

The Future for Family Farms and Rural Communitiesⁱ

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The future is always shaped by the past and the present. The natural tendency is to simply project the continuation of past and current trends when anticipating the future. For agriculture, this approach would suggest the end of the tradition of family farming and the eventual economic demise of most rural communities. However, everything on earth tends to operate in cycles – physical, biological, social, and economic.ⁱⁱⁱ No trend goes on forever. Long term trends eventually reverse themselves and move in opposite directions during times of fundamental societal change. I believe that we are living through such a time of change, both within agriculture and the larger human society.

This great transition is being driven by questions of sustainability: How can we meet the basic human needs of all today while leaving equal opportunities for those of future generations to meet their needs as well? More simply, how can we meet today's needs without compromising the future? There is strong and growing evidence that the industrial approach to *economic* development is incapable of meeting the basic needs of *all*, in either the present or the future. The industrial era is coming to an end in agriculture and elsewhere, because industrial economic development quite simply is not sustainable.

Sustainability, in agriculture and in general, is ultimately 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. This is 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, innovating... – also require energy. The brain accounts for about one-fifth of the energy used by the human body. Therefore, the sustainability of human life on earth depends on sustaining the usefulness of energy.

Sustainability is a matter of science. According to the first law of thermodynamics, energy can neither be created nor destroyed, which might suggest that sustainability is inevitable. However, each time energy is used, some of its *usefulness* is lost, according to the second law of thermodynamics – 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 and less organized, and thus, less useful. Energy naturally tends toward uselessness, toward entropy.

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ⁱⁱⁱ Elizabeth Culotta, "Science's 20 greatest hits take their lumps," *Science*, American Academy of Science, March 15, 1991, 251:4999, p.1308.

Economists generally show little concern for sustainability because contemporary economics is based on the unspoken premise that humans will always be capable of finding substitutes for anything we use up or solving any problem we create. All we need is an economic incentive to do so. 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.

Certainly, more economic value could be derived by using natural and human resources more efficiently – by conserving, reusing, and recycling useful energy. In addition, some types of energy could be substituted for others as energy sources are depleted. However, no matter how efficiently alternative energy sources are used, the usefulness of energy eventually will be depleted. Economists fail to recognize the relevance of physical law of entropy to economics. Economic dogma cannot nullify the law of entropy.

Solar energy is the only source of new energy available to offset the loss of useful energy to entropy. The sustainability of human life on earth ultimately depends on capturing and storing sufficient quantities of solar energy to offset the loss of useful energy as a consequence of entropy. Conservation, reuse, recycling and resource substitution are certainly logical, useful strategies to prolong the usefulness of energy. However, sustainability ultimately depends on energy renewal and regeneration – on renewable solar energy.

The fundamental problem in relying on economic incentives to ensure sustainability is that economics places a premium on the present relative to the future. Economic value is inherently individualistic. Thus, 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. That's the reason we demand interest when we loan money to other people and pay interest when we borrow money from other people.

At an interest rate of seven-percent, a dollar we expect to receive ten years in the future is only worth fifty cents today, because fifty cents invested today at seven-percent interest would be worth one dollar ten years in the future. An investment that is expected to pay off seventy-years from now is only worth a penny on the dollar today. Based on everything we know about nature and society, economics places too little value on the resources needed by future generations to ensure sustainability. The industrial paradigm of economic development is simply not sustainable.

So what does this have to do with the future of family farms? Over the last several decades, we have seen the widespread industrialization of agriculture. The strategies employed in industrial manufacturing have been employed by farmers, including specialization, standardization, and consolidation of control. In both cases, the objective has been to increase productivity and economic efficiency. And in both cases, these industrial strategies have been successful, although somewhat less so in agriculture.

As global competition has forced farmers to focus on the economic bottom line, we also have seen the negative ecological and social consequences of industrialization. Industrial agriculture

has polluted the air, water, and soil with toxic agrochemicals and livestock manure. Agriculture has become dependent on fossil energy and other non-renewable resources. Farming has contributed to the growing social and economic inequities which threaten the cultural, political, and economic stability of rural communities.

The “useful energy” of farms and rural communities is being rapidly depleted – the natural tendency toward entropy is accelerating. The ultimate state of entropy is characterized by inert uniformity – meaning a lack of form, structure, pattern or differentiation. A barren desert or landscapes on the moon are natural systems as close to entropy as most of us have seen. Industrialization has destroyed much of the form, structure, pattern, and diversity that once characterized farms and rural areas. The useful energy – the productivity – of both the land and people has been systematically extracted and exploited in the pursuit of economic efficiency.

Family farms and rural communities of the past were abundant sources of useful, renewable energy; rural areas had form, structure, pattern and diversity. Most farms had a diversity of complementary crop and livestock enterprises. Crop rotations and integrated crop and livestock systems were utilized to regenerate and renew the energy lost to entropy. Farming operations were individualized to fit to particular locations, soil types, and landscapes. Farms were also individually owned and operated by families who were committed to preserving the schools, churches, and businesses of their local communities. There was an ethic of stewardship, a responsibility future generations.

Today, however, many farms specialize in producing a few or even a single commodity. Fence rows that once defined the boundaries of different fields have been removed to allow use of large-scale equipment, with little regard for differences in soil types, topography, or aesthetics. Small farms have been consolidated into large agribusiness operations, often under the contractual control of multinational agribusiness corporations. The economic boundaries that once defined rural communities have largely disappeared as agribusinesses have sought to maximize individual profits at the expense of local economies. As their useful energy has been depleted, rural areas have lost their form, structure, pattern, and diversity, as they tended toward a state of entropy.

Future trends on farms and in rural communities must be fundamentally different. Agricultural sustainability will require new farming practices and strategies, but more important sustainability will require a fundamental change in thinking. Albert Einstein once wrote that we can't solve problems using the same thinking we used when we created them. The industrial model or paradigm reflects a mechanistic way of thinking. Machines are very efficient means of extracting useful energy, but they are fundamentally incapable of self-renewal or regeneration. Sustainable strategies for the future must be based on the paradigm or model of living systems.

Living systems are capable of self-renewal and regeneration and thus capable of sustainability. Green plants have the ability to capture energy from the sun and store useful solar energy in their tissues. Plants are biological solar energy collectors. People are also capable of capturing solar energy; we just use windmills, water impoundments, and photovoltaic cells. People, being biological beings, are inherently dependent on the energy stored by green plants. Strategies for farming sustainably must be based on the principles of living systems.

Sustainable farms of the future must be managed as living organisms, rather than the inanimate mechanisms. Mechanisms function according to physical laws, expressed as mathematical formulas. Living systems function according to general principles. 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 living things will respond, but not how a particular plant, animal, or person will respond in a particular situation.

Living systems are holistic. The whole of a farm is something more than the sum of its parts. Thus, sustainable farms must be managed according to the ecological principle of *holism*. The living system of a farm is composed of soil organisms, insects, plants, animals, and people – including the farm operator and farm family. The whole farm has properties that emerge from the whole, that are not contained in individual farm enterprises. The various farm enterprises have properties that disappear or are lost when specialized enterprises are separated from the whole.

Sustainable farms must also be managed according to the ecological principle of *diversity*. Diversity is necessary to maintain the resistance and resilience needed to survive shocks and adjust to adversity. Diversity among crop and livestock enterprises also allow farms to capture, store, and recycle the solar energy needed for renewal and regeneration. Diversified farms have form, structure, and pattern; they are storehouses of useful energy.

The payoff from holism and diversity is realized through the principle of *interdependence* or *mutuality*. To achieve sustainability, relationships among the diverse aspects of sustainable farms must be mutually beneficial. Complementary relationships make whole farms something more than a sum of their individual parts and make it possible to create sustainable farms out of enterprises that individually would be unsustainable.

Communities are also living systems and function according to principles rather than physical laws. Relationships within sustainable communities must be built upon the social principle of *trust* rather than laws and contracts. People must be honest, fair, and responsible in their dealings with each other. In addition, we humans are fallible beings; at times, we need mercy rather than justice. Sustainable communities must value *caring* and kindness. People must be empathetic, respectful, and compassionate toward each other. Finally, people in sustainable communities must find the *courage* to be trusting and caring. It takes “moral courage” to sustain a community in a world where trusting and caring are seen as naïve or idealistic.

People on sustainable farms and in sustainable communities also must respect the basic principles of economics. The most basic economic principles reflect the fundamental nature of individual human behavior. We value things individually that are *scarce*, not necessarily things like air and water, which are necessary but abundant. We want to get as much usefulness as we can from whatever we have; we want to use our time, money, and energy *efficiently*. We also need to be able to make independent decisions; we value our *sovereignty*. People in rural communities, including farmers, must respect the basic principles of economics in order to sustain their farms and communities economically.

Finally, sustainable farms and communities must have ecological, social, and economic integrity – all three. The same basic principles must permeate all aspects of farms and rural communities. The principles of holism, diversity, and interdependence must permeate local 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 new ways of thinking and a renewed commitment to integrity.

So what does this mean for the future of family farms and rural communities? It means that past and current trends simply cannot continue. Farms of the future will be smaller and more diversified, rather than larger and more specialized, standardized, and routinized. Farms will reflect the uniqueness of their land and the people who operate them. They will be individually owned and operated, rather than corporately controlled. They will be family farms – the farm and the family will be inseparable parts of the same whole. Relationships among farmers and their neighbors and customers will be interdependent – cooperative rather than competitive. The physical and economic boundaries that once defined fields and farms will be reestablished, restoring the form, structure, pattern, and diversity needed to capture and store useful energy.

Rural communities of the future will reestablish the social and economic boundaries that once defined local social networks and local economies. The purpose of such boundaries will not be to prevent communications or transactions with those outside the community, but instead to allow communities to be selective in their social and economic relationships. Every healthy living cell, organism, and organization is defined by boundaries that are semi-permeable in nature, meaning they are selective in what they allow in and out. Every sustainable community must have the ability to protect its resources and its people from exploitation, while benefitting from mutually beneficial communications and trade with other communities.

Cooperatives could play an important role in shaping the future of family farms and rural communities. The cooperative model of organization could be used to help redefine the social and economic boundaries of local communities. To be successful in the future, it's important that cooperatives remain true to the original Roachdale Principles of cooperation, including democratic member control, education and information, concern for the community, and in general, operate for the benefit of coop members and their communities rather than growth of the cooperative organization. Small farms could join together in such cooperative ventures to serve local markets more efficiently than can individual farmers. Consumer cooperatives could be formed to encourage local production of a wide range of goods and services, including local foods, and could show economic preferences for local products and producers. Again, the purpose of local preferences is not to prevent communications or trade, but to protect the local ecosystem, economy, and society from outside exploitation.

To support local economies, cooperatives could develop the local infrastructure needed for assembly, exchange, processing, and distribution of goods and services within local economies. They could develop scale-appropriate processing, storage, and transportation technologies to accommodate smaller local markets. Cooperatives could also help develop the electronic information and communications infrastructure that will be essential for viable local economies

and communities in the twenty-first century. In general, cooperatives could help family farms and rural communities restore their ecological, social, and economic integrity.

In summary, fundamental societal changes come about whenever people in general conclude that what they are doing is not working and is not likely to work in the future. I have tried to explain that we simply cannot continue doing what we have been doing on farms or in rural communities; it quite simply is not sustainable. In addition, people must have a mental image of a future that would be better than it would be if they don't change. I have tried to create such a vision of farms and rural communities that would be better than those of today. Finally, people must believe the vision of a better future is possible – they must have hope.

I remain hopeful, if not optimistic, about the future of family farms and rural communities. All we really need to do to create a better future is to return to our common sense of what gives quality, purpose, and meaning to our lives. Certainly, we are physical beings; we have individual economic needs that must be met. However, we are also social beings; we need positive relationships with other people, not because we might get something tangible in return, but because we need to love and be loved. Finally, we are ethical or moral beings; we need to feel a sense of rightness and goodness about what we do and how we live.

Certainly, we need to care about ourselves. But, it is not a sacrifice to care about others; caring and sharing make our lives better. And, it is not a sacrifice to respect the needs of future generations; stewardship of the land and of society makes our lives better. To create sustainable farms and rural communities, we need only pursue our “enlightened self-interest,” realizing that our individual well-being is interrelated with the well-being of others, including those of future generations. I remain hopeful for the future of rural people and of humanity because I know our lives are fundamentally better when we meet today's needs without compromising the future.