

## Healthy soils, healthy communities, healthy economies: Making the connections<sup>I</sup>

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When I arrived on the University of Missouri campus as a freshman in the fall of 1957, William Albrecht was Chairman of the Soils Department. Albrecht was a familiar name in the College of Agriculture at the time because he taught the beginning soils course. I recall a friend being offended because Albrecht suggested that people raised in areas of the country with “poor soils” were of lower average intelligence. My friend was raised on a “worn-out” farm in South Georgia. Albrecht believed the health of soils determined the health of crops, animals, and ultimately the health of people. While President of the Soil Science Society in 1938, he wrote in the USDA Yearbook of Agriculture “A declining soil fertility, due to a lack of organic material, major elements, and trace minerals, is responsible for poor crops and in turn for pathological conditions in animals fed deficient foods from such soils, and mankind is no exception.”<sup>1</sup>

He was frequently criticized by his colleagues for venturing beyond the bounds of his academic disciplines of soils and agronomy. Perhaps his most controversial study was a review of World War II era dental records of 70,000 U.S. sailors. He concluded, “If all other body irregularities as well as those of the teeth were so viewed, it is highly probable that many of our diseases would be interpreted as degenerative troubles originating in nutritional deficiencies going back to insufficient fertility of the soil.”<sup>2</sup> With the end of World War II, Albrecht called for a major national initiative to restore the health and fertility of America’s “worn out” soils.

Instead, the nation’s agricultural priorities shifted to producing more food more cheaply by relying on commercial fertilizers rather than healthy soils. Albrecht anticipated the degradation of both soil health and human health as a consequence. He was particularly concerned with an overemphasis on the major elements of nitrogen, phosphorus, and potash, or N, P, & K, would lead to a lack of critical trace minerals required for healthy plants and foods. He wrote: “N P K formulas, as legislated and enforced by State Departments of Agriculture mean malnutrition, attack by insects, bacteria and fungi, weed takeover, crop loss in dry weather, and general loss of mental acuity in the population, leading to degenerative metabolic disease and early death.”<sup>3</sup>

Unfortunately, Albrecht’s admonitions were largely dismissed as being out of touch with the realities of “modern agriculture.” By the time I graduated from the University of Missouri in 1961, Professor Albrecht was rarely mentioned, and then with a seeming sense of embarrassment. The College of Agriculture was committed to making agriculture more economically efficient in order to produce more “cheap food.” Soil was seen as little more than a medium to prop up plants that were fed by and protected by agricultural chemicals.

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<sup>I</sup> Prepared for presentation at the Missouri Organic Association Annual Conference – 2016, Springfield, MO, February 5-6, 2016.

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I didn't rediscover Albrecht until I returned to Missouri in the late 1980s to conduct research and educational programs in sustainable agriculture. I found Albrecht's stature to have never been higher among those farming for *sustainability*. For many of these farmers, *The Albrecht Papers*, compiled and published by *Acres USA*, had become the *Bible* on all matters related to soils, and the healthy soils were understood to provide the essential foundation of agricultural sustainability.<sup>4</sup> In the spring of 2011, I had the honor of presenting *The Albrecht Lecture* at the University of Missouri. Much of that lecture can be found in my foreword to the latest volume of the Albrecht Papers, *Soil Fertility and Animal Health and Human Health*.<sup>5</sup> In that lecture, I challenged scientists at the University of Missouri to at least find the courage to test the "Albrecht hypothesis:" that human health is inextricably linked to soil health.

Thankfully, a few other scientists have accepted that challenge over the years. Arden Andersen, who is a keynote speaker of this conference, documents some of these results in, *Real; Medicine, Real Health*.<sup>6</sup> Daphne Miller's book, *Farmacology; Total Health from the Ground Up*,<sup>7</sup> is another popular source of information relating soil health to human health. However, Albrecht's work still represents a voice of authority on matters related to soil health. My primary intent here is not to review the work linking soil health to human health, but to extend it by exploring the logical links between soil health to the health of communities and economies.

I am an agricultural economist – not a soils scientist or human nutritionist. I know about a bit about soils, plants, animals, and human health, but I know a lot more about economics. I spent 30 years on the faculties of four agricultural colleges at North Carolina State University, Oklahoma State University, University of Georgia, and University of Missouri. I spent the first half of that career as a traditional bottom-line, free-market economist. I bought into the economic promises of "modern agriculture." We were going to make good food affordable for everyone by making agriculture economically efficient and making food cheap. Profitable family farms and strong rural communities would be created in the process. To make a long story short, it didn't work.

The profit-driven farm economy failed in its most basic purpose of ensuring that everyone has enough good food to support healthy, active lifestyles. A far larger percentage of people in the U.S. are "food insecure" today than during the 1960s. More than 15% of Americans are classified as food-insecure and more than 20% of our children live in food insecure homes.<sup>8</sup> In addition, the diets of many lower-income families are high in calories and lacking in essential nutrients, leading to an epidemic of obesity and other diet-related health problems. Diabetes, heart disease, hypertension, and various diet-related cancers, are projected to claim about one-in-five dollars spent for health care in the U.S. by 2020 – erasing virtually all of the gains in public health over the past several decades.<sup>9</sup> While the percentage of American's total economic output required for food dropped by one-half, the percentage going to health care more than doubled.<sup>10</sup>

Albrecht ventured into economics in the late 1950s, when he wrote: "The costs of growing healthy livestock and healthy people do not fit themselves readily into our economics where costs and earnings must always be matched in monetary values (dollars)."<sup>11</sup> Albrecht seemed to understand that declining *soil health* would eventually lead to declining *economic health*. He wrote: "We are slow to study the importance of soil fertility to the quality of food, for this is *not yet* [emphasis added] to our economic advantage in the marketplace."<sup>12</sup> Perhaps he anticipated a

time in the future when we would be forced to confront the reality that healthy economies can be sustained only by healthy communities, which must be sustained by healthy people, healthy animals and plants, and ultimately healthy soils. If so, that time is now.

I first gained a glimpse of this reality during the “farm financial crisis” of the 1980s. In order to become more economically efficient and lower the cost of food production, farms had to become larger so they could achieve “economies of scale.” We told farmers to either “get big or get out.” I eventually realized that in order for some farmers to get big, others farmers had to get out – even if they had to be forced out. I began to understand that this kind of farming wasn’t good for farmers, and it wasn’t good for rural communities that depended on farm families.

Communities are supported by people, not production. People buy shoes, haircuts, and cars on Main Street, send kids to school, attend church, and participate in civic affairs essential to the health of communities. This new industrial farm economy was forcing families off their farms and destroying rural communities in the process. I also began to see that tilling the land “fencerow-to-fencerow” and concentrating animals on “factory farms” were eroding and destroying the health of soil and polluting the air and water with chemical and biological wastes. The kind of agriculture I had helped to create wasn’t ecologically sound, socially responsible, or economically viable. This kind of agriculture could not sustain its productivity over the long run.

Thankfully, the sustainable agriculture movement emerged onto the scene at about that time. I spent the rest of my academic career, and have spent 16 years now since “retiring,” trying to help create a new sustainable agriculture. A sustainable agriculture must be capable of meeting the needs of all in the present without diminishing opportunities for those of the future. It must be ecologically sound and socially responsible if it is to be economically viable. The so-called modern agriculture I had helped to create fails every test of sustainability.

The basic idea of a sustainable agriculture was not a new idea – even though it was met with a lot of skepticism. The early pioneers of organic farming understood that healthy soils were the essential foundation for healthy, *permanent* societies. In the early 1920s, Sir Albert Howard began his classic 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.”<sup>13</sup> He concluded that the Roman Empire had “failed because it was unable to maintain the soil in a fertile condition.” J. I. Rodale, wrote, “The *organiculturist* farmer must realize that in him is placed a sacred trust, the task of producing food that will impart health to the people who consume it. 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.”<sup>14</sup>

The critical linkages among health soils, healthy communities, healthy economies, and health societies are firmly rooted not only in history but also in the most fundamental principles of economics and laws of physics. Everything of use to us, including everything of economic value, ultimately comes from the earth – soil, water, minerals, air, energy. There is no other possible source. Beyond self-sufficiency, we must rely on other people – friends, community, or society – to meet needs that we cannot meet directly from nature. To meet needs that we can’t meet through relationships people we know personally, we must rely on the “impersonal markets” –

meaning the economy. Regardless of the means, everything that sustains the health of people, communities, societies, and *economies* ultimately must come from the earth – from nature.

While everything of economic value ultimately comes from the earth, economies do not value all of the useful things the earth has to offer. The economy only values things that are *scarce*, meaning things that are not sufficiently abundant for everyone to have all they want. Air obviously is essential to life, but air has no economic value until it is polluted or otherwise diminished in quality or quantity to create a scarcity of clean air. Water has no economic value unless access to clean water is somehow restricted. In general, things of nature only have economic value to the extent they are used to produce things that are scarce and thus have economic value, such as food, clothes, houses, and cars – or are purposely made scarce.

As long as biologically and chemically healthy soils were necessary to produce crops for food, healthy soils obviously had economic value. The economic value of soils was directly related to the economic value of the crops particular soils were capable of producing. Soils that could support an abundance of healthy plants and healthy animals obviously were more economically valuable than “worn out” soils lacking in the natural fertility essential to grow healthy crops or animals. Healthy soils also supported healthy people who were capable of sustaining healthy farm economies, which helped sustain healthy rural communities.

However, the advent of cheap commercial fertilizers – Albrecht’s N, P, K – decoupled rural economies and communities from the health of their local soils. Production was no longer limited by the biologically available nutrients in the soil but by the quantities of commercial fertilizers crops could metabolize. The economic value of agricultural crops and livestock was and still is determined by quantity or production per acre not by quality, nutrition, or human health per acre. With cheap commercial pesticides, crops didn’t even need to be healthy to resist pests. Antibiotics could keep sick animals alive until they could be killed. As Albrecht understood, chemically-intensive farming could produce large quantities of saleable energy or calories without relying on healthy soils. Farm economies were no longer dependent on healthy soils. Neither could communities depend on the healthy soils to support their local economies.

The new sources of agricultural economic value were agricultural chemicals, machinery, and other things farmers needed for a chemical-intensive approach to farming. The location of economic value shifted from farming communities to urban centers where workforces could be assembled to manufacture agricultural chemicals and farm equipment. Farming communities were left as places with little economic purpose other than to provide the “soil” needed to prop up the plants that produced profits mostly for corporate investors in distant cities. The degradation of soil health and economic health of rural communities was of little concern. The agricultural economy no longer depended on healthy soils or healthy communities. Since they were not needed they were no longer *scarce*, and thus neither had significant economic value.

The negative impact of this chemical-intensive, industrial approach to farming was not limited to degradation of rural economies, but it also ripped the social fabric of rural communities. Economic value is individual, impersonal, and instrumental – as least as we know it today. Economic relationships are impersonal. The specific persons involved in economic transactions don’t matter. If something cannot be bought, sold, or traded, it has no economic

value. Relationships matter in economics only to the extent that they create economic benefits. Thus, the economy places no value on the “personal” relationships that must weave, sustain, and occasionally mend the social fabric of healthy communities.

Economic value is individualistic. Economies are nothing more than collections of individual enterprises. Economic wholes are simply the sums of their parts. As a result, there is no economic value in doing anything for the sole benefit of anyone else or of communities or societies as wholes. Finally, an economic transaction or investment is always a means to some further end – it is instrumental. There is always an expectation of getting something of greater economic value in return for any economic investment. Acts of selflessness and altruism – doing something solely for others – are “economically irrational.”

The social values are different from economic values. First, social values are personal rather than impersonal. Social value depends of the specific persons involved in the relationship. We simply cannot buy, sell, or trade the relationships we have with friends, neighbors, children, or spouses. They may be critically important to our quality of life, but they have no economic value. Social values are instrumental, at least in a sense, in that we expect of get something in return for what we give. However, we generally don’t know specifically what we will receive or when we will get it. We just know that to have a friend we must be a friend and to have neighbors we must be a neighbor. To *sustain* any real sense of community, people must feel personal connectedness to “their” communities. Communities must be sustained by social values, as well as economic values.

When farming communities began to give priority to economic efficiency, relationships within rural communities became less personal. Farmers lost their sense of connection and commitment to community when they began producing commodities for national and global markets. Rural people began to lose their sense of commitment to the future to their communities when they no longer felt a personal connection to local farms or local sources of food. Many encouraged their children to “go away and get an education” so they could live elsewhere. The social fabric of rural communities became frayed and in many cases was ripped asunder. The healthy soils that had supported healthy farms no longer provided the foundation for a sense of common commitment essential to sustain rural communities.

Ironically, whenever societies are driven by economic value, they not only degrade the health of their communities; they degrade and eventually destroy their source of economic value. In short, economies driven by economic values are not economically sustainable. When societies give economic value priority over social and ethical values, they inevitably diminish the productivity of the natural and human resources upon which all economic value ultimately depends. This conclusion is supported by fundamental laws of physics as well as basic principles of economics.

While all of the earth’s elements – air, water, minerals, soil, energy, – are of potential use and economic value, *energy* is the essential element in converting the potential usefulness of the other elements into economic value. Our food, our clothes, our houses, and our cars all require energy to make and energy to use. Even our thinking, imagining, and managing require energy: our brain uses about one-fifth of our body’s energy requirement. In addition, we are born as

helpless babies that must be nurtured, socialized, and educated to become economically “useful” – all of which requires energy. So, the health of economies, as well as the health of individuals and communities, is dependent on the *usefulness* of energy.

According to the basic laws of physics, energy can neither be created nor destroyed. However, whenever energy is used to do anything useful, some of its usefulness inevitably is lost. This is the law of *entropy*. Energy isn’t destroyed by use, but it always changes form in ways that disorganize, disperse, and thus diminish its usefulness. For example, to extract the potential usefulness from food, we must disorganize and disperse its energy through the processes of chewing and digesting. We don’t destroy the energy in the food we eat. Our “wastes” still contain useful energy that could be reused – perhaps, to restore the health of soils. It just contain *less* useful energy than was in the food. No matter how efficiently and carefully we use or reuse the resources of earth, the “usefulness” of energy necessary to make air, water, minerals, and soil useful, and thus *economically* valuable, eventually will be lost to entropy.

The only source of new energy available to offset this inevitable loss of usefulness and potential economic value is the sun – meaning solar energy. In addition, only the *living things* on earth, primarily green plants and plankton, are capable of capturing, organizing, concentrating, and storing solar energy in forms that are useful to humans. Humans can also sequester solar energy to produce economic value by using windmills, falling water, and photovoltaic cells. However, we humans are biological beings and are inherently reliant on the other biological energy collectors for our life’s energy. We can’t digest the electricity generated by windmills or photovoltaic cells.

So, human health and both community and economic sustainability are all inherently dependent on the earth’s biological solar energy collectors – primarily green plants. While the non-living world inevitably tends toward uselessness, the living world of plants and animals has the capacity to sustain the net usefulness of energy and thus provides the only sustainable source of economic value. In order for green plant to sustain their ability to collect and store useful solar energy to sustain animals, including humans, the plants must be nourished by healthy *living* soils. “Dead soils,” like all other non-living things on earth, inevitably tend toward entropy – or uselessness. The fossil energy that now sustains agricultural productivity by providing cheap nitrogen fertilizers, pesticides, and fuels is inevitably tending toward uselessness or entropy.

Now to the bottom line: The only sustainable economies are those sustained by healthy, productive people who express a sense of common commitment by sustaining the health and productivity of the living things of nature that are capable of sequestering useful solar energy. These living things must include healthy green plants that are grown on healthy soils in order to provide healthful food for animals, including the people by whom and for whom the economy must be sustained. An economy that sustains people ultimately must be sustained by people, specifically people who are committed to giving healthy soils, healthy people, and healthy community priority over their individual short-run economic self-interests.

Many economists deny or simply ignore the law of entropy. Others naively assume that humans will be able to find a substitute for any resource of the earth that we might “use up.” Even if economists were to acknowledge the inevitability of entropy, there is no economic

rationality for being concerned about the productivity of natural resources, as long as the resources still seem plentiful or at least not sufficiently scarce to give them economic value.

Unfortunately, things critical to sustainability often become ecologically and socially scarce long before they take on economic value, as we have seen with the health of soils, people, and communities. Fossil energy prices are not influenced by its ultimate depletion but instead by its current scarcity or abundance. Climate change gets little attention because its major economic impacts are thought to be in the distant future. Human health is of no economic value until people get sick – meaning their health becomes *scarce*. Sick people may die, in spite of our best efforts to save them. If we wait for the “living earth” to get sick before we value it, it may die. Sustainability ultimately depends our willingness to give “ethical values” priority over economic values. We can’t wait for economic scarcity to save us. Sustainable economies must function within the limits or bounds of ethically and morally just societies.

Ethical values are different from economic or social values, although they may evolve from social relationships. Ethical values are impersonal, non-instrumental, and communal. As social relations become less personal, we begin to understand we need to treat people we don’t know as well as we treat people we do know. Ethical values are non-instrumental. Our expectations regarding social reciprocity for our good deeds become less well defined and less certain as relationships become less personal. Eventually, we do things for purely ethical reasons, with no expectation of receiving anything of tangible value in return. We do thing simply because it is the right thing to do. Ethical values are also communal: We also understand that whatever is right and good for one person is good for all people, everywhere, including those of the future.

To restore the health to our soils, our communities, and our economies we ultimately must find the courage to express a common ethical commitment to sustainability: to meet the needs of all in the present without diminishing opportunities for the future. As a step in that direction, I have proposed an ethic of sustainability: *A thing is right when it tends to enhance the quality and integrity of all life on earth by means that honor the unique responsibilities and rewards of humans as members and caretakers of the earth’s integral community. A thing is wrong when it tends otherwise.*

First, the ethic of sustainability goes beyond defining sustainable farming in terms of practices or systems by defining some things farmers might do as right and others as wrong. The economy places no value on the long-run well-being of humanity. We can rely on social values only to the extent that our social relationships help shape our sense of responsibility for the future of humanity. We must make the economic and social investments essential for the sustainability out of a sense of ethical or moral responsibility.

Second, the ethic focuses on the quality and integrity of “life” – meaning the whole of life on earth. The sustainability of human life on earth is inherently dependent on the quality, integrity, and thus *usefulness* of the living world to offset the inevitable tendency of the non-living world toward entropy or uselessness. The emphasis on life also is important because we can’t see or directly experience energy but we can see and experience life. Farmers can see the diminished quality of biological life in their soils, in their crops and livestock, and in the lives of the people who farm and live in their rural communities.

Third, the ethic of sustainability acknowledges that our lives have *purpose*. We have uniquely human responsibilities as members and caretakers of the earth's communities. As Pope Francis states: "The biblical texts are to be read in their context, recognizing that they tell us to 'till and keep' the garden of the world (Gen 2:15). 'Tilling' refers to cultivating, ploughing or working, while 'keeping' means caring, protecting, overseeing and preserving... Each community can take from the bounty of the earth whatever it needs for subsistence, but it also has the duty to protect the earth and to ensure its fruitfulness for coming generations."<sup>15</sup> "We are led inexorably to ask: What is the purpose of our life in this world? Why are we here? What is the goal of our work and all our efforts? What need does the earth have of us?"<sup>16</sup>

Finally, the ethic of sustainability recognizes that all life on earth, including human life, is integrally interconnected and interdependent, and all living things are integrally connected with all non-living things on earth.<sup>17</sup> We can explain the connections through the laws of physics and principles of economics or accept interconnectedness as a matter of philosophy or spirituality. Either way, the health of the soil is inseparable from the health of plants, animals, people, communities, economies, and humanity. If we are to sustain human life on earth, we must restore the health of our societies, economies, communities, families, and foods by producing them on farms with healthy animals and healthy plants rooted in living, biologically-healthy soils.

#### End Notes:

<sup>1</sup> William A. Albrecht, *Soils and Men*, Yearbook of Agriculture (U.S. Dept. of Agriculture, 1938), 347-360.

<sup>2</sup> Albrecht, *Annals of Dentistry*, "Our Teeth and Our Soil," Vol. 8, No. 4, December, 1947.

<sup>3</sup> Quoted in T. J. Clark, *Soil Depletion*, [http://www.tjclark.co.nz/jurassic\\_soil.htm](http://www.tjclark.co.nz/jurassic_soil.htm) (accessed April, 2011).

<sup>4</sup> Albrecht, *The Albrecht Papers*, (Several volumes of Albrecht's most significant papers), edited by Charles Walters (Austin TX: Acres USA), first published in the 1970s and reprinted to meet continuing demand.

<sup>5</sup> Charles Walters, Ed. Foreword by John Ikerd, *Soil Fertility & Human and Animal Health*, (Austin TX: Acres USA, 2013).

<sup>6</sup> Arden Anderson, *Real Medicine, Real Health*, (Holographic Health Press, 2004).

<sup>7</sup> Daphne Miller, *Farmacology; Total Health from the Ground Up*, (New York, William Morrow-HarperCollins, 2013).

<sup>8</sup> USDA, "Household Food Security in the U.S.," ERS, Economic Research Report No 125, Sept. 2011.

<http://www.ers.usda.gov/Publications/ERR125/ERR125.pdf>

<sup>9</sup> J Levi, LM Segal, R. St. Laurent R and Kohn D, Robert Woods Johnson Foundation, "F as in Fat; How Obesity Threatens America's Future," <http://www.rwjf.org/en/research-publications/find-rwjf-research/2011/07/f-as-in-fat.html>.

<sup>10</sup> Center for Medical and Health Services, *NHE Fact Sheet*, [https://www.cms.gov/NationalHealthExpendData/25\\_NHE\\_Fact\\_Sheet.asp](https://www.cms.gov/NationalHealthExpendData/25_NHE_Fact_Sheet.asp).

<sup>11</sup> Albrecht, *Soil Fertility and Animal Health*, Chapter XIII, "Impoverished Soils, Poor Animal Health, and Distorted Economics for Agriculture" (Webster City, IA: Fred Hahne Printing Company, 1958).

<sup>12</sup> Albrecht Balanced Soil Fertility--Better Start of Life, In *Let's Live Magazine*, December 1966.

<sup>13</sup> Sir Albert Howard, *An agricultural testament*. Oxford University Press: Oxford, England, 1940. also in Small Farms Library [http://journeytoforever.org/farm\\_library/howardAT/ATtoc.html](http://journeytoforever.org/farm_library/howardAT/ATtoc.html)

<sup>14</sup> J. I. Rodale, The Organiculturist's Creed, Chapter 8. *The organic front*. Rodale press: Emmaus, PA, USA, 1948. <http://www.soilandhealth.org/copyform.asp?bookcode=010133>.

<sup>15</sup> Francis, *Laudato Si*, para. 67.

<sup>16</sup> Francis, *Laudato Si*, para. 160.

<sup>17</sup> For a deeper discussion of worldview and sustainability, see John Ikerd, Lonnie Gamble, and Travis Cox, "Deep Sustainability; The Essentials," 2015 <https://sites.google.com/site/sustainabilitydeep/>.