WE ARE WHAT WE DON’T EAT: WORMS, BACTERIA, AND THE SOIL UNDER US

Todd LeVasseur

This paper will explore the status of worms, soil bacteria, and soil microbes within competing and antagonistic Western approaches to agriculture. It will also illuminate the differences between the two religious worldviews that inform these approaches. One of these worldviews sees worms and bacteria as invaders and pests that have no intrinsic value, being only worthy of extermination; the other sees worms and bacteria on a positive continuum that starts with simply valuing their potential profitability and culminates in seeing them as beings worthy of respect and reverent care as the foundations of soil health and as such are part of our biological and spiritual ken.

Builders of Humus

Earthworms, beneficial soil microbes, and soil bacteria play an important role in systems of organic agriculture. The term “organic” raises a host of issues but here it will refer to the definition given by the United States Department of Agriculture in their USDA Organic guidelines. These defining USDA guidelines are complex, with various standards for both livestock and produce. In order for crops to be certified organic, the following demands must be met: farm land must go through a three year transitional period where banned/non-organic substances are no longer applied to fields; soil fertility must be managed by: cover crops, rotational planting, application of waste materials from animals and crops (i.e. compost), tillage and cultivation regimes, and the application of allowed synthetic and non-synthetic materials; the preferred use of organic seeds; and control of pests, weeds, and diseases by physical, mechanical, and biological management practices. To be considered for organic certification, livestock must be given access to pasture and the outdoors, be fed organic feed, and must not be given antibiotics or growth hormones.

It must be noted that there are those within the organic food community (retailers, consumers, growers, processors) who claim that this definition of organic has been diluted and even co-opted by corporate agribusiness
interests seeking to profit on the burgeoning organic food industry. Others feel that this definition is not strict enough, and that prior to the USDA assuming regulatory control over the definition and guidelines of the label organic, dictated by federal legislative fiat, the term's meaning and the farming methods covered by the word "organic" were purer and stricter.\(^2\) These vocal opponents of the government role in organic agriculture are now looking to move "beyond organic."\(^3\)

Regardless of where U.S. citizens might fall in this debate, most every supporter of organic agriculture agrees with some basic tenets of organic farming practices, most of which are included in the USDA guidelines mentioned above. These practices include companion planting, crop rotation, growing a polyculture of crops/plants, humane treatment of animals, creating habitat on site for various animals (worms and microbes included), and minimal to no use of synthetic and petroleum based pesticides, herbicides, fungicides, and fertilizers.\(^4\) Of course, even within this general consensus, there are at times acrimonious debates between various vested interests in what constitutes organic farming: for example, does a large scale organic farm growing 300 acres of a broccoli monoculture for Wal-Mart count as organic, even if it is USDA certified?

Despite these conundrums, the above practices of organic agriculture both depend on and ideally attain one of its main goals: soil health. To this end, many monographs and studies emphasize the importance of worms and bacteria in creating a robust, healthy organic agriculture.\(^5\) However, most of us, if we have any experience with worms at all, have most likely seen them dangling on the end of a fishing line. Equally, most of our experience with bacteria is clouded by messages from the media, whether news or advertising, that warn us of the myriad harmful side effects of bacteria and dangerous microbes. However, to grow healthy, organic food, according to Sir Albert Howard's 1940 seminal classic *An Agricultural Testament* and multitudes of similar-themed books published since 1940 and devoted to delineating the basics of organic agriculture, both worms and healthy soil bacteria are a godsend.\(^6\)

The common varieties of earthworm and night crawler that we encounter in American soils disembarked with early colonists at Jamestown. These worms were carried over in root balls or dumped on land as part of ballast. Their introduction changed the landscape, especially of Eastern woodlands, because prior to the earthworm, there was nothing that ate the leaves that
would fall to the ground every autumn.⁷ Besides eating leaves, thus recycling nutrients stored in the leaves back into the soil and providing nutrients to growing flora, earthworms also aerate roots, provide tunnels for rainwater to flow through, and excrete pellets of nutrients throughout the soil. As the Indian organic food activist Vandana Shiva puts it, “The little earthworm working invisibly in the soil is actually a tractor, fertilizer factory, and dam combined.”⁸

There are dung earthworms, earthworms that thrive in compost, and still others who live in pastures rather than in gardens. Worms that live higher in the soil have more offspring than worms living lower in the soil—in good soil, one surface dwelling worm can have 1,000 offspring in a year (of course not all of these will survive). These varieties of worms appear in ever increasing numbers of studies that show the role worms have in creating and maintaining healthy, fertile soils, studies which inspire growing numbers of organic farmers to create optimal conditions on their farms for worm habitat. In fact, vermiculture—the practice of growing and breeding worms either for the worms themselves or their castings—is a rapidly growing business in the organic agriculture industry.

Besides worms, there are various species of bacteria and microbes in the soil that also play an equally important role in organic agriculture. Although mainstream advertising and our cleanliness-obsessed culture disparagingly label bacteria and microbes in general as parasitic and dangerous to human health (and certainly some are, especially if manure based compost—a central ingredient to almost all forms of organic agriculture—is not properly broken down), soil bacteria and microbes nonetheless play a pivotal role in creating and maintaining soil health on organic farms. For organic farmers, soil health is equated to the presence, abundance, and vitality of soil microbes that result from the above mentioned practices of organic agriculture (especially the application of well made compost). Many organic farmers and consumers of organic agricultural products feel that the healthier the soil is, in terms of nutrients available to plants, then the healthier the plants are that are grown in such soils. These farmers and consumers maintain that the humans who eat the plants will be healthier, too. The same rule applies to organic animal husbandry—the healthier the animal (raised on a diet of organic food, allowed to “free-range,” and not given antibiotics), then the healthier their meat, milk, and other products will be for human consumers.
Soil bacteria and microbes are instrumental in helping agricultural crops feed upon nutrients found in the soil. Well-made compost when applied to organic fields becomes the mineral and nutrient dense soil humus from which crops feed. Worms multiply and course through this nutrient dense humus, helping to aerate the soil and add to soil fertility by releasing their castings, thus improving the nutrient level and humus content of the soil. Microbes and bacteria help this crop feeding process as well, from rhizomic activity around plant roots to the ongoing decomposition of the deceased bodies of bacteria and microbes: these decomposing cellular bodies become food for plants and their decaying biomass helps to further build soil humus. Organic advocates claim that this improved soil humus leads to pH-balanced soil, greater retention of water, and that it provides plants with habitat for healthy, vigorous growth that leaves them less susceptible to blights and pests. Most organic farmers will maintain that none of the above is possible for their crops and the various life forms that create on-farm habitat without worms, bacteria, and microbes.

Given this important role bacteria and microbes (and worms) play in helping to create the literal foundations for life, the famed Harvard biologist E.O. Wilson points out that “Bacteria and bacteria-like microbes called archaea are the dark matter of Earth’s living universe.” He makes this claim because in one gram of fertile soil there exists ten billion bacteria and in one ton of soil there is an estimated four million species of bacteria. These vast amounts of bacteria and microbes literally help create and constitute the soils under our feet and in agricultural fields. Therefore, creating and maintaining this diversity of bacterial life within pastures and crop fields is seen as one of the major goals of organic agriculture.

Proponents of organic agricultural methods attempt to realize this goal through the rituals of making and spreading compost, the creation and casting of biodynamic preps in biodynamic agriculture as spelled out by Rudolph Steiner, the breeding of worms, and the creation of habitat (especially compost piles) for earthworms. All of these activities have as their goal the maintenance and creation of bacterial and microbial life of the soil. If we were to reduce this organic ideal to an equation, it would read: healthy levels of bacteria and worms = healthy soils = healthy crops = healthy humans. Organic farming advocates further claim that this equation contributes to on-farm biodiversity and healthy ecosystems.
The Grass is NOT Always Greener

In contrast to the organic equation (or formula) exists a competing farming worldview. This conventional farming worldview sees worms and soil microbes as enemies that need eradicating, especially if these organisms are deemed a threat to crop yields and farm profits. Supporting this worldview and approach to worms and soil microbes, historically and still in great measure today, are land grant universities, chemical agribusiness corporations, and the US Government, especially through its Farm Bill subsidies. In this worldview, farming is in large part about increasing yields of cash crops for markets and corporate profit and is heavily dependent on machines (large tractors, combines, etc.), hybrid and genetically engineered seeds, and synthetic-chemical intense farming methods.

It is important to emphasize that the distinction between these two forms of farming, and the soon to be explored, religious worldviews behind them, exists for partly heuristic reasons. These categories are not "hard and fast" distinctions, nor do they completely exhaust the range of values practitioners self-report as motivations for farming organically or conventionally. However, such distinctions are necessary for systematic analysis of the values and beliefs that motivate these contrasting forms of farming, in large part because these forms of farming and the worldviews behind them have different material repercussions in the environment. In the case of conventional farming, these include algae and toxic bloom "dead zones" in the Gulf of Mexico from nitrogen-based fertilizer run-off draining out of the Mississippi River; Mad Cow disease, which results from cows in Concentrated Animal Feedlot Operations (CAFOs) being fed ground up body parts of dead sheep and other cows as they are fattened up for slaughter and market; and the poisoning of farm workers who apply agricultural chemicals to the fields of conventionally farmed produce.

The chemicals used in conventional farming regimes, which critics say pollute the environment and the bodies of carbon-based life forms, are a result, both technological and ideological, of twentieth-century violence. Professor of technology, culture, and communication Edmund Russell has shown how the ideology of waging war on pests in agricultural fields co-evolved with ideologies of waging war on our human enemies in the two World Wars. In effect, he describes how the processes of using synthetic
chemicals to bomb human beings during war and in agricultural fields when farming both share the same technologies and chemical ingredients.

This ideology of chemical-backed farming technologies and practices was greatly aided by the revolutionary hypothesis of the German chemist Justus von Liebig. In the late 1800s, von Liebig claimed that plants were almost wholly nourished by nitrogen, phosphorous, and potassium carbonate; furthermore, during this period of his scholarship and research, he maintained that plants were not significantly nourished by any of the other manifold minerals and microbes that constitute the soil humus in which plants are found. Thus, von Liebig almost single handedly overturned the traditional, low-input farming paradigm and practices that were extant prior to that time and opened the door for today’s chemical-based conventional farming. Ten years after releasing his initial studies and revolutionary view, von Liebig realized that increased soil fertility actually results from applying organic materials via compost and that the minerals and microbes in the soil are what feed plants, but by then it was too late--profits were being made and the belief about nitrogen, phosphorous, and potassium carbonate being central to plant growth assumed a life of its own.

This “life of its own” occurred when poison gasses left over after WW I were profitably applied to insects on and in the soils of fields in both Europe and the United States, thus beginning the multi-billion dollar petroleum and synthetic-chemical based insecticide, herbicide, and fungicide industries that exist today. Most of the companies that produce these chemical products—Du Pont, Dow, and Monsanto—began by making liquid ammonia that was used in WW II as weapons and explosives. DDT was also created in this era, at first to keep fleas and lice off of GIs, and later to keep insects off of crops.¹⁶ Despite intense lobbying and incomplete and questionable testing methods on behalf of the advocates for these products and technologies, studies empirically show that these chemicals kill life—from microbial to worm to plant to human.¹⁷ Overall, U.S. farmers apply twenty-one million tons of nitrogen, phosphate, and potash a year on the country’s 907 million acres of cropland. This tonnage is a combination of 50,000 pesticide formulas and over 700 different chemicals, all geared towards eradicating and controlling pests and blights and boosting yields.¹⁸
Whither Religion? In the Soil or in the Chemical?

I posit and argue that the organic and conventional forms of farming outlined above, both of which have impacted views about and habitats of worms and microbial bacteria, are part and parcel of two competing religious worldviews. One of these religious worldviews sees the earth as a living system of interdependent parts. Certain followers of and adherents to this worldview even go so far as to say the earth itself and the myriad life forms residing thereon are sacred and worthy of reverent care. Inherent to this worldview is the perception that nature is a teacher and that natural processes and organisms and their habitats are to be respected and cared for. The other religious worldview sees worms and insects as pests needing to be controlled and ideally eradicated and the earth and its biotic life as dead, inert matter, there to be manipulated, killed, and processed in the name of profit. I will now articulate this latter religious worldview before exploring the former.19

The religious worldview that motivates the practices of conventional farming sees the earth and its organisms and processes as atomistic background material to be manipulated for profit.20 This worldview subscribes to and follows what religious studies scholar David Loy terms “The Religion of the Market” (1997).21 Loy posits that by adopting a functionalist approach to religion, it is possible to conclude that consumerism has become the most powerful value-system of the world today.22 Loy explains how economics and the theorized functioning of market mechanisms have long since left the realm of being a discipline and profession and today have assumed the air of a religion and function as one. Significantly, for Loy, this religion has as its god the Market (which he writes with a capital “M” to recognize its divine stature). Loy claims that the religion of the Market has become the world’s most widespread and dominant religion, offering a secular salvation based on production, consumption, and the accumulation of profit. Furthermore, its eschatological worldview is of a future capitalist utopia with individual bank accounts magically filled by retirement age--Loy maintains that this end-times belief is aggressively pitched around the world. Loy ends his treatise on this religion by claiming it is to our common detriment (academically, politically, socially, and ecologically) if we only view the Market in secular, rather than religious, terms.
Especially important for the theme of this paper, Loy writes that, "The degradation of the earth and the degradation of our own societies must both be seen as results of the same market process of commodification—which continues to rationalize its operation as natural and inevitable." 23 Here we see that The Market, operating through its "priestly class" of corporations, advertisers, and government supporters (Loy claims that the U.S. Government is the most powerful proponent of apotheosized Market capitalism) advances under a worldview of quarterly profits earned via trading commodities on international markets. 24 This view of the market—where the earth becomes lifeless commodities to be traded and sold—trickles down to farm policy decisions and farm management practices that have resulted in an "unsettling of America," to use Wendell Berry's seminal phrase, and in a symbiotic increase in conventional farming practices. These farming practices are heavily dependent on chemicals, crop patterns, tillage methods, and other farming technologies germane to conventional farming, all of which critics claim are inherently harmful to worms, soil bacteria, and microbes in the soil. The goal of these farming practices is to boost yields of monoculture crops that can be sold on national and international commodity markets. The soil thus becomes a medium that is injected with deadly chemicals, fungicides, pesticides, and fertilizers so that photosynthesizing crops can be grown, processed, and traded with the goal being the accumulation of profit, as this is what the Market demands of its followers. As Nixon's Secretary of Agriculture Earl "Rusty" Butz famously said to farmers: "get big or get out." 25 In other words, play by the rules of the Market, or lose your farm.

In this religious worldview of the Market, the act of farming and the inhabitants of farming soils are strictly viewed in utilitarian terms as a way to make profit. The actual care for and stewardship of farmland and inhabitants of farm soils—such as worms—only registers in this religious worldview if it helps to make money. Ironically, as seen with the exponential growth of organic foods, there is money to be made in organic farming. One problem with this is that chemical companies and large agri-business corporations, such as Monsanto, will be unable to sell their products in the organic paradigm, creating a clear disincentive to support worm and bacteria friendly farming practices. As Mark Winston explains:

Pest management is a business. It has science behind it, sometimes fascinating science, but in the end the bottom line determines whether a piece of interesting
biological research is relegated to the textbooks or becomes a commercially useful system to control a pest. The farmers, exterminators, extension agents, and agricultural product distributors who make decisions concerning pest control are not swayed by elegant science, clever techniques, or trendy new ideas. Rather, decisions are made by the simplest and most pragmatic criteria: which product or method does the best job of controlling a pest with the minimal cost. Pest management today is still pesticide-heavy because chemical pesticides are the most efficient and direct way of meeting the joint standards of high efficacy at low cost. There have been innumerable scientific advances in developing alternative, biologically based, environmentally friendly solutions to pest management in our century, but none of them has even approached the commercial success of pesticides.26

I want to offer two quick addendums to this religion of the Market-inspired approach to farming. The first involves religion scholar Richard Foltz’s recent ten-year revisit of David Loy’s original article about the religion of the Market. Foltz argues that Loy’s article, premises, and conclusions about the religion of the Market are accurate and have strong explanatory power and that, at the least, “the Religion of the Market is surely worthy of broader attention from religion scholars than it has been getting up to now.”27 The second is the observation made by Vandana Shiva of the worldview created by and thus inherent to the religion of the Market. She describes this worldview as being a “monoculture of the mind,” where all diversity (in terms of thought, culture, and economic production) is whittled away and colonized so that all that is left are cultural and ecological monocultures, able to be bought, packaged, traded, and sold in the global economy (1993). It can be argued that this monoculture of the mind manifests itself in monocultures of conventional farming landscapes and the practices that shape them: a landscape where the worm and the desire for healthy soils full of bacteria have no room or sway.

I now revisit the worm and bacteria friendly organic farming methods outlined earlier and explore a variety of religious worldviews that underlay these practices. One tributary of this organic farming worldview is a Christian based “Theology of Sustainable Agriculture” argued for by the agricultural engineer Steven Hall.28 Combining his lay-Protestant reading of scripture with his Ph.D. in agriculture engineering, Hall argues for implementing a Sabbath rest so soils can recover vital nutrients and bacteria and worms can replenish themselves. He also champions a living wage be paid to farmers who practice sound farming practices; a restorative agriculture that heals the soils and organisms damaged by conventional farming practices; and a hoped for cultural redemption of both ourselves and
the soils around us through sound farming practices. This is one example of a Christian based organic farming worldview that is worm and bacteria friendly.29

Other religious worldviews motivate some practitioners of organic, worm-friendly agriculture.30 For example, religious historian Rebecca Kneale Gould undertook ethnographic research with a group of New England homesteaders who purposively turned their back on the consumption-based lifestyle of the Market (2005). In the process of trying to “escape” the religion of the Market (my terminology, not that used by her research subjects), some of these homesteaders integrated organic farming into their homesteading practices. Gould found that these homesteaders were motivated by a “psychospiritual longing: to find a form of spiritual life outside formal religious institutions and to practice a way of living that is in step with the natural world rather than against it” (ibid: xx). This quote shows that, at least for some homesteaders and others who practice organic agriculture, a life lived close to nature and at odds with dominant urban consumer lifeways can be explicitly religious, with nature, nature’s processes, and respect and reverence for nature’s creatures and organisms at the center of that religion. In support of this claim, Gould found that reverence for nature tops the list of attributes that constitute the religious worldviews of the homesteaders she interviewed.31

Continuing with this exploration of possible religious worldviews and motivations behind the practice of organic worm and bacteria friendly agriculture, I offer religion scholar Bron Taylor’s recent scholarship that posits the existence of an emerging “Dark Green Religion” (2010).32 He claims that this nascent religion has its roots in various religious environmentalisms and that it is significantly impacted by insights from ecology and evolutionary biology.33 In dark green religion reverent care for and appreciation of the biodiversity of life in all its shapes and sizes is a central tenet. Of the many characteristics that Taylor claims constitute dark green religion and other nature-as-sacred religions, namely, “religions that consider nature itself to be inherently sacred,” is “the biocentric turn” (1994) that these forms of religion have adopted. For Taylor, these emerging nature religions represent a religious “turn toward values professing that nature has intrinsic or inherent value,” (2010) as compared to the religion of the Market, where nature has no value except what the Market dictates.
This biocentric turn Taylor describes can be seen in the kinship ethics that many organic farmers embody in their attempt to practice sustainable and earth friendly agriculture. Such kinship ethics can and may even include viewing other life forms in nature and in the soil as spiritual kin; as fellow travelers in the unfolding process of evolution on this planet; and even as spiritual teachers and powerful beings in and of themselves, especially for those practitioners of dark green religion who Taylor claims hold an animistic worldview.

A final example of religious motivations and approaches to worm and bacteria friendly farming comes from the organic farmer and agrarian essayist Wendell Berry. Berry writes that, "Because the soil is alive, various, intricate, and because its processes yield more readily to imitation than to analysis, more readily to care than to coercion...agriculture...is a practical art. But it is also a practical religion, a practice of religion, a rite." In Berry’s agrarian understanding, the soil is alive, as are the organisms and worms in the soil. In this worldview, it is proper to care for these life forms—in fact, to do so, according to Berry, is both a religious duty and a moral obligation.

Beyond the above discussion of conventional and organic, gray areas exist within the farming and religious motivations behind these different practices. To be sure, there are conventional farmers who are trapped in a cycle of debt who might no longer wish to commit farming acts that kill soil microbes and worms. Just as surely, there are organic farmers who view worms and compost in strictly utilitarian terms and who are only in organic farming for money, or for personal health issues, and therefore might have no biocentric kinship ethic motivating their farming. In fact, one of the main findings of Gould’s book is the ambiguity and ambivalence homesteaders have toward nature despite psycho-spiritual longings that for some includes forming a spiritual bond with nature.

Ambiguity aside, the worldview farmers bring to their engagement with nature impacts how they interact with it and how they farm. If they see the planet as inert matter to be traded for profit, then worms, soil bacteria, and soil microbes will suffer; if they see a living planet that is to be spiritually worshipped and whose biological processes are to be subtly directed for health, wealth, and harmony, then worms, soil bacteria, and soil microbes will thrive.
Conclusion: Harvesting the Fruits of Our Labor
(and the Labor of Worms and Bacteria)

The explorations of this paper are emblematic of a larger process of America’s history of creating contested sacred space. This process is expertly outlined by scholars Edward Linenthal and David Chidester, who write that “sacred space has been ritualized, reinterpreted, and contested all over America.” It should be of no surprise that this process is occurring on the farmland of our country, too. In the end, this means that worms and bacteria not only help create and maintain the health of our soils, and by default our bodies, but they are unwitting victims in a religious battle being waged by competing religious worldviews on contested ground throughout our country. On one side is Loy’s Religion of the Market, which sees the earth and its life forms as a monoculture of products to be sold at the altar of Mammon; on the other side sits various “nature as sacred” strands of Christianity, Judaism, religious environmentalisms, and emerging dark green religions that see the earth and its life forms as being holy, “good,” interconnected, and worthy of reverent care.

Postscript: Fornication and Worm Reverence

A few years ago, organic farmer Michael Ableman traveled the country. His journey took him from his own farm on Salt Spring Island in British Columbia to visit U.S. farmers who are practicing the sort of worm and bacteria friendly organic and biodynamic farming practices outlined in this paper. He visited farmers in all parts of the States, including those living in dense urban areas. His trip resulted in his book, called Fields of Plenty: A Farmer’s Journey in Search of Real Food and the People Who Grow It (2005). One of the farms he visited was Knoll Farms, one of the earliest California Certified Organic Farms. The following is a summary quote he gave regarding his time spent with Rick and Kristie Knoll, the founders, owners, and farmers of Knoll Farms. Notice in this quote both Rick’s view on worms, and also Ableman’s description of alternative, earth friendly farming methods and how his description borders on a religious testament: “When Rick proudly tells me that there are ‘night crawlers fucking in the orchard,’ I understand. To know that numerous creatures have settled in and
are comfortable enough to reproduce themselves provides as much a sense of accomplishment and satisfaction as high yields and tasty crops. Once again, I'm reminded that farmers who are outlaws by conventional terms are actually lured by a sense of being part of something much bigger than themselves.\textsuperscript{36} Whether this something "much bigger" that Ableman praises is a concept of Christian stewardship, of back to the earth religiosity, of dark green religion, or some other form of nature centered worldview, it nonetheless impacts the way worms and bacteria are treated in the soils of agricultural fields around the country and world.

\textit{Notes}


2. The legal fiat came with the passing of The Organic Foods Production Act of 1990, which required the Secretary of Agriculture to create and establish a National List of Allowed and Prohibited Substances. Prior to this Act, organic certification was conferred on a state-by-state basis and was administered by various state and regional-level governing bodies; for example, the California Certified Organic Farmers (CCOF) handled certification for California and other regional farmers. The USDA has formed partnerships with these state-level certifiers so that the state-level certifiers help certify and monitor organic farms for the USDA.

3. See, for example, the long-running monthly magazine \textit{ACRES USA: The Voice of Eco-Agriculture} (www.acresusa.com) and its criticisms of the USDA and of corporate interests in today's organic markets, and the work of farmer Joel Salatin, \textit{Everything I Want to Do is Illegal: War Stories From the Local Food Front} (Swoope, VA: Polyface, Inc., 2007).

4. In contradistinction, farmers who do not follow organic practices but rather who rely almost solely on petroleum and synthetic based artificial chemicals, who plant hybrid seeds, who use genetic engineered seeds and other genetic engineering technologies, and who plant monocultures of hundreds to multiple thousands of acres are called "conventional" farmers in modern agricultural parlance. These practices form the core of what is called the "Green Revolution" in farming, where production has shifted from
small scale family farms using traditional farming methods (now in part called “organic” as a response to the Green Revolution, although organic farming methods have developed in sophistication and efficacy of obtaining increased yields compared to 100 years ago) to large scale and tractor, irrigation, and chemically based monocultures of high-yielding hybrids. For an in depth history of this shift from traditional to conventional farming in the U.S., see P. Conkin, A Revolution Down on the Farm: The Transformation of American Agriculture Since 1929 (Lexington, KY: The University Press of Kentucky, 2009). For a critique of what this shift has done to agrarian farming communities in the U.S., and the role corporations and the U.S. Government have played in this shift, see Wendell Berry, The Unsettling of America: Culture and Agriculture (NY: Avon Books, 1977).


7. See C. Mann, “America, Found and Lost.” National Geographic. May 2007, vol. 211, no. 5, esp. 35-37. There have historically been indigenous species of worms native to the North American continent but most of these species became extinct after the last ice age.


10. Biodynamic agriculture is seen by some as being a potential “beyond organic ‘savior’.” Although still on the margins in the United States, biodynamic agriculture is a large component of organic agriculture regimes in Europe and Australia. This type of agriculture also does not use synthetic chemicals, sees the farm as a “whole organism,” applies composts, plants by stars and other celestial bodies, and applies “homeopathic” tinctures to crops and the soil. A. Podolinsky, Biodynamic Agriculture Introductory Lectures: Volume 1 (St. Leonards, Australia: Gavemer Publishing, 1996); R. Steiner, Agriculture (An Introductory Reader) (Forest Row, UK, 2003). The chemist and biodynamic farmer Hugh Lovel claims that these tinctures rapidly and dramatically boost the population of soil microbes and bacteria. H. Lovel, A Biodynamic Farm (Austin, TX: Acres U.S.A., Inc., 2000)
11. For example, see Fahnestock (2005), who shares data about a joint USDA-Monsanto-Purdue University study about combating soybean rust with fungicides and pesticides. A. Fahnestock, “Soybean Rust Strategy: R2D2.” *Croplife.* 168 (2005), 10.

12. Critics of large-scale conventional farming claim that studies show that large machines destroy the soil and thus habitat for worms and bacteria. The weight of the tractors and combines used on today’s farms packs the soil so that the soil becomes rock hard and thus nearly impossible for worms to be able to crawl through. Of course, many organic farmers, and especially large corporate organic farms, use tractors. This is another murky area, as most farmers on either “side” maintain that market demands dictate the use of tractors. E. Faulkner, *Plowman’s Folly* (NY: Grosset and Dunlap, 1943).

13. Sociologists Beus and Dunlap found six areas of difference between what they call the competing paradigms of conventional and alternative agriculture: dependence vs. independence; domination of nature vs. harmony with nature [of significant import for this paper]; centralization vs. decentralization; exploitation vs. restraint [see below discussion about religious motivations behind these two farming paradigms]; specialization vs. diversity; and competition vs. community [see again below discussion about religious motivations]. See Beus, C. and R. Dunlap. “Conventional versus Alternative Agriculture: The Paradigmatic Roots of the Debate” in *Rural Sociology,* Winter 1990, 55:4, 590-616.

14. Michael Pollan’s bestseller *The Omnivore’s Dilemma* (2006) provides a well-documented account of these material results of conventional farming. He also offers an astute analysis of the US Farm Bill and how the subsidies contained therein impact the soils and waters of our nation and hemisphere. Again, to show that there are murky areas, some claim that large-scale organic cattle operations, especially in today’s sizeable organic market, are inimical to soil and environmental health, despite the traditional ideals of organic agriculture and husbandry as advocated by pioneers like Howard, Walters, and Rodale. For the poisoning of farm workers, see Stephanie Hicks, (http://www.colby.edu/personal/t/thxttieten/ag-pest.htm) who shares that “Mevinphos, an organophosphate insecticide used to control aphids, mites, grasshoppers, cutworms, leafhopper caterpillars and other insects, is applied to a variety of vegetables, such as head lettuce, leaf lettuce, cauliflower, broccoli, and celery” and that the application of this chemical has been linked to illness and death in farm workers.


16. P. Tompkins and C. Bird, *Secrets of the Soil: New Solutions for Restoring our Planet* (Anchorage, AK: Earthpulse Press, 1998), especially their “Introduction,” pgs. xi-xviii. These early chemical and weapons companies are still the major suppliers of chemicals and genetic engineering technologies used by today’s domestic and international conventional farmers. Most of these companies are what are now called Transnational Corporations, with subsidiaries in multiple countries and investments in various aspects of national and global agricultural regimes. Lastly, Rachel Carson’s *Silent Spring* helped educate the public about the harmful side effects of DDT. While outlawed in the U.S., DDT is still manufactured by Monsanto and is sprayed on agricultural fields throughout Latin America.

17. For a sustained critique of conventional farming, the chemicals used in it, and the impacts of these synthetic chemicals on ecosystem and human health, see A. Kimbrell,
18. Some scientists dedicate their research to mediating the effects of these chemicals in the fields of landscape ecoxicology and environmental toxicology. Also, Journals such as *Applied Soil Ecology* and *Soil Biology and Chemistry* do publish studies that recognize the important roles various soil bacteria and worms play in agriculture and advocate for Integrated Pest Management (IPM) best-practices that attempt to minimize the use of chemicals in farming. For a textbook based example of chemical-backed farming, see David Alford, ed. *Pest and Disease Management Handbook* (London: Blackwell Science, 2000), 1, who maintains that “Arable farmers...need to make efficient use of variable inputs such as insecticides, fungicides, fertilizers, seeds and energy.” While mentioning public concern over such chemicals, and that there are forms of biological pest control available to farmers, the edited volume nonetheless delineates chemical control regimes to combat pests and plant diseases. Lastly, an example of a conventional farming text reads as follows: “Nematode management [nematodes are an extremely diverse species of roundworms] must be viewed as a preplant consideration because once root infection occurs and plant damage becomes visible there are very few nematode management options available to help resolve the nematode problem and avoid potentially significant crop losses. In this regard, pest and crop monitoring activities are very important considerations for early detection of pending problems. Once the discovery is made that nematodes have colonized plant roots and stunted crop growth, the question is whether it is possible to effectively reduce nematode population levels and restore crop yield potential. At present the only post plant nematicide which can be used in some crops to help resolve an established nematode problem is Vydate (Oxamyl). Vydate is not considered a true nematicide, but rather a nematostat. Nematostats, rather than kill nematodes, induce a narcotic effect which paralyzes the nematode and prevents it from feeding, movement, mating, and other normal activities. The narcotic effect is only as persistent as adequate Vydate concentrations are maintained within soil and roots. Following nematicide application, irrigation and rainfall can dilute and leach toxic concentration from the nematode environment, thereby restoring the nematodes ability to conduct normal bodily functions. As a result, repeated and sequential Vydate applications to soil are required to maintain toxic (narcotic) concentrations” (J. W. Noling, “Nematode Management in Commercial Vegetable Production.” http://edis.ifas.ufl.edu/ ng004). Organic farmers also have farm management practices geared towards controlling blights and pests, but these practices are holistic and have as their goal healthy soils. Most organic farmers, especially those working at smaller scales, accept that up to twenty percent of what they plant will be lost to insects, birds, deer, and disease and/or will not be of good enough quality to sell to retail outlets. Rather than resorting to chemicals to protect their crops, they plant an excess of crops at the beginning of the season, understanding that some will be “lost.” Organic farmers also practice companion planting to help protect against blights and pests.

19. As with the discussion about farming methods, I present these religious worldviews in such a clear-cut way in part as a heuristic tool, but also to show that there are actually significantly different beliefs in these two religions and that these beliefs have a material impact on the subject matter of this paper—worms and soil bacteria and microbes.

20. For an in-depth analysis of how Western science from the enlightenment onwards came to view the world in this way, see C. Merchant, *The Death of Nature: Women, Ecology*
and the Scientific Revolution. (San Francisco, CA: HarperSanFrancisco, 1980 [new preface: 1990]). This scientific view is in large part what the religion of the Market uses as its own view of nature. Merchant goes so far as to claim that “the death of nature” (the provocative title of her book) is “the new value system of the modern world” (ibid: 217).


30. Future scholarship on the motivations cited by those who practice organic farming would do well to investigate religious beliefs and worldviews. Two questions worth exploring are whether organic farmers see organic agriculture itself as a religious practice, and if the goals and ideals of organic farming function on their own as a religion for some organic farmers.
32. Author accessed Taylor’s unpublished manuscript at the time of this article’s acceptance for this book. All quotes are taken from this manuscript, which has now been published in book form.
35. Chidester, David and Linenthal, Edward. “Introduction” in *American Sacred Space* (Indianapolis: Indiana University Press, 1995), 1-42. They also point out that “nature in America is not a ‘natural’ but a thoroughly cultural production of space” (ibid: 13). The nature found on and in farm lands is thus in part a cultural production and as this paper labors to show, this nature is impacted by cultural and individual understandings of religion—including concepts of a sacred/profane dichotomy.
Brenda Gardenour holds a PhD in medieval history from Boston University and specializes in the history of medieval medicine and hagiography. Her current research examines the use and abuse of Aristotelian discourse in the medieval world, the development of medicine as a language of authority, and the continued influence of both on the deeper structures of modern mentalités, particularly those linked with the horror genre from gothic literature to digital gaming. She is currently Assistant Professor of History at the Saint Louis College of Pharmacy.

Amber Campbell Hibbs is a biocultural anthropologist whose research examines the influence of human interaction with the environment on health and illness. She has studied irrigation use and other farming practices as they relate to disease transmission dynamics in archaeological populations and is currently developing climate education programs for rural populations including agricultural producers in Kansas and Nebraska as part of the Central Great Plains Climate Education Partnership.

Todd LeVasseur received his Ph.D. in religion and nature from the University of Florida, with his dissertation investigating what he calls "religious agrarianism." He is currently a Visiting Instructor in the Department of Religion at the College of Charleston in South Carolina.

Alison More is a researcher for the project ‘Religious Orders and Identity Formation in Late Medieval and Early Modern Europe’ at Radboud University in Nijmegen. She obtained her PhD from the University of Bristol in 2005 and has held the post of Assistant Professor at the Franciscan Institute of St. Bonaventure University. She specializes in the devotional climate of the high Middle Ages, and has a particular interest in the role of gender in religious devotion. She has co-edited a volume, Representing Medieval Genders and Sexualities in Europe, 600-1530. She is working on an edition of Beguine rules for the Brepols series, Disciplinca Monastica.

Mark G. Pitner, PhD is an Assistant Professor of Asian Studies at Elmira College. He has written on developments in Ruism (Confucianism), the work and reception history of Yang Xiong (53 BCE–18 CE), the history of natural science in China, and is currently working on a number of projects that explore the role of place in the intellectual history of China.