Rethinking Sustainability; Food as a Metaphor[i]

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Over the past few decades, sustainability has evolved from the futuristic vision of a handful of environmentalists to become the watchword of American government and industry. The meaning of sustainability has not changed. Most still agree that sustainability is about "meeting the needs of the present generation without compromising the ability of future generations to meet their needs." [1] There is also general agreement on the ecological, social, and economic dimensions of sustainability. With its growth in popularity, however, sustainability has lost much of its original significance as a fundamental challenge to current ways of working, living, and thinking.

Different organizations address the three dimensions of sustainability in different ways but they all include general references to ecological, social, and economic integrity. The specific institutional commitments, however, tend to be narrowly defined in scope and focus. For example, U.S. EPA initiatives are focused on four specific areas: urban sustainability and the build environment; water and ecosystem services; energy, biofuels, and climate change; and material management and human health.[2] Walmart focuses its efforts on three goals: "to be supplied by 100-percent renewable energy, create zero waste, and sell products that sustain people and the environment."[3] ExxonMobil pledges to "improve efficiency and environmental performance" and "develop technologies to reduce the environmental footprint of energy use."[4] Monsanto's specific goals are to "meet the needs of a growing planet, preserve natural resources for future generations, and increase incomes and standards of living."[5]

Institutional commitments to sustainability have been systematically redefined to accommodate the ongoing mission of the organization. For corporations, this meant maximizing economic returns to their stockholders. Attention to sustainability has become a public relations necessity that can sometimes assist in, but is never allowed to detract from, the pursuit of corporate profits and growth.

The basic problem with most existing sustainability initiatives is they let the necessary become the enemy of the sufficient. Increased efficiency in use of fossil energy and other nonrenewable resources will be necessary to make the best use of remaining stock of finite resources. Markets will provide incentives for increased efficiency as resources become increasingly scarce. Markets will also provide incentives to substitute more plentiful resources for scarce resources as the total stocks of nonrenewable resources decline. However, resource efficiency and substitution will not be sufficient to achieve sustainability. Sustainable economic development must be a self-renewing, regenerative process that relies on solar energy to offset the inevitable depletion of productivity of nonrenewable resources. Today's emphasis on resource efficiency and substitution are delaying the inevitably rethinking and redesigning that will be both necessary and sufficient to ensure sustainability.

Our economic and political systems ultimately must be redesigned using the paradigm of self-renewing, regenerative, living systems. This is not an impossible task. It will just require a fundamental change in thinking. Sustainability challenges the dominant ways of thinking of the past two centuries, including the thinking of most scientists and academics. We simply can't keep on doing the things we have been doing. Our economic and political systems aren't working for the good of today's society overall and certainly for the good of future generations. Meeting the real challenges of sustainability will require a fundamental rethinking of our most basic beliefs, including how we think the world works and where we humans fit within it. The quest for sustainability ultimately will change virtually every aspect of our current way of life.

The industrial era of economic development has brought tremendous material progress and no one would choose to return to pre-industrial times of widespread drudgery, deprivation, disease, and early death. But, the industrial era is nearing an end. We are rapidly depleting the natural and human resources upon which all industrial economies ultimately must depend for their productivity. Industrial economic development is not sustainable. This is not a personal opinion. It is a conclusion based on the most fundamental laws of science and most basic principles of economics.

Sustainability ultimately is a matter of energy. Our houses, automobiles, clothes, food, all things of use to us require energy to make and energy to use. In fact, all material things are concentrated forms of energy. That's what Einstein's famous equation $E=MC^2$ is about: E equals energy, M is matter, and C is the speed of light. All useful human activities--working, thinking, creating--also require energy. In fact, the brain accounts for about one-fifth of energy used by the human body. In addition, we are not born as productive individuals but as helpless babies. We have to be nurtured, educated, socialized, and civilized by families, communities, and society before we become "useful." All of this requires energy, including "social energy." The sustainability of human life on earth depends on sustaining the usefulness of energy.

According to the first law of thermodynamics, energy can neither be created nor destroyed, which might suggest that sustainability is inevitable. However, according to the second law of thermodynamics, each time energy is used, some of its *usefulness* is lost--the law of entropy. Whenever energy is used, it always changes in form, specifically from more concentrated, organized forms to more dispersed, disorganized forms, as when gasoline explodes in the engine of an automobile. In fact, this natural tendency to disperse is what makes energy useful. Each time it is used and reused, it becomes less concentrated, less organized, and thus, less useful.

Some forms of energy can be reconcentrated and restored, but this requires energy, which is then unavailable for other uses. No matter how efficiently energy is used and reused, energy inevitably tends toward uselessness, toward entropy. Solar energy is the only source of new energy available to offset the loss of useful energy to entropy. Consequently, the sustainability of human life on earth ultimately depends on capturing, concentrating, and storing sufficient quantities of solar energy to offset the usefulness of energy lost to entropy.

Economists have shown little interest in sustainability because contemporary economics is based on the archaic belief that science and technology will always be capable of finding substitutes for anything we use up or solving any problem we create. Most economists believe all we need to do to create a sustainable economy is to provide the appropriate economic incentives. However, things have economic value only because they are useful, and their usefulness ultimately is derived from energy. All economic value is derived from either natural or human resources--from nature or society--the only sources of useful energy. Once all of the useful energy in nature and society is used up, there will be no source of additional economic value.

The fundamental problem in relying on economic incentives to ensure sustainability is that economic value is inherently individualistic. It places no value on purely social, non-instrumental relationships. To an economist, a rational relationship is always a means to an economic end. It makes no economic sense to do anything for the sole benefit of someone else or for society in general. There is no incentive to regenerate and restore the "social energy" necessary to ensure an educated, equitable, and just society for the benefit of someone else, certainly not someone else of some future generation. Based on everything we know about the nature of humans and human civilizations, economics places too little value on society to ensure sustainability.

This is not a philosophical conclusion; it can be derived directly from economic reality. People are willing to pay interest on borrowed money, to have money to spend today rather than wait until sometime in the future. People demand interest on loaned money; to offset the risks of delayed gratification. This preference for the present arises from the fact there is no way for an individual to realize economic value after he or she is dead. Since life is inherently uncertain, we value things we can enjoy today more highly than things we might or might not be able to enjoy in the future. At an interest rate of seven-percent, a reasonable market rate of interest, a dollar that will not be received or paid until ten years in the future is only worth fifty-cents today because fifty-cents invested at seven-percent today will be worth a dollar ten years in the future. A dollar seventy years in the future is worth only a penny today. Obviously, it makes no economic sense to invest in anything for the benefit of some distant future generation.

Some theorists speculate about the possibility of "delinking" economic growth from natural resources, thus sustaining growth without increasing resource use. It most certainly is possible to *increase* economic output by increasing resource efficiency and substitution. However, it is not possible to *sustain* economic growth without depleting the usefulness of energy from which all economic value is derived. Resource efficiency and substitution only slow the process of entropy. It will take a complete redesign of the economic development process, based on new ways of thinking, to capture and store solar energy sufficient to achieve sustainability.

As Albert Einstein once wrote, we can't solve problems using the same thinking we used when we created them. The industrial paradigm of economic development reflects a

mechanistic way of thinking that emerged during the times of Isaac Newton and Rene Descartes. Mechanisms and mechanistic organizations have proven to be very efficient in extracting useful energy, but they are fundamentally incapable of energy renewal or regeneration. No matter how efficiently mechanisms of the future may use energy, they eventually will deplete its usefulness. No matter how efficiently mechanistic organizations use energy, including businesses, governments, and nonprofits, they eventually will lose their ability to do anything useful for human society.

Sustainable economic development must be based on an organismic worldview--the world as a living ecological system. Only living systems are capable of self-renewal and regeneration and thus capable of offsetting the loss of useful energy to entropy. Green plants, for example, have the ability to capture energy from the sun and store useful solar energy in their tissues. Plants are biological solar energy collectors. People also are capable of capturing solar energy; we use windmills, water impoundments, and photovoltaic cells. People, being biological beings, are inherently dependent on the energy stored by green plants. Living things, including people, also have a natural inclination, as well as ability, to devote a significant portion of their life's energy to reproduction, meaning renewal and regeneration. Sustainable economic development must be based on the paradigm and principles of biological, living systems.

Businesses, governments, and all other organizations of the future must be managed as living organisms, rather than the inanimate mechanisms. Mechanisms function according to physical laws, which can be expressed as mathematical formulas. Living systems function according to general principles which are more difficult to define and quantify but no less real. When we apply a specific production practice or management strategy to a particular plant, animal, or person we never know for sure how they will react. We know, in principle**,** how they will respond, but not how a particular plant, animal, or person will respond in a particular situation.

Living systems are holistic. A living organism is something more than the sum of its parts; it is a *whole*. Living systems have properties that emerge from the whole that are not contained in their individual parts; relationships matter. Sustainable organizations must also respect the ecological principle of *diversity*. Diversity is necessary for biological systems to capture, store, and recycle the solar energy needed for resistance, resilience, renewal, and regeneration. The payoff from holism and diversity is realized through the principle of *interdependence* or mutuality. Mutually beneficial relationships make it possible to create sustainable systems from elements or parts that individually and separately are simply not sustainable.

Families, communities, and societies are also living systems and thus function according to principles rather than laws. Relationships among true friends and within sustainable communities must be built upon the social principle of *trust* rather than relying on laws and contracts. Laws are only effective in constraining the incorrigible and antisocial. People must choose to be honest, fair, and responsible in their dealings with each other. We humans are fallible beings; we need mercy as well as justice. Sustainable relationships must be based on *caring* and kindness. We must be empathetic, respectful,

and compassionate. Finally, people must find the *courage* to be trusting and caring. It takes moral courage to sustain positive relationships in a world where trusting and caring are seen as naive or idealistic.

As individuals, we must respect the basic principles of economics. The most basic economic principles reflect the innate nature of individual human behavior. These principles also provide the foundation for the economic viability of sustainable organizations. We value things individually that are *scarce*, not things that are necessary but also abundant, like air and water. We need to get as much usefulness as we can from whatever we have; we need to use our time, money, and energy *efficiently*. We also need to be able to make independent decisions; we value our *sovereignty*. We need not accept the dominant economic belief that our self-interest serves the greater common good, but we must respect the basic principles of economics if we are to meet our individual needs and sustain business organizations and local and national economies.

Finally, sustainable development must have ecological, social, and economic integrity--all three. These same basic principles must permeate all aspects of life. The principles of holism, diversity, and interdependence must permeate societies and economies. The principles of trust, kindness, and courage must also be reflected in ecological and economic relationships. And, the principles of scarcity, efficiency, and sovereignty must be used in managing natural ecosystems and maintaining social relationships. Sustainability requires a renewed commitment to integrity based on ecological ways of thinking about how the world works and our place within it.

The production and provision of food provides a compelling metaphor for the inability of current thinking to address the real issues of sustainability and the necessity to rethink the way the world works and our place within it. Food is among the most basic of all human needs. We are biological beings. If we destroy the biological integrity of the earth, we destroy the future of humanity. There are already too many people on the earth to return to hunting and gathering. Therefore, the sustainability of human life, at any level remotely comparable to that of today, depends on the sustainability of our supply of food, specifically the sustainability of agriculture.

Today's dominant paradigm of industrial agriculture provides a metaphor for the perils of industrial economic development in general. Industrial agriculture evolved from the mechanistic scientific worldview that has undergirded the industrial era of economic development. It relies on the basic strategies of specialization, standardization, and consolidation of control. In the quest for economic efficiency, farms have been transformed into factories without roofs and fields and feedlots into biological assembly lines. The industrialization of agriculture has yielded impressive results, at least in terms of productivity and economic efficiency. However, it has degraded its natural resource base, depleted its human resource base, and destroyed economic opportunities for the future. Today's industrial agriculture fails every test of sustainability.

As American agriculture has become more industrial, it has become increasingly dependent on fossil energy and other non-renewable resources. The total food system

currently claims about twenty-percent of all fossil energy used in the U.S. with farming accounting for about one-third of the total. In fact, our industrial food system requires about ten calories of fossil energy for every calorie of food energy produced. Globally, agriculture also accounts for more than twenty-percent of greenhouse gas emissions, even more than transportation. Agricultural pollution represents negative energy, in that it destroys the usefulness of other energy resources or requires energy to mitigate its negative impacts. Industrial agriculture pollutes the air, water, and soil with toxic agrochemicals and livestock manure. In fact, agriculture has become the number one source of nonpoint source pollution in the U.S., creating huge "dead zones" in the Chesapeake Bay and Gulf of Mexico. An industrial agriculture is not ecologically sustainable.

Industrial agriculture also is a significant contributor to the depletion of social energy. Farm workers today are among the lowest paid workers in the U.S., while working under dangerous and disagreeable conditions, most without adequate health care or other fringe benefits. A growing reliance on migrant farm workers also creates cultural and political conflicts, particularly in times when good paying jobs are few. Farming communities depend on farm families, not just to support businesses on Main Street but also to maintain viable local schools, health care, and other public services. Industrial agriculture has meant larger farms and fewer farm families. As a consequence, rural communities in agricultural areas have suffered decades of economic and social decline and decay. An industrial agriculture is not socially sustainable.

These negative ecological and social impacts are defended as being necessary to make the food system more economically efficient. Industrial production methods are deemed necessary to ensure an adequate supply of safe and healthful foods that are affordable to all people. However, there are no fewer hungry people in the U.S. or in the world today than at the beginning of the industrial era in agriculture. There are also growing indications that many of industrially produced foods are not healthful or even safe to eat. Outbreaks of salmonella and E-Coli have become commonplace. Millions of Americans suffer from diet related illnesses, such as obesity, diabetes, heart disease, and various forms of cancer, all of which are most common among those with the lowest incomes.

Industrial agriculture certainly hasn't been economically viable for most farmers. The total number of farmers in the U.S. has dropped from more than six-million in the 1930s to less than two-million today, and a large majority of farm household incomes today come from something other than farming. In fact, many farm families fare little better than migrant farm workers, as independent farmers are periodically forced out of business to make room for further consolidation. In fact, much of today's agricultural production is carried out under comprehensive contracts with multinational agribusinesses which leave farmers little better off than serfs on their own land. An industrial agriculture is not economically sustainable.[iii]

Just as industrial agriculture provides a metaphor for the perils of industrial economic development, sustainable agriculture provides a metaphor for the promises or possibilities

of creating sustainable economies. Sustainable farmers rely on green plants to capture and store solar energy and to regenerate the organic matter and natural productivity of the soil. They use crop rotations, cover crops, intercropping, managed grazing, and integrated crop and livestock systems to manage pests and maintain the fertility of their soils. They are able to reduce costs by relying less on purchased inputs, many of which are derived from fossil energy, while maintaining or increasing their productivity and profitability.

Sustainable farmers build personal relationships with their customers, not just to create a market but also because they value their friendships. Farmers and their customers find a renewed sense of community at farmers markets, community supported agricultural associations (CSAs), and community gardens, and other direct marketing venues. Sustainable farmers give priority to their local communities in marketing their products and purchasing products and local consumers give priority to local farmers; both value community and society. Farmers are able to increase product value and profitability while helping to build stronger local economies and communities.

Most important, sustainable farmers accept an ethical and moral commitment to preserve the natural productivity of their land and their communities by leaving them as good as or better than they found them. Sustainable farmers realize direct value from their relationships with their land and with people, not just the instrumental or economic value. They work in harmony with nature, not just to maintain productivity, but also to respect their honored role as stewards of the land. They work in harmony with society, not just to create new markets, but to respect their honored role as responsible members of the human community.

Sustainable farmers embrace the historic philosophical principles of organic farming. Sir Albert Howard, a pioneer of organics, began his book, *An Agricultural Testament,* with the assertion, "The maintenance of the fertility of the soil is the first condition of any permanent system of agriculture."[6] He contrasted the permanent agriculture of the Orient, specifically China and India, with the agricultural decline that led to the fall of Rome. He concluded, "The farmers of the West are repeating the mistakes made by Imperial Rome." J. I. Rodale, another prominent proponent of organic farming, defined organics in terms of intergenerational equity; he wrote, "The *organiculturist* farmer must realize that in him is placed a sacred trust. As a patriotic duty, he assumes an obligation to preserve the fertility of the soil, a precious heritage that he must pass on, undefiled and even enriched, to subsequent generations."[7]

Rudolph Steiner, the founder of Biodynamic Farming defined an organic farm as a living system, as an organism, whose health and productivity depended on healthy relationships among its ecological, social, economic, and spiritual dimensions. He wrote, "A farm is healthy only as much as it becomes an organism in itself, an individualized, diverse ecosystem guided by the farmer, standing in living interaction with the larger ecological, social, economic, and spiritual realities of which it is part."[8] To Steiner, organic farming was about relationships--physical, social, and spiritual relationships among the farm, farmer, food, and eater.

The new sustainable approach to farming has many names, including organic, biodynamic, holistic, bio-intensive, biological, ecological, and permaculture. Such farmers and their customers share a common commitment to creating a new food system that is capable of permanence through renewal and regeneration. Smaller independent food processors and retailers also are beginning to form alliances with local farmers and community members to compete with the large, corporate agribusinesses, which increasingly dominate both national and global food markets.

Over time, with supportive changes in public priorities and policies, a global network of sustainable, community-based food systems could well replace the current industrial, corporately controlled global food system. Various natural food retailing surveys have shown that approximately one-third of American consumers today are looking for alternatives to industrial foods, specifically foods that have ecological, social, and economic integrity, and their numbers are growing.[9] A sustainable alternative to the current industrial food system is an absolute necessity in a world running out of fossil energy.

The same things that are happening in agriculture are happening all across our economy and society. Everything of economic value, not just our food, must be derived from either the resources of nature or society. We are depleting not only the productivity of agricultural land and rural people but also the productivity of all natural and human resources. The relationships are just more direct and easier to see in agriculture. The environmental, social, and economic challenges confronted today by American and global society are a direct consequence of the lack of sustainability of today's paradigm of industrial economic development. We are systematically destroying the future of humanity.

The new paradigm of sustainable economic development must be built upon a new foundation of new scientific thinking. The science of sustainability will be a quest for understanding of the principles that guide complex living systems rather than mechanistic laws that define specific mechanistic causes and effects. The mechanistic science of the present will continue to be appropriate for the nonliving world, but a sustainable living world will depend on a new science of living systems. The science of sustainability must respect the value of human relationships among friends and within families, communities, and societies. Perhaps most important, the science of sustainability must respect the importance of ethics and morality in all human activity. Sustainability is ultimately about intergenerational equity, about meeting the needs of present and future generations fairly and equitably.

Scientists who are serious about sustainability must accept the philosophical responsibilities that come with their Doctor of Philosophy degrees. Aristotle, perhaps the greatest philosopher, understood the ultimate goal or purpose of human life as the pursuit of happiness, which he called *eudemonia*.[10] Happiness is the end to which all our economic, social, and ecological relationships are but means. Aristotle's eudemonia is inherently social in nature, in that it is realized only within families, friendships, communities, and society. Furthermore, he believed that human happiness required a life

of virtue. He thought someone *flourished* by doing things simply because they were the "right thing to do. Sustainable development ultimately is "the right thing to do."

Scientists have both the ability and an ethical and moral responsibility to expose the myths of today's economics, politics, and science and to tell the truth about what it will take to achieve sustainability. Scientists have both the ability and an ethical and moral responsibility to do the new thinking that will be necessary to redesign our means of production and our economic and political institutions to achieve sustainability. Sustainable prosperity without growth is a realistic possibility.[11] Scientists must first find the courage to break out of the old, comfortable patterns of mechanistic thinking that dominate their respective disciplines. They must be willing to rethink how the world works and the place of we humans within it. Ultimately, we all must find the courage to rethink sustainability simply because it's "the right thing to do."

End Notes:

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[i] Prepared for presentation at the Global Think-In Conference on Environment, Economics, and Equity, Central Michigan University, Mount Pleasant, MI, April 20, 2010.

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[iii] The ecological, social, and economic consequences of agricultural industrialization have been well documented in best-selling books, such as *Fast Food Nation*[iii] and *Omnivore's Dilemma.*[iii] Less popular books, such as *The End of Food*[iii] and *America's Food,*[iii] covered virtually all aspects of the industrial food systems in great detail. Video documentaries such as *Future of Food,*[iii] *Broken Limbs*,[iii] *Food Inc.*[iii] and *Fresh; The Movie*[iii] provided gripping images of the negative ecological and social impacts of industrial agriculture. These books and documentaries all tell the same basic story: our industrial food system is simply not sustainable.

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[1] The World Commission on Environment and Development, *Our Common Future*, ed. Gro Bruntland, (Oxford, England: Oxford University Press, 1987).

[2]*U.S. Environmental Protection Agency*, *Sustainability*, http://www.epa.gov/sustainability/

[3] *Walmart, Sustainability*, http://walmartstores.com/sustainability/

[4] *ExxonMobil, Sustainability*, http://www.exxonmobil.com/Corporate/community_ccr_sustainability.aspx

[5] *Monsanto, Sustainability*, http://www.monsanto.com/responsibility/sustainable-ag/default.asp

[6] Sir Albert Howard. 1940. *An Agricultural Testament.* Oxford University Press: Oxford, England. also in Small Farms Library <http://journeytoforever.org/farm_library/howardAT/ ATtoc.html>

[7] J. I. Rodale. 1948. *The Organiculturist's Creed*, Chapter 8. *The Organic Front*. Rodale Press: Emmaus, PA, USA. <http://www.soilandhealth.org/copyform.asp?bookcode=010133>

[8] Rudolph Steiner.1924. *Spiritual Foundations for the Renewal of Agriculture.* Gardner, M. (1993) (ed). Bio Dynamic Farming and Gardening Association of USA: Junction City, OR, USA. <http://www.biodynamics.com/ index.html>

[9] Allison Wortington, *Sustainability, the Rise of Consumer Responsibility*, The Hartman Group, Bellevue, WA, Spring, 2009.

[10] *The Internet Encyclopedia of Philosophy*, Aristotle (384-322 BCE.): Politics, by Edward Clayton, http://www.iep.utm.edu/a/aris-pol.htm#H5 . Aristotle discusses happiness in Book II, Chapter 3 of the *Physics* and Book I, Chapter 3 of the *Metaphysics.*

[11] Sustainable Development Commission, *Prosperity without Growth? The Transition to a Sustainable Economy*. http://www.sd-commission.org.uk/publications.php?id=914