Capital, machinery, and agri-chemicals are used to replace expensive labor. This strategy has been so successful that there are now fewer than 1 million full-time farmers in the US, a country with over 300 million people. In fact, there are more prisoners than farmers in the US. Food has become cheap and plentiful but the skills required to grow it are quickly being lost. As the opportunity to make a living on the land disappears, the pressure to create jobs and infrastructure for hundreds of millions of new urbanites intensifies. The world only needs so many software engineers.

Taken together these six factors make it impossible for the world's human population to continue feeding itself using the same systems that are currently being employed. The next section of this book will look at the role that leaf vegetables might play in addressing some of these thorny nutritional and ecological problems and helping to make the transition to a new food system.