

Economics and “Nature’s Standard”: Wes Jackson and The Land Institute

DONALD G. RICHARDS

*Department of Economics, Indiana State University, Terre Haute, IN 47809;
e-mail: drichards@isugw.indstate.edu*

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Abstract

This essay introduces or re-acquaints readers with the work of Wes Jackson and The Land Institute in Salinas, Kansas. At the center of this work is an effort to develop perennial poly-culture as an alternative to industrial agriculture. The latter dominant model of food and fiber production is shown to involve severe problems in terms of short-run ecological costs and long-run sustainability. It is also argued that the perennial poly-culture model has much to recommend it to radical economists as a corrective to capitalist inefficiency. Finally, notwithstanding Jackson’s facile criticism of Marx, it is argued that Marx’s own writing actually anticipates Jackson’s agro-ecological critique of capitalism.

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I. Ethanol and Agriculture

The recent increase in the prices of imported fossil fuels has promoted proposals for a dramatic expansion of domestic energy substitutes including ethanol derived from grain (Thurmond 2007). These proposals have been greeted with great enthusiasm in the grain producing states as a potential boost to their economies that have suffered in recent decades from a contraction of manufacturing production and jobs (Kriz 2007). Important questions need to be raised, however, concerning the wisdom of policies designed to expand the reach of industrial agriculture to include both energy and food production. As a source of new employment, ethanol production faces the same limitations as industrial food production. The latter industry is highly capital and chemical intensive and provides direct employment to a scant few (and shrinking) percentage of the American labor force as family farms find it ever more difficult to manage the debt required to achieve the scale economies necessary to compete with corporate agribusiness enterprises. Whereas

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in the immediate post-Civil War period the share of agriculture in total U.S. employment was around 50 percent, today it accounts for less than one percent of the labor force. Between 1981 and 2002 farmers and farm laborers contracted by 18 percent, while employment in wholesale and retail trade in agriculture-related occupations expanded by 60 percent (U.S. Department of Agriculture website).

Moreover, the energy efficiency claims of the pro-ethanol lobby have also come under critical scrutiny. Cornell University scientist David Pimentel argues that the amount of fossil fuels needed to produce a gallon of corn-based ethanol costs about \$1.74 compared to the 95 cents required to produce a gallon of gasoline. "That helps explain why fossil fuels—not ethanol—are used to produce ethanol. The growers and processors can't afford to burn ethanol to make ethanol. U.S. drivers couldn't afford it, either, if it weren't for government subsidies to artificially lower the price" (*Cornell News* 2001).

Pimentel's findings have been criticized by others including scientists at the United States Department of Agriculture who conducted their own studies of the net energy balance of corn ethanol (Shapouri et al. 1995). They argue that Pimentel's data are obsolete and fail to take into account improvements in yields from new, better varieties of corn as well as reduced demands for nitrogen-based fertilizers. They also argue that more efficient processing techniques have raised the corn-ethanol energy conversion rate.

The accounting on this issue is complicated and overlooks other important questions related to the notion of a sustainable agriculture. What, for example, does the implication of an expansion of industrial agriculture imply for soil contamination and erosion? What does it mean for sustainable water use? What does it mean for the potential of crop failures associated with expanding monocultures? What does it mean for the integrity of rural communities?

These are not new questions. They have been at the center of concern of a community of scholars and practitioners of alternative agricultural practices dating to at least as far back as the Dust Bowl decade of the 1930s. In this short article I wish to call attention to one particular critic of conventional industrial agriculture and the model of sustainable agriculture he proposes as an alternative.

2. The Problem of Agriculture

Wes Jackson's important book *New Roots for Agriculture* started with an important critical distinction. This is the one that separates the problem *in* agriculture from the problem *of* agriculture. Most of the issues that I briefly enumerated in the previous section may be said to constitute problems *in* agriculture. They suggest the possibility of policy solutions and, in some cases, quick technical fixes. Jackson's critique *of* agriculture, however, is far more fundamental involving as it does the very notion of tilling the soil as preparation for monoculture. At the heart of this critique is the realization that till agriculture, a practice that may have begun as long as 15,000 years ago, is putting at risk our ability as a species to feed ourselves. This is true in spite of, and in some degree *because* of, the enormous increases in agricultural production that have been achieved.

The most serious short-coming of till agriculture as it is conventionally practiced is the loss of top soil through wind and water erosion (Bennett 1931; Pimentel et al. 1995). Soil erosion has been a problem from the beginnings of agriculture and can be counted

as a prime cause in the fall in formerly great cultures. In U.S. history soil erosion was in dramatic evidence during the “dirty thirties” when drought combined with high winds created the conditions for the Dust Bowl that forced many family farmers off the land and into the migratory streams headed west to California.

Soil erosion is an on-going problem inasmuch as it represents a loss of natural fertility that has to be replaced with synthetic, largely fossil fuel-derived substitutes. Soil run-off mixed with chemical herbicides and pesticides also contaminates ground water supplies that accumulate as silt in waterways and estuaries.

An enhanced awareness of the problem of soil erosion since the 1930s led to the creation of the Natural Resources Conservation Service (NRCS) to monitor soil loss and advise farmers on how to control the problem. The NRCS estimates rates of combined sheet and rill erosion and wind erosion at around 3.1 billion tons per year on U.S. cropland in 1982.¹ By 2001 this combined rate had fallen to 1.8 billion tons per year. Erosion control has been accomplished partly as a matter of low-till or no-till agricultural methods, but these practices involve the use of intensive applications of herbicides that carry their own economic and environmental costs.

The conventional agriculture model is also heavily energy dependent in terms of the fossil fuels needed to provide traction for tilling and harvesting. The use of heavy machinery compacts soil, destroys its structure, and undermines its integrity as an eco-system thus further encouraging the use of additional chemical inputs to offset declining natural fertility. The conventional practice of extensive monoculture renders crops susceptible to disease and pests and narrows the amount of genetic diversity in our agriculture.

Finally, industrial agriculture has pernicious effects on rural communities. The directive to “get big, or get out” has resulted in a vast out-migration of families from agriculture that cannot compete with highly capitalized agribusinesses without falling into a debt trap. Federal government subsidies do little to prevent the tendency towards industrial concentration in U.S. agriculture as the bulk of these payments are directed toward the large, highly capitalized agribusinesses themselves (Pollan 2006; Jackson 2002: 57).

3. The Land Institute and Perennial Polyculture

The alternative to conventional agriculture proposed by Wes Jackson involves the notion of the domesticated prairie. The prairie provides nature’s standard against which Jackson wishes to evaluate human productive activity. The reasons for this involve the prairie’s self-renewing, and therefore sustainable, capacities. The prairie is populated by a diversity of perennial plant species as opposed to the annual monocultures characteristic of conventional agriculture. This diversity of species provides for a natural form of pest control and dispenses with the need for chemicals. The deep roots of perennial plants help the prairie to absorb and retain water, making irrigation unnecessary. Diversity of perennial plants also feeds the soil with micro-flora and fauna that enriches it with nutrients that

1. The National Soil Erosion Research Laboratory describes rill erosion as occurring when “soil is removed by concentrated water running through little streamlets, or headcuts. Detachment in a rill occurs if the sediment in the flow is below the amount the load can transport and if the flow exceeds the soil’s resistance to detachment. As detachment continues or flow increases, rills will become wider and deeper.” For comparisons to other types of soil erosion consult the NSERL website at <http://topsoil.nserl.purdue.edu/nserl/weppmain/overview/intro.html>.

render chemical means of pest and weed control unnecessary as it does fossil fuel-based fertilizers. In Jackson's words the prairie functions on the basis of contemporary solar energy rather than on the earth's rapidly depleting stores of stored, fossil fuel energy.

Perhaps most importantly, however, the prairie eco-system with its deep rooted vegetation holds the soil in place and prevents the loss of "ecological capital" that has become the unfortunate hallmark of conventional till agriculture. This savings is primarily the result of not having to plant and re-plant on an annual basis as is required for the cultivation of annual monocultures. Under Jackson's alternative, plantings would be undertaken only every five years preventing an estimated loss of soil to erosion on the order of 1.27 billion tons per year.

The primary technical/scientific challenge presented by Jackson's model of sustainable agriculture is the search for the perennial species that are capable of producing adequate yields of output that are useful for consumption purposes. Conventional wisdom among plant scientists argues that there exists a tradeoff between the amount of energy a plant devotes to the development of a deep, sturdy root system necessary to survive from one growing season to the next, and the amount of energy it can devote to the propagation of harvestable seed. Our traditional food crops such as corn, wheat, rice, and soybeans have been bred to devote the bulk of their energy to seed production and little to their root systems. Thus they lack the ability to survive a single growing season and must be replanted every year. Other plants, such as those found in what remains of America's formerly vast prairie lands, have evolved deep root systems that enable them to survive the vicissitudes of climate, including drought, as well as to over-winter to grow the following season.

Plant scientists at The Land Institute, established by Jackson and his wife Dana Jackson in 1978, have been at work developing species that combine the virtues of the deep root structures of perennial prairie plants and the yield potential of herbaceous annuals like corn. Other important characteristics, such as the ability to fix nitrogen, to control weeds and pests, to lend themselves to mechanical harvesting, are also important goals of the research and breeding efforts. There have been some qualified successes and a larger number of failures.² Such an outcome is typical of scientific research in general and certainly no less true of the scientific effort to develop new grain varieties. Progress in sustainable, natural systems agriculture such as that studied at The Land Institute, and a few university agricultural research departments around the country, faces considerable research constraints. For obvious reasons this research is not going to attract the kind of private sector support favored by corporate agribusiness sellers of seed, chemicals, and heavy equipment. Jackson and his colleagues at The Land Institute, as well as others around the country working in the area of alternative models of agricultural sustainability, remain convinced that solutions to the problem of agriculture can be found given a sustained commitment to the research problems.

4. A Shift in Cultural Perspective

This commitment may itself require, however, a prior change in the culture. Jackson critiques contemporary culture in the following terms:

2. For a recent report detailing efforts to develop perennial grain crops see Cox et al. (2006).

Our culture is now like a time machine running backward. National polls frequently show that when the issues are framed as value questions, the public will give what in my view is the responsible answer. Then they'll vote otherwise. We saw this during the Reagan and Bush years. Environment gets a high rating because it is the right answer, but people want government to do it without raising taxes or having a national discussion about getting rid of the automobile. It is reminiscent of a child who can give the answer the parents want and then goes on and does what he or she wants to do.

This is not what Madison and the founding fathers expected. They believed the maturity of people's judgment would expand. Worried about corruption, they assumed that eventually our judgment would be larger, more diverse, and therefore more stable. Instead, we have gone the other way. We have become a more juvenile culture. We have become a childish "me, me, me" culture with fifteen-second attention spans. (1994: 88)

By way of cultural prescription Jackson suggests a cultural revival will require that we recapture what we once had that has now been lost in our hyper-mobile, hyper-active society: namely, a strong sense of locality.

Our task is to build cultural fortresses to protect our emerging nativeness. They must be strong enough to hold at bay the powers of consumerism, the powers of greed and envy and pride. One of the most effective ways for this to come about would be for our universities to assume the awesome responsibility to both validate and educate those who want to be homecomers—not necessarily to go home but to go someplace and dig in and begin the long search and experiment to become native. (1994: 97)

An important part of this cultural change is that we become better economists and, especially, better accountants. Jackson writes:

An extractive economic system to a large degree is a derivative of our perceptions and values. But it also controls our behavior. We have to loosen its hard grip on us, finger by finger. I am hopeful that a new economic system can emerge from the homecomer's effort—as a derivative of right livelihood rather than of purposeful design. It will result from our becoming better ecological accountants at the community level. If we must as a future necessity recycle essentially all materials and run on sunlight, then our future will depend on accounting as the most important and interesting discipline. Because accountants are students of boundaries, we are talking about educating a generation of students who will know how to set up the books for their ecological community accounting, to use three-dimensional spreadsheets. (1996)

The problem, as Jackson sees it, is that conventional agriculture, as it has been practiced for thousands of years, is based on deficit ecological spending. It has continuously made withdrawals from the fossil fuel energy, fresh water, and soil "banks" to the point that soon our ability to feed ourselves will be imperiled. The financial metaphor is limited by the long geological time periods by which "deposits" to these banks can be made. We attempt to compensate for diminishing returns on the inherent fertility of the land via a substitution of fossil fuel-derived fertility for natural fertility. In Jackson's words we substitute ancient energy stores for contemporary sunlight. Industrial agriculture also employs ancillary inputs such as pesticides and herbicides whose externalities impose costs whose incidence falls most heavily on farmers, their families, and the communities they live in. Jackson notes, for

example, that the age-adjusted incidence rates of certain cancers among farm families is significantly higher than among the population-at-large and that ground water contamination from nitrates and phosphates has reached levels in many farming communities as to render tap water non-potable (Jackson 2002: 57).

Agricultural policy has only exacerbated the decline of family farming and rural communities according to Jackson, who notes government's impact in the following terms:

Our government has tried, in its own way, spending more money on agriculture each year to keep the current system propped up. In the past five years, farm subsidies have increased 300 percent. Seventy-five percent of these subsidies go to corporate farms and 72 percent of agricultural production is controlled by the wealthiest eight percent of farms. There are beneficiaries, but primarily they are the suppliers of inputs, the agribusiness companies who, in the year 2000, spent \$58 million on campaign contributions. The farmer is there to launder the federal money the primary beneficiaries receive. The Department of Commerce recently ranked all 3,110 counties in the nation according to their per capita income. Rural counties are in the worst shape. Only one among the poorest 50 counties in the U.S. is metropolitan. The rural, agriculturally dependent counties are in the majority. Why have we been so ineffective as rural activists? Are we not properly focused? Are we not working hard enough? Are we tilting at windmills and too stupid to realize it? (2002)

The loss of rural culture and community has also come at the cost of a loss of a collective knowledge of the land that hastens the decline of agricultural sustainability. Jackson sees healthy rural community as an inextricable part of a healthy agricultural ecosystem. The arrival of industrial agriculture has rendered this an important and necessary relationship. He writes:

Human communities, before the industrial revolution, promoted and managed the products of photosynthesis through cultural arrangements. Over time those photosynthetic products, those packets of energy, were moved through harmonious routings to satisfy the human endeavour. The local nature and culture that generated that contemporary energy in turn informed the local culture....

When the internal combustion engine entered our fields and traveled our roads, this high energy led to the destruction of the cultural information essential for every activity from seed preparation to harvest and storage. Fossil fuel forced a disappearance of countless arrangements and social contexts we call human. The front porch and neighborliness disappeared. Little services went away. What is now left in the little places, after the parts have been stripped away are vulnerable people dependent upon high energy and high concentration agents in distant cities. During this evolution we seemed not to realize that we are affecting the architecture of these cultural shock absorbers—genomes, landscapes, rural communities. We were dismantling what we need in an emotional and spiritual sense as well as physical sense. (1999: 54)

5. Jackson's Critique of Capitalism

In a recent paper Jackson registers a note of despair that socially concerned scientists that work in the area of sustainable agriculture have not been able to reverse the downward direction of the dominant model of actual agricultural practice (Jackson 2002: 55-56). In

seeking to locate the sources of this failure Jackson cites the continued dominance of an epistemological tradition that has its historical roots in the Enlightenment and is closely associated with the empiricism of Bacon and Descartes. This “knowledge as adequate” worldview encompasses neoclassical economics which presumes that policy makers have enough information to formulate market-based incentives that will adequately address the “externalities problem” presented by capitalist agriculture. Jackson argues that given the complexity of the natural and social eco-systems, and their interactions, the requisite knowledge necessary for these market-oriented policies to succeed does not exist. He is furthermore doubtful that given the preference of the dominant research paradigms for methods that focus on study of parts, grounded in the Baconian-Cartesian tradition, to the neglect of the whole, our knowledge can ever be sufficient to address our problems.³ Appropriate analysis of complexes such as human communities and natural eco-systems require rather complex methods that take appropriate regard of their internal and interactive dynamics (Jackson 1999b).

Jackson has also in recent years come to view capitalism itself as fundamentally unsuited to the tasks of adapting itself to the requirements of a sustainable agriculture. He writes,

It seems the promoters and apologists for this economic system have never heard of justice between generations. It is time that we seriously question our economic system, much of which is, after all, based on greed and envy. Now, lest you think that I am unpatriotic, consider that there is a big difference between the economic system called capitalism and the political system called democracy. Because I believe in democracy, I have come to regard capitalism as un-American. Capitalism detracts from our democratic ideals partly because it destroys free enterprise. (By definition, capitalism depends on economic growth that must come from exploiting earth’s resources and from forcing more and more people to provide services.) With finite resources, the accumulation of capital means that resources fall into the hands of fewer and fewer persons, and the freedom to be enterprising becomes restricted to those few. (1987: 35)

Jackson’s condemnation of capitalism both as an economic system and as an ideology are based on shortcomings that it shares, in his view, with Marxism. His understanding of Marx and his method is given expression as follows:

It turns out that neither of the two dominating economic ideologies, neither capitalism nor Marxism, is fit for our planet. Fundamental to both of these nearly identical twin orthodoxies is a barbaric plunder of nature. Marx especially was explicit about this. He saw this plunder as necessary and inevitable if progress is to be made toward a better world for

3. Jackson by contrast urges scientists, including economists, to aspire to the status of scientists, to embrace an evolutionary/ecological world view. He complains about mainstream economics in the following terms:

The question has gone unanswered too long as to why the rank and file of economists have ignored the most basic human considerations. Why have we allowed the forward stampede of technology to increase demand when we should be increasing efficiency and reducing throughput? Why are thrift and frugality seldom heard anymore? Whether it is computers or freeways being proposed, few economists seem to say, “We better back off,” or, “We should think how to do better with less.” That nature is to be subdued or ignored and that rigor means to place priority of part over whole must share in the blame. Evolutionary ecological thinking would lead to more benign action. (2002: 63)

humanity. He endorsed this plunder wholeheartedly, perhaps because he was a city boy who believed in "historical necessity." (1987: 41)

Jackson goes on to charge Marx with advocating central planning to the neglect of "the periphery" as well as with the destruction of native cultures and life-ways as a matter of historical necessity. He cites Marx's explicit "approval," for example, of the impacts of British rule on small-scale handicraft production in India.

Students of Marx's work will recognize this as a highly distorted caricature of his views on the human-nature relationship as well as his conception of history or of "historical necessity." In fact, such students will find in Marx's writings an analysis of capitalist agriculture that fully anticipates Jackson's own critique. Bellamy Foster (2000) notes that Marx, following his study of the nineteenth century chemist and agronomist Justus von Liebig, identified a "metabolic rift" in the interaction between man and the earth whose roots lay in capitalist relations of production. This "rift" has pernicious consequences for both the continuing vitality of human labor, human community, and fertility of the soil. In "The Genesis of Capitalist Ground Rent" in volume 3 of *Capital*, Marx writes:

Large landed property reduces the agricultural population to an ever decreasing minimum and confronts it with an ever growing industrial population crammed together in large towns; in this way it produces conditions that provoke an irreparable rift in the interdependent process of social metabolism, a metabolism prescribed by the natural laws of life itself. The result of this is a squandering of the vitality of the soil, which is carried by trade far beyond the bounds of a single country. (Liebig)....Large-scale industry and industrially pursued large-scale agriculture have the same effect. If they are originally distinguished by the fact that the former lays waste and ruins labour-power and thus the natural power of man, whereas the latter does the same to the natural power of the soil, they link up in the latter course of development, since the industrial system applied to agriculture also enervates the workers there, while industry and trade for their part provide agriculture with the means of exhausting the soil. (Quoted in Bellamy Foster 2000: 155)

Marx may have been a "city boy" as Jackson puts it, but this did not prevent him from educating himself on the state of the art in soil chemistry as it existed during his lifetime. He was well versed in the works of Liebig as well as those of Scottish agricultural chemist James F. W. Johnson who documented soil depletion in North America (Bellamy Foster 2000: 152). No one who has made even a semi-serious study of Marx's writings could accept the claim that he approved of capitalism's plunder of the earth, of workers, or of their communities.

Jackson's facile (and erroneous) dismissal of Marx and his method is surprising from someone with his evident breath of intellectual interests.⁴ This blind spot in his perspective should not lead Marxian social scientists, however, to underestimate the essential radical nature of Jackson's critique of industrialist capitalist agriculture, or to under-appreciate the equally radical implications of his alternative model. It is a model that I suspect Marx and Engels would endorse as a means of helping to repair the rift between town and country.

4. These charges against Marx and Marxism are familiar ones to those who have been involved in recent years in the so-called "red-green" debate. Burkett (1999) does a service in demonstrating the fallacies committed by those who dismiss the ecological concerns of Marx and Engels.

6. Conclusion

The recent push for using agricultural resources as a means of acquiring energy independence is rife with social, economic, and ecological contradictions. Leaving aside the question of whether or not the energy content of ethanol fuel production is greater than or less than its value as an energy source, it is clear that the true economic and ecological costs of the proposal have been greatly underestimated. The proposal to convert thousands of acres of land to producing ethanol provides a fillip to the industrial-agricultural model precisely at a time when we ought to be searching for alternative approaches to sustainable ways of producing and living. Consider what “success” of the ethanol project will mean. It will mean a rise in the prices of crops that can be converted to fuel production. This will in turn mean an expansion of acreage dedicated to crops that can be processed into ethanol with a corresponding loss of soil due to erosion, an increase in water and chemical use, along with an increase in agricultural run-off. This run-off in turn will accelerate the chemical pollution of our waterways and the silting of rivers and estuaries. Moreover, the diversion of land and other agricultural resources into ethanol production will force up the prices of food. The stimulus to industrial agriculture will continue to undermine small farming operations and population exodus from rural areas will continue.

Radical social scientists are very good at identifying the failures of capitalism but in general have had much less to offer in the way of concrete proposals for the re-organization of the means and social relations of production in ways that displace the production of exchange values for profit with the rational production of use values. Whatever the technical obstacles confronted by, and ultimate feasibility of, perennial polyculture, The Land Institute’s “sunshine” model offers a model of agricultural sustainability worthy of careful examination even by those who are not specialists in plant science. Moreover, Wes Jackson’s admonition that we take nature as our standard has application to how we think more generally about the economy.

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Donald G. Richards is Professor of Economics at Indiana State University where he teaches a course on Food, Hunger, and Agricultural Sustainability. He is the author of numerous articles on international and development economics as well as Intellectual Property Rights and Global Capitalism published by M. E. Sharpe, 2004.