

Emotionally-, Economically- and Environmentally-Enhancing Agriculture

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As farmers, we are in the landscape business. Whether we have a window box, a backyard or a million acre ranch, the more we can intersect the three basic environments of open land, forest land, and water, the greater the diversity of plant and animal life. The greater the diversity, the more stable the ecosystem.

All three of these environments must justify their stewardship by being independent profit centers, and it's up to us to figure out how to have multiple, balanced profit centers. Usually a farm will have at least one centerpiece enterprise, but the trick is to hang multiple complementary enterprises synergistically and symbiotically off that primary profit center.

We sell firewood and mill logs on a portable bandsaw mill to generate income from the forest. Of course, the forest enhances our hydraulic cycles, buffers climate extremes, produces biomass and generates oxygen. Branches run through a chipper produce carbon to lock up nutrients produced in livestock housing situations.

In the winter, when we run out of stockpiled forages and feed hay, the cattle lounge and eat in a hay shed with a vertically adjustable V-slotted feeder gate. We add whole corn to the carbonaceous bedding and let the entire bedding pack build up to four-feet deep. This bedding pack ties down all the 50 pounds excreted daily by the cattle and keeps it from leaching into the groundwater or running off into streams.

The anaerobic bedding pack, containing fermented corn, receives pigaerators in the spring after the cows go back out on pasture.

The pigs turn the pack, injecting oxygen and creating aerobic compost. By letting appreciating livestock do the work, the profit potential is size neutral because we do not have to generate the income to capitalize things that rot, rust, and depreciate.

Intensive controlled grazing maximizes nutrient cycling and cattle performance on pastures. We produce salad bar beef, and believe that no multi-stomached animal needs grain--ever. The only reason to feed grain to a multi-stomached animal is to compensate for improper pasture management.

Moving the cattle daily to new paddocks mimics natural herbivore grazing through short duration, high density patterns. We have not used an ounce of chemical fertilizer since coming to the farm in 1961, and yet average 250 cow-days per acre compared to the county average of 70 in our 31-inch rainfall area.

Two eggmobiles hooked together housing 800 layers follow the cattle in their grazing. The layers free-range a couple of days behind the cattle and scratch through cow paddies to remove fly larvae and spread the dung. In addition, the birds harvest grasshoppers, crickets and other bugs, producing nearly \$15,000 worth of eggs annually as a byproduct of pasture sanitation and livestock hygiene. We use no systemic parasiticides.

Pastured broilers housed in 10 foot x 12 foot x 2 foot high portable, floorless pens move across the pasture at about 500 birds per acre per five-week period. We prepare the pasture for the broiler with the cattle. The pens protect the Cornish Cross birds from weather and predators; but offer a fresh daily salad bar to

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produce a bird that is light-years superior to fecal factory fare in all measurable areas: taste, nutrition, humaneness, odor, texture, cleanliness and safety. We raise about 8,000 birds a year, processing the first in May and finishing in early October, yielding about \$50,000.

The feathernet is another pastured egg model in addition to the eggmobiles. Each model has assets and liabilities. The feathernet utilizes highly-portable electrified poultry netting to keep the birds in and predators out, along with hoophouses on skids for shelter and laying boxes. A feed sled holds enough feed for a month, and the water trough is plumbed into a farm-wide gravity water system. The feed sled and houses are all hooked together with chains in train fashion for ease of moving.

Three 150-foot sections of the netting enclose a quarter acre, which is plenty large for 1,000 birds for three days. One person working seven hours per week on five acres can net \$15,000 per year with this system. Of course, marketing gets to be a major factor, and that is addressed in the *Relationship Marketing* section.

We raise turkeys in the broiler pens as well. This acts as a season extender for the infrastructure and stacks an additional enterprise on the pasture. The stacking creates incredible income opportunities and can be done with many different plants and animals. The same acre of pasture on our farm, for example, sees cattle, pastured broilers, eggmobiles and turkeys during the season, adding up to nearly \$5,000 per acre, per year.

Our biniary is another example of this. It is a combination production system integrating bunnies, vineyard, and aviary, hence biniary. A totally enclosed 100 foot x 100 foot area divided into four quadrants, it contains twelve grape vines per quadrant. The trellis poles hold up the overhead netting, which protects free-ranging rabbits from predators and keeps jumbo white pheasants in. The rabbits mow

the forage under the grape vines and the pheasants debug. The quarter acre can net \$5,000 per year because of the synergism of the multiple enterprises.

In the winter, the layers come into hoophouses. The rabbits come in as well, in pens at eye level. The chickens keep the bedding aerated and clean under the rabbits and the combination more fully utilizes the vertical airspace in the facility. When the animals come out in the spring, we plant vegetables into the composted bedding to jumpstart the gardening season and produce premium-priced produce.

When pigs are not doing their aerobic compost turning, they go out on pasture. Quarter-acre paddocks divided by two strands of electric fencing control the pigs, which we move from paddock to paddock. We train the pigs to electric fence in a corral near the house before taking them out to the fields. Portable nipple-waterers and self-feeders round out the pasturage. This system yields around \$3,000 per acre per year.

Guiding principles are:

1. All food production and processing models must be aesthetically and aromatically pleasing, period. Otherwise, it's not good farming.
2. All plants and animals must be produced domestically in a way that most closely approximates their natural setting.
3. All plants and animals should be allowed to express their physiological distinctiveness.
4. The more plants and animals a farm can integrate in close proximity, the better.
5. A farm is a solar collector and should run on current solar dollars; it should generate far more energy than it uses.

Building Sustainable Communities and Schools

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Introduction

The USA is the highest producer and consumer of goods, and the largest producer of wastes on earth (President's Council on Sustainable Development, 1996). Not only the well-being of future generations, but also our own welfare, is increasingly at risk by our failure to manage our economic, social, and natural resources holistically. Solid and lasting solutions must be found and rapidly implemented. In this presentation we offer a foundational map to guide our pursuit of sustainable communities. To that end we examine how technology and reductionist trends are impacting our society and propose conceptual models and guidelines for healthy communities drawn from natural ecosystems. Our central position is that achievement of true sustainability will require a redirection of our technological advances and professional pursuits to an application of ecologically-based approaches directed at local community levels.

Premise

A well known ecological principle is that the universe is made up of systems within systems. Certain unifying principles of the universe,

including transfer of energy and cycling of materials, are known to govern the functional mechanisms of these systems at all levels from individual organisms and ecosystems to the biosphere. The human race and associated activities, including local communities, are a part of this design and are ultimately subject to these natural guidelines. Thus, the elucidation and understanding these principles is the basis for sustainable living practices.

The basic ecological definition of a community is a group of interacting and interdependent population of organisms, which share a common environment and form a fairly complete structure for the capture and release of energy and cycling of materials. For the purposes of our discussions, we define a local community as the people living in an area along with the environment and associated natural resources. See basic ecology textbooks e.g. Odum (1971), Krebs (1972) for further discussion of this subject. These local communities evolved through people coming together for mutual benefit and to meet interdependent needs for energy, materials and

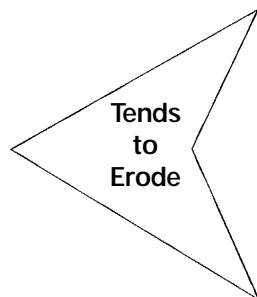
Figure 1. **Premise**

From the study of ecology we can identify five inherent strengths that promote health and balance of communities and other natural systems. Unbridled practice of modern trends and technology can erode the health of community and other systems. We must redirect community planning and development so that our technology is better aligned with fundamental systems principles.

Strengths of Healthy Systems

(including local communities)

- Interdependency
- Self-sufficiency
- Self-regulating
- Self-renewing
- Efficiency
- Diversity/versatility



Modern Technology & Trends

- Specialization/centralization
- Interventionist Paradigm
- High input/export
- Therapeutic Approach

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relationship.

Certain inherent features are central to the healthy functioning of communities and other natural systems and enable them to maintain balance and minimize the impact of adverse encounters. From the knowledge of natural systems we suggest six such inherent pillar strengths that should be fostered in communities to assure their health (*Figure 1*). These strengths are: Interdependency, Self-sufficiency, Self-regulating, Self-renewing, Efficiency, and Diversity/versatility.

Modern science and associated technologies has brought about a way of thinking and an array of interventions that offer serious challenges to these inherent attributes of healthy communities (see Flint and van den Bosch, 1981 for a basic discussion of this subject as it relates to pest outbreaks and management). Science by traditional design is based on reductionism, which requires subdividing things into parts for specialized study, versus holistic views. Reductionist perspectives together with technological advances have brought many short-term benefits such as the flexibility for modifying our surroundings and for the production of goods for subsistence (food, clothing and shelter) and various pursuits of happiness (transportation, communication, medicine, fine arts). However, the over-reliance on these technologies has given us a false sense of freedom from the connectedness and accountability to the governing principles of the natural world. We have identified four modern trends that place us in undue confrontation with the six important strengths of communities mentioned above, and that threaten the balance and well being of our communities. The four trends are: Specialization/centralization, Interventionist paradigm, High import/export, Therapeutic approach.

The development of healthy communities will require a redirection of our paradigm and practices so as to maximize the six core

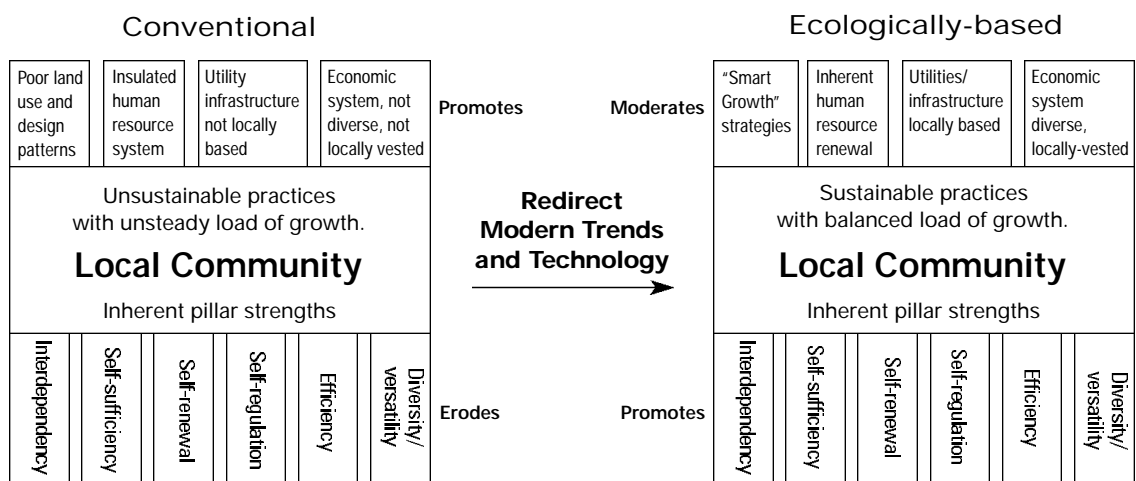
principles drawn from natural systems while moderating the adverse impact of modern trends. These communities are the building blocks of our society and it is at this level that all of our professional, social and cultural interactions are ultimately expressed. Above the family level, local communities are the only truly natural assemblage in our social structure. State, national, and sometimes county groupings, though usually based on certain historical, cultural and other parameters, are relatively arbitrary as compared to local communities. To borrow a quote from Bucky Fuller (1981), "Think globally, act locally." In accordance to these principles similar redirections need to guide the practices of our respective professions such as agriculture, education, healthcare, and manufacturing. Readers are referred to Lewis, et al. (1997) Senge et al.(1994), and Lewis and Jay (2000) for further discussion of such redirections among these professions.

Challenges to Local Communities

The modern technology and trends reflected in figure 1 challenge the sustainability of local communities in a variety of ways. With the industrial age, came the emergence of high technology, specialized tools, knowledge and an expanding array of goods and services, including homes with a host of appliances, luxury automobiles, and spectacular entertainment devices. The marvels of communication and transportation technology allow us span the earth in a matter of hours. Powerful machinery enable us to literally reshape large portions of the landscape of entire communities and to transport natural resources, services and manufactured goods around the world in a matter of days. The growth in the global market for these goods, services, and lifestyles has enhanced the rate of specialization and centralization of organizations and management structures.

A result of this phenomena is increased

Figure 2. **Community Management and Development Strategies**



We must redirect our technology and operating paradigm so as to base our economic development and management on principles that promote inherent strengths and moderate the load of growth on communities. Such a redirection will emphasize practices shown in the right-hand boxes that are based on the "built-in" renewable strengths of community.

insulation of organizations from accountability at the point of delivery which is the local communities. High-volume-based organizations tend to "crowd out" the local businesses and providers. Because of minimal interdependence of the large organization on an individual local community and in the absence of reduced competition, the community's influence regarding the organization's service becomes limited.

These developments and trends have led to numerous unwise and unsustainable practices that must be redirected in order for our local communities to deal with the realities of our modern world in a sustainable fashion. We class these unsustainable practices, as seen in figure 2, into four major categories: Poor land use and design patterns, insulated human resource service system, core utility and infrastructure services not locally-based, economic system not adequately diverse and locally-vested.

By shifting our operating paradigm and use of modern technology, we can redirect our community management and development strategies as depicted in figure 2 to an ecologically-based approach. The redirection should be guided by principles that promote rather than erode the inherent pillar strengths

of community systems, and moderate rather than promote the load of growth. Basically, by design, these growth and maintenance processes should be based on promoting and using the "built in" renewable strengths of the community as depicted by the ecologically-based model of figure 2. On the right are four ecologically-based counterparts to the four unsustainable practices mentioned above and shown in the conventional model on the left. They are: "Smart growth" strategies, inherent human resource renewal, utilities/ infrastructure locally-based, economic systems diverse and locally-vested.

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Ecologically-based Guidelines:

The management of communities in accordance to ecological principles is in essence applied ecology. We recognize that such a process is complex and cumbersome. In fact, in accordance with the same ecological

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principles, the process has to be customized to each local community. Thus, no "cookie cutter" prescription can be given. However, we do feel that these general ecological guidelines are appropriate and can be effectively used as a baseline tool for individual community decision-making. Refer to the more detailed publication of Lewis and Jay (2000) for more detailed suggested guidelines in this regard.

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Sustaining America's Rural Communities

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The trend toward fewer and larger farms in the U.S. is but a phase of a cycle that may well be nearing an end.

The historic purpose for settling most rural communities in the U.S. was to realize the value that was inherent in the land. Some early towns were mining and timber towns, but most were farming towns. The density of farm population across the land was determined in large part by the number of farmers or ranchers needed to realize the benefits from the land. The range lands of the West were sparsely populated because one rancher could manage a herd of cattle roaming over hundreds, or even thousands, of acres. Areas suited for truck farming and dairy operations were more densely populated because of higher labor and management requirements. The Midwest was covered with diversified family farms with a corresponding rural population density.

The numbers and types of farms in the surrounding community determined the nature of activities carried on in town. More farm families translated into more health care, more education, and other social services. Business activities in rural communities reflected not only the number of farm families, but also the need for markets and farm inputs, such as credit, machinery, feed, and fuel. Rural service communities evolved into trade centers as early farmers moved beyond self-sufficiency and began to specialize and trade among themselves. These communities became agribusiness centers as more consumers left nearby farms for distant urban areas and farmers became more reliant on mechanization and purchased inputs.

However, during the last two-thirds of the

twentieth century, the industrialization of agriculture has resulted in fewer, larger, and more specialized farms. Fewer farm families meant fewer people to support local retail stores, fewer people to attend local churches and schools, and fewer people to pull their weight in civic activities. Larger farms also tend to bypass the local community when buying production inputs and marketing their products. The industrialization of agriculture has caused many rural communities to wither and die. Some communities have diversified to reduce their dependence on agriculture. But many rural communities continue to be dependent on agriculture and suffer with farmers through every agricultural crisis.

If past trends affecting food and farming were to continue into the future, there will be little hope for rural agricultural communities. But trends never continue, at least not indefinitely. A few years back, a couple of scientists proposed a list of the top twenty "great ideas in science" in *Science* magazine, one of the two most respected scientific journals in the world. Their top twenty included the proposition that "everything on the earth operates in cycles." Some scientists responding to the *Science* survey disagreed with the proposed theory of universal cycles, but most left it on their list of the top twenty great ideas in science (Culotta).

In essence, the theory of universal cycles claims that trends never continue forever. Trends are nothing more than phases of longer-term cycles. In reality, it's just common sense – everything that goes up eventually comes down, everything that goes around eventually comes around. The theory of cycles implies that farms will neither get larger nor smaller forever, but instead will cycle between larger and smaller over time.

The trend toward large-scale, industrial agriculture might seem destined to go on forever. But in fact, there are growing signs that it is nearing an end. Any future benefits

from the further industrialization of agriculture are questionable, and it is coming under increasing environmental and social challenges all around the globe. Much of the rest of the economy of the developed world is moving beyond industrialization to something fundamentally different – a post-industrial era of development. Agriculture became fully industrialized last, because it was least well-suited for the specialization, standardization, and centralization processes that characterize industrialization. The benefits have been fewer and the problems greater than for any other sector of the economy. Thus, for agriculture the period of industrialization quite likely will be shorter. The trend toward fewer and larger farms in the U.S. is but a phase of a cycle that may well be nearing an end.

The theory of cycles also implies that people will not continue to migrate from the country to cities forever, but instead, will cycle between rural to urban and urban to rural migration over time. In fact, human history is marked by such cycles in spatial dispersion and concentration of people in general. Anthropological evidence indicates that people have concentrated in large cities in centuries past, but later, for a variety of reasons, have abandoned those cities and dispersed themselves across the countryside. Thus, there is reason to believe that migration from rural areas to U.S. cities during the twentieth-century was simply a phase of a cycle.

Most large center-cities are already losing population as people move to the suburbs in increasing numbers. A further migration back to rural areas might be a logical continuation of the dispersion phase of this cycle. The phenomena we call urban sprawl today eventually may lose its ties to the city and evolve into patterns of dispersed rural resettlement.

As we enter the new century, futurists are talking and writing of a shift in worldview from the mechanistic, industrial era where

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people derive power from control of capital and the technical means of production, to a post-industrial era where the source of human progress becomes knowledge. People will enhance their quality of life by learning to live better with what they have rather than by acquiring more "stuff." Knowledge is biological rather than mechanical in its fundamental nature – it changes, grows, and multiplies over time. The transitions in agriculture and rural communities are but small parts of the great transition that is taking place all across society. The questioning that is driving changes in agriculture, however, exemplifies the broader questioning of society that is fueling the great transition. The question invariability is one of sustainability.

Using almost anyone's definition, concerns for sustainability imply concerns for the long run, for intergenerational equity – meeting the needs of our current generation while leaving equal or better opportunities for those of generations to follow. The three cornerstones of sustainable agriculture – ecological soundness, economic viability, and social responsibility – rest upon a foundation of intergenerational equity. Sustainability applies the Golden Rule across generations.

Sustainable agriculture, with attention to equity, stewardship, and high levels of management skills is consistent with post-industrial trends in the broader economy. The increased knowledge needed to manage resources sustainably suggests a trend toward smaller family farms that allow farm families to remain personally connected to the land. Sustainable agriculture strategies provide more opportunities for local ownership, hands-on management, and long-term commitment to the local community. A high level of farming skill increases returns to management and leads to greater profitability for small farms. Farming becomes profitable for farmers and for rural communities as more dollars remain in the community.

Wendell Berry, a Kentucky farmer, has clearly articulated the connections among people, quality of life, and a sustainable agriculture. *"...if agriculture is to remain productive, it must preserve the land and the fertility and ecological health of the land; the land, that is, must be used well. A further requirement, therefore, is that if the land is to be used well, the people who use it must know it well, must be highly motivated to use it well, must know how to use it well, must have time to use it well, and must be able to afford to use it well."* (p. 147).

Sustainable rural communities, like sustainable farms, must maintain the productivity of their local resources while protecting their physical and social environments. Sustainable communities must also provide an acceptable level of economic returns and otherwise enhance the quality of life of those who live and work in the community. Strategies that rely solely, or even primarily, on local natural resources are unlikely to fulfill these latter requirements. However, rural people can overcome the obstacle of limited local resources through a clear vision of the new realities of post-industrial development and a firm commitment to the concept of community. As the local economy continues to grow, its natural resource "equity" will become a smaller proportion of its total economy, but no less important than is equity capital to a business in ensuring its survivability and sustainability.

Thus, sustainable community development must be linked to something that cannot easily be moved. For some communities, the foundation for development may be scenic landscapes, recreational opportunities, or proximity to urban areas, but for development to be sustainable for most communities it must be linked to the land. In addition, sustainable development strategies must give local workers and investors a logical reason for investing, working, and spending in the communities where they live. Communities

cannot be sustained without strong economic interdependencies among those within communities. But, people must have strong logical reasons for developing interdependent relationships.

Many people have strong ties to rural areas; however, rural communities cannot depend on an allegiance of rural residents to their communities to keep productive people from moving to town. People can and do move freely among communities within the U.S. Thus, it will be critically important for sustainable communities to be able to attract new knowledge workers, if there are to be places where "home-grown" mind workers will want to stay. The primary attraction of rural communities for current and future knowledge workers will be the promise of a desirable quality of life.

Quality of life is a product of human relationships -- relationships among people and between people and their environment. Obviously, other things such as employment, income, personal safety, economic security, and access to health care are important aspects of quality of life. However, quality of life also includes peoples' subjective judgments regarding self-determination, freedom to participate, individual equity, freedom from discrimination, economic opportunity, ability to cope with change, social acceptance, and treatment according to accepted social principles of one's culture.

Rural communities that survive and prosper in the future will be culturally diverse. Successful rural communities will be made up of long-time rural residents, bright young people who choose to stay, returning rural residents, those born in urban areas of the U.S., and those born in other countries. They may also be Anglo-American, Afro-American, Asian, Mexican, and Canadian. Male and female, young and old, rich and poor, educated and less well-educated may be viewed as different, but they must be respected

for their differences in the workplaces and in the town halls of rural renaissance communities. This diversity will be an important source of creativity, innovation, and synergistic productivity, and will be an important aspect of quality of life in rural areas. In such rural communities, people will have an opportunity to know each other individually rather than simply accept the stereotypes of their cultural groups.

The most important single step toward success may be for those in the community to develop a shared vision of hope for their future -- for a better way of life and a brighter future for their community. The vision of each person in the community will be different from the vision of others in many respects and not all will be hopeful. However, the people of a community must search for and find some common positive elements among their different visions to provide the nucleus for a shared vision of hope. Otherwise, the group is not really a community but rather a collection of people who happen to live in the same general area. A community that has found its shared vision has made its first critical step toward self-revitalization and community sustainability. Hope then can begin to transform reality. To paraphrase Jesse Jackson, the articulate civil rights leader, "if they can conceive it, and believe it, they can achieve it." The future of rural America belongs to those who have a vision of hope and courage to seize it.

Notes

1. Culotta, Elizabeth. 1991. "Science's 20 greatest hits take their lumps," *Science*, American Academy of Science, March 15, 251:4999, p. 1308.
2. Berry, Wendell. 1990. *What are People For*. San Francisco: North Point Press, p. 147.

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