A Brief Overview of the History and Philosophy of Organic Agriculture

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Introduction

For most of its history, organic agriculture has been given short shrift. If they paid attention at all, conventional agricultural institutions treated it as an antiquated, unscientific way to farm – suitable, perhaps, for gardeners, but not a serious means of commercial food production. Anyone who advocated for organic farming was derided; it was professional suicide for an agronomist or soil scientist to do so.

While its methods, proponents, and philosophy are still derided in some quarters, things have been turning around for organic agriculture. Organic consumption is increasing and organic acreage is growing. An organic industry is developing that not only commands respect, but now demands a growing share of research and educational services from USDA, land-grant universities, and state agriculture departments.

By the end of 2008, the organic sector had grown to a whopping $24.6 billion industry.[1] While many sectors of the agricultural economy are growing slowly and even stagnating, the organic sector has been growing at roughly 20% a year since 1994.[2] Even during the recession year of 2008, growth was a respectable 17%.[3] At present the organic sector constitutes about 3.5% of total U.S. food sales, but should these growth rates continue, it could reach 10% in less than a decade.

According to ERS statistics from 2005, U.S. organic acreage now exceeds four million, with certified production in all 50 states.[4] Worldwide, the United States has the fifth largest amount of acreage in organic production, following Australia, Argentina, China, and Italy.[5]

To better understand today's organic phenomenon, it helps to know the origins of organic agriculture and its evolution to the present.

The Origins of Organic Agriculture[6]

As a concept and ideal, organic agriculture began in the early part of the twentieth century, primarily in Europe, but also in the United States. The pioneers of the early organic movement were motivated by a desire to reverse the perennial problems of agriculture – erosion, soil depletion, decline of crop varieties, low quality food and livestock feed, and rural poverty. They embraced a holistic notion that the health of a nation built on agriculture is dependent on the long-term vitality of its soil. The soil's health and vitality were believed to be embodied in its biology and in the organic soil fraction called *humus*.

A soil management strategy called *humus farming* emerged, which employed traditional farming practices that not only conserved but also regenerated the soil. These practices – drawn from mainly from stable European and Asian models – included managing crop residues, applying animal manures, composting, green manuring, planting perennial forages in rotation with other crops, and adding lime and other natural rock dusts to manage pH and ensure adequate minerals.[7]

Since the strategy revolved around soil building to nourish crops, “feed the soil” became the humus farming mantra. “Feeding the soil” meant feeding the soil food web. The soil food web is the living fraction of the soil, composed of bacteria, fungi, earthworms, insects, and a host of other organisms that digest organic matter and “meter” nutrition to crop plants (see Figure 1). This contrasts with the (then emerging) strategy of using soluble fertilizers, which bypass the soil food web to fertilize plants directly.

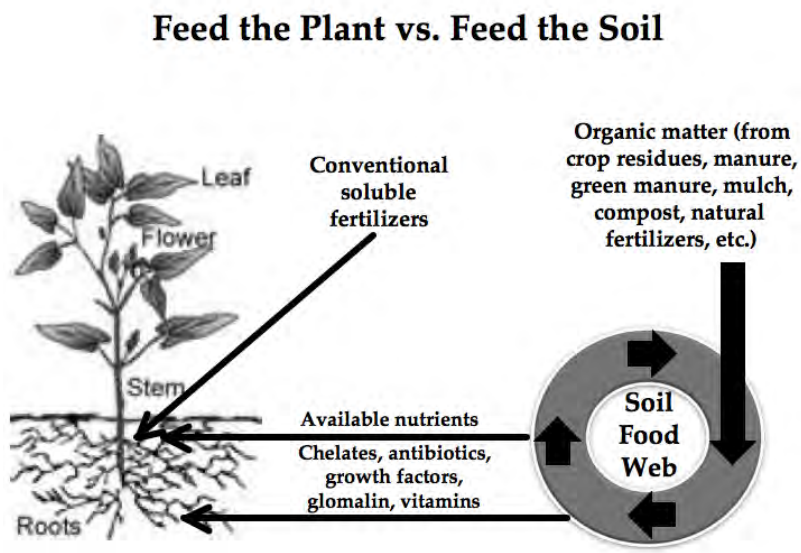


FIGURE 1

Humus farmers typically avoided, or used very few, synthetic fertilizers. Obviously, they were not consistent with the idea of crop fertilization through the soil food web. Humus farmers felt that soluble fertilizers led to imbalanced plant nutrition and “luxury consumption,” which reduced food and feed quality. Many also believed that many synthetic fertilizers actually harmed the soil biology – either killing organisms or upsetting the natural balance. They also saw this danger in the use of pesticides, and chose to use few, if any, of those.

Still other humus farmers recognized that synthetic fertilizers and pesticides would lead to shortcuts in crop rotation – eliminating many of the soil building and pest control benefits that good rotations confer. The use of synthetic nitrogen fertilizer, especially, would reduce the inclusion of perennial legume forages and green manure crops in cropping sequences. These crops not only supplied nitrogen to subsequent crops in rotation, but sustained soil biology and organic matter levels. Wherever synthetic fertilizers and pesticides were used to cut corners on biodiversity and soil building, they were in direct opposition to the principles of humus farming.

Humus farming, then, was a conscious, well-founded approach to farming and soil management. It embodied a commitment to sustainability through soil regeneration; it sought to avoid wasteful exploitation of natural resources. This was in stark contrast to many of the world’s agricultural systems, which, in so many cases, led to the downfall of nations through mismanagement of resources.[8] It puts a lie to the commonly held notion that organic agriculture is simply farming as it was practiced before the advent of synthetic chemicals.

How *Humus* Farming Becomes *Organic* Farming

The term "humus farming" went out of vogue in the 1940s as the term "organic" became more popular. According to one source, the first use of "organic" to describe this form of agriculture was in the book *Look to the Land*, by Lord Northbourne, published in 1940.[42,43] Northbourne uses the term to characterize farms using humus farming methods, because he perceived them to mimic the flows of nutrients and energy in biological organisms – "…a balanced, yet dynamic, living whole."[44] Therefore, the word "organic" was intended and used to describe process and function within a farming system – not the chemical nature of the fertilizer materials used, and not adherence to a discredited notion of plant nutrition.[45]

Two Enduring Ideas about Organic Agriculture

People believe many things about organic farming. Some of them are true and some are not. Some originated with humus farming and persist in contemporary organic thinking. Two of these are the beliefs that organically grown food is healthier or otherwise "better for you," and that organic crops are naturally resistant to pests. Both hypotheses are very controversial.

Is organic food healthier?

The belief that organic food is healthier than conventional fare is a foundational belief of organic farming that continues to drive the market today. Surveys continue to show that "healthfulness" is the main reason that consumers buy organic food.[9,10,11,12]

Pioneers of the organic movement believed that healthy food produced healthy people and that healthy people were the basis for a healthy society. Since most food originates with the soil, they naturally promoted a method of growing that was based on soil health and vibrancy – the organic/humus farming method. They believed that soils thus managed would yield more nutritious food.

Is the organic community justified in its belief? The answer depends on who gives it. In the recently published article *Nutritional Quality of Organic Foods: A Systematic Review*[13], the British authors conclude that there is no difference in nutrient quality between organic and conventional foods. This has been challenged by scientists from the Organic Center (TOC) – a nonprofit organization whose stated mission is "to generate credible, peer reviewed scientific information and communicate the verifiable benefits of organic farming and products to society."[14] The TOC reviews support the British findings on some classes of nutrients, but disagree on others. Specifically, TOC cites considerable research that shows organic foods are higher in total antioxidants.[15] The British review generally ignored this body of research. TOC further cites a failure to recognize the higher non-protein nitrogen levels in conventional foods for the hazard they present through formation of nitrosamines in the human digestive tract.[16]

Nutritional content is not the only factor that interests organic consumers. Since the 1960s, they have been concerned about pesticide residues. The concern is not about acute poisoning, but the possible effects from bioaccumulation over time.

That there would be less pesticide residue on organic produce seems to be a given. It was reconfirmed by a 2002 study of residue data from several sources over time. Organic produce had one-third the residue levels of conventional fruits and vegetables and half the level found on produce grown using integrated pest management.[17]

The compelling question is whether pesticide residues actually have significant negative effects on human health. This is not clearly answered. The scientific community is most concerned about the possible impacts on children.[18] Whatever those impacts, several studies *do* demonstrate marked reductions in pesticide metabolites in children switched to a diet of organic food.[19,20]

The concern for children is certainly valid. Their body weight is lower and small effects in childhood can grow to major problems over a long lifetime. But the danger may occur well before childhood. A 2009 article in *Newsweek* suggests that the impact of pesticide (and other environmental chemical) exposure may be equally or more significant to those in the womb. There is growing evidence that hormone-mimicking pollutants from pesticides and plasticizers are a major factor in infant obesity, which has risen 73% since 1980. Of particular note is the observation that these effects were caused at very low dosages.[21] In a similar vein, University of Wisconsin researchers have recently reported a connection between exposure of pregnant women to the popular pesticide chlorpyrifos (trade names include Dursban® and Lorsban®) and long-lasting birth defects in female offspring.[22] Again, the damage appears at extremely low dose levels.

Beginning in the 1990s, genetic engineering became another issue in the organic food quality debate. The National Organic Standard prohibits the use of genetic engineering in organic agriculture as per §205.105(e), where its various permutations are referred to as "excluded methods." The concern over so-called "frankenfoods" and their possible effects on human health were certainly a major factor in the organic community's insistence that genetic engineering be banned from organic food production.

Do organic crops resist pests?

The assertion that organic culture induces pest and disease resistance in crops is much less well known than the healthy food claim, though the notion has been around for some time. In *The Soil and Health*, one of the earliest classics of organic thought, the father of organic agriculture, Albert Howard, writes that health is the "birthright of all living things," and that health in humans depends on a chain of health that begins in the soil. He goes on to state that "vegetable (and animal) pests and diseases…are evidence of a great failure of health" in the plant and animal links in that chain and those failures begin with the soil and its management. In other words, pests and diseases may be considered *agricologenic* – induced by the farmer. The organic method was, according to Howard, a means for restoring and sustaining soil health, thereby reducing and even eliminating most pest problems.[23]

The notion that plant stress and disease/ pest tolerance are related did not originate with Albert Howard and the organic movement. There is an independent school of thought on *predisposition theory* that traces back to the work of H.M. Ward in 1890 and continues at least through the mid-1970s.[24,25] Subsequent inquiry became increasingly bound to research on organic systems. A prime example is P. L. Phelan's work with European corn borer that found reduced pest damage under organic management.[26]

Early work on predisposition theory focused on fungal diseases but later expanded to address other diseases and arthropod pests. It is the basis for a common belief among organic farmers that insect pests are nature's "garbage collectors;" that their main function is to remove unhealthy and unsuitable plants.

There are several theories regarding the mechanisms of predisposition. One revolves around phytochemicals that plants produce to protect themselves from diseases and pests. A prime example is DIMBOA, a chemical compound found in young corn plants that protects against fungi, bacteria, and a range of insect pests, including European corn borer.[27,28] Stressed plants, it is argued, produce fewer protective phytochemicals, making them more susceptible.[29] If, as research shows, organic crops produce more phytochemical antioxidants, it is logical to believe they might also produce more pest-repellant phytochemicals.

Another theory about how predisposition works relates to the breakdown of proteins under stress, leading to the accumulation of soluble amino acids in plant sap. It is believed that these forms of free nitrogen are more digestible by insect pests, many of which lack the enzymes to break proteins down to their amino acid constituents. Therefore, they thrive on stressed plants.[30,31]

A further theory links total dissolved plant-sap solids to susceptibility and resistance. Higher levels of sugars, minerals and other components of plant sap are treated as indicators of plant health and, therefore, improved resistance.[32] Since dissolved solids can be readily monitored using inexpensive hand-held refractometers, this theory is quite popular among growers, though research has not always supported a direct correlation. California-based research by Dr. Mark Mayse, for example, did not find a correlation between dissolved solids in grapes and resistance to leafhoppers during a two-year study.[33]

While induced resistance offers great promise, it is not a panacea and its mechanisms are hard to nail down. Furthermore, the degree of resistance is likely to vary with the pest or disease involved. Predisposition theory may be totally irrelevant where a new crop species is involved, or a new pest or disease introduced.[34]

If organic crops are more resistant to pests and diseases, the root cause is most likely the soil food web. A healthy food web leads to good tilth and a better air and water balance. Increased humus means more moisture retention and less drought stress. There is also a significant nutritional benefit. Though organic agriculture recognizes that plants absorb soil nutrients in soluble (inorganic) form, it places great importance on the organic compounds – chelated nutrients, amino acids, natural antibiotics, vitamins, growth factors, humic substances, etc. – that plants also absorb. Traditional practitioners believe that these *phytamins* contribute much more to plant health and growth than is generally recognized.[35]

The soil food web not only makes phytamins available, it also aids in their uptake. Albert Howard noted this and wrote in considerable detail on the importance of mycorrhizal associations in particular.[36] Mycorrhizae are fungi that coat, and form symbiotic relationships with, plant roots. They effectively increase the absorptive surface of the root hairs, aid in the uptake of minerals and water, and provide a barrier to pathogens.[37] High-humus, biodiverse, organically managed soil certainly favors the survival and proliferation of mycorrhizae.[38]

As early organic farmers embraced predisposition theory, it led to a *plant-positive* paradigm for disease and pest management. By accepting agricologenic stress as a root cause of pest problems, organic growers sought to change and improve their systems and reduce plant stress by improving tilth, balancing crop nutrition, and whatever else they could do to protect and enhance the soil food web.[39] This is in contrast to a conventional pest-negative paradigm that assumes outbreaks are inevitable, no matter how a crop is grown, and that they must always be dealt with by direct means such as pesticides.

Earning Credibility: Groundbreaking Research

Because the organic movement criticized and diverged from mainstream agriculture, it became something of a pariah in the professional community. Few researchers would consider proposing serious research for fear of ridicule, isolation, and damage to their careers. A slow change began in the late 1970s with two widely publicized studies.

The better known of these was a USDA evaluation of organic farming that was published in 1980 as the *Report and Recommendations on Organic Farming*.[46] The USDA team interviewed a large number of organic spokespeople, promoters, writers, and farmers, studied a variety of farms across the country, toured European operations, and produced a positive report that pointed to the environmental benefits of organic farming, its wise use of resources, innovations in pest and disease management, and the need for the USDA and land-grant universities to respond better to the needs of these growers.

At roughly the same time, a large study of Midwestern organic farming was also underway. It was conducted by The Center for the Biology of Natural Systems (CBNS) at Washington University in St. Louis, Missouri.[47] CBNS had acquired a multi-year National Science Foundation grant to study energy use in Corn Belt agriculture. The study zeroed in on organic farms because they used few energy-intensive inputs.

The CBNS study took a snapshot of organic farming at a time before the organic marketplace developed in the Midwest. Therefore market premiums were almost nonexistent and did not influence crop selection, agronomic practices, the economics of farming, or the decision to farm organically. Among its many findings:

Though conventional wisdom dictated otherwise, commercial organic farming of agronomic crops was a fact in the Corn Belt.

Organic crop farms growing corn, soybeans, small grains and hay crops consumed 40% of the energy used by conventional farms to produce a dollar's worth of crop. The key factor in the accounting was the high use of energy-intensive nitrogen fertilizer on conventional farms.[48]

These same farms had 33% less soil erosion than conventional farms, based on crop mix alone. Though not quantified, almost all organic farms had converted to mulch- and ridge tillage to conserve soil. These practices were seldom in evidence on neighboring conventional farms.[49]

Organic farming sequestered more carbon in the soil. There was no evidence of phosphate or potash depletion.[50]

Organic farms had lower yields of corn (about 10%), comparable yields of soybeans, and required about 12% more labor per dollar of crop produced.[51]

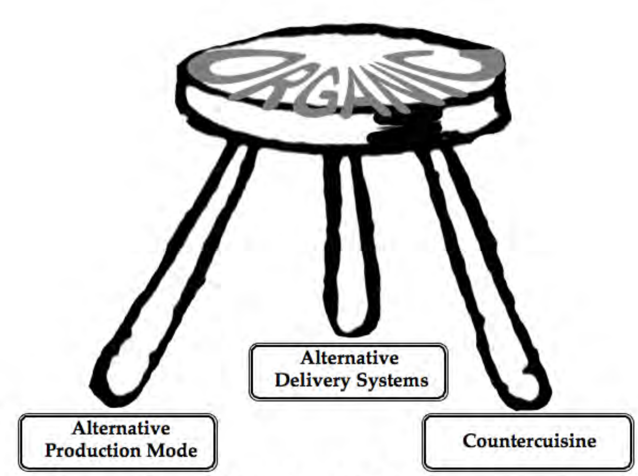
In four out of five years, the lower organic yields and higher labor costs were offset by lower input costs, resulting in generally similar net returns per acre. The significance of this becomes most apparent when one realizes that all sales from these organic farms were made into the conventional market at conventional market prices.[53]

With no market premiums available, the motivations for converting to organic farming were somewhat different from today. Organic growers in these studies cited livestock health, soil problems, and the cost of chemicals as their top three reasons for converting.[54]

It is right to question how relevant the Washington University findings might be to other parts of the country, including the Mid-south and the Southeast. Higher temperatures and rainfall patterns that deplete the soil, resist the buildup of humus, and increase pest and disease pressure hint at challenges for humus farming in the South. They tend to buttress the conventional wisdom that insists "it doesn't work here."

However, prior to the Washington University study, conventional wisdom also denied the viability and existence of organic farming in that region, where it has ultimately proven workable and competitive. No doubt, successful organic farming systems in the South will look different from their northern counterparts, but to deny that such systems can be developed is premature.

The Influence of the '60s and '70s Counterculture



Counterculture Vision of Organic Agriculture

Adapted from: Pollan, Michael. 2006. *The Omnivore's Dilemma*. Penguin Press, New York. 450 p.

FIGURE 2

Organic agriculture is beset by many myths. Among the most common is that it was created by the counterculture of the 1960s and 1970s. Obviously, this is not true. What the counterculture did, instead, was to co-opt what was then a small and rather obscure organic movement whose political and social tendencies were ultraconservative and even reactionary.[55] The counterculture gave it a left-leaning political and social flavor. It also gave organic food, farming, and gardening greater visibility and popularity. But most significantly, it gave it customers and set the stage for an industry to develop. So while one can't say that the '60s counterculture invented organic farming, it is fair to say that it created the organic industry.

The 1960s also married organic agriculture to the wider environmental movement. Rachel Carson's *Silent Spring*, published in 1962, highlighted the dangers – real and perceived – of pesticides, making organic agriculture especially attractive, as it eschewed the use of most synthetic pesticides.[56]

The 1960s and 1970s also spawned a back-to-the-land movement, with a new generation setting out to farm and garden organically. Unfortunately, many novices failed to understand that growing quality food without pesticides or synthetic fertilizers would not work very well without the regenerative practices of the traditional organic method. A lot of unattractive, low-quality produce appeared, grown using a do-nothing approach that became known as "organic by neglect." "Organic by neglect" was precisely the approach to farming that the pioneers of organic farming railed against in the first half of the twentieth century. They would have been appalled to see the critics label these poor examples of gardening and farming as "organic."

One very positive residual of the '60s and 70s counterculture was a holistic and enduring vision of what organic agriculture was and how it contrasted with mainstream, industrialized food and farming. This vision is well articulated by Michael Pollan in *The Omnivore's Dilemma*. He writes that there are three pillars or legs to the counterculture vision of organic (Figure 2). The first pillar is environmentally sound farming without the use of synthetics, to produce high quality, safe food (i.e. humus farming). The second is an alternative food distribution system with few middlemen. One bought organic food either directly from the grower or from food cooperatives, buying clubs, or health food stores – never from "industrial food" supermarkets. Last of all, organic food meant whole, fresh food, with minimal processing and no artificial ingredients – "counter cuisine" for the "counterculture." There would be no room here for an organic version of the Twinkie.[57]

The Slow March towards Federal Regulation

The growing demand for organic food in the 1960s and 1970s produced a more sophisticated marketplace. Supply chains lengthened as organic products traveled longer distances to reach customers. Third party certification emerged as a means of assuring those consumers that the products they purchased were truly organic. Certification agents, as the "third party," stand between organic farmers and food processors, and the ones who buy their products. They provide assurance to the consumer that he or she is truly getting an organic product.

Certification begins with the establishment of a *standard* that defines what organic means. The standard details which practices, inputs, ingredients, and so forth, are required, permitted, and prohibited in organic food production and processing. Farmers and processors submit plans that explain how they will meet the standard, and submit to an annual inspection by the certification agent. Those that measure up to the standard become certified and can sell their products as *certified organic*.

As organic standards developed in the 1970s and 1980s, they came to include the *absolute exclusion* of most synthetic pesticides and fertilizers. This was significant. As USDA investigators learned in the late 1970s, the organic movement represented "a spectrum of practices, attitudes, and philosophies" that included purists who used no synthetic chemicals whatsoever, and those who were more flexible – using small amounts of agricultural chemicals in limited circumstances.[58] Such circumstances might have included spot spraying of problem weeds, using an insecticide to rescue an infested crop, or using starter fertilizer in cold spring weather.

The emerging organic standards did not allow these. All fertility and pest management would be accomplished without these inputs.[59] From this time onwards, unfortunately, organic became better known and understood for what it did not allow (synthetic pesticides and fertilizers) than for positive farming practices and environmental benefits they yielded.

California Certified Organic Farmers (CCOF) established the first organic certification program in 1973. Many more followed. By the late 1980s, there were quite a few agencies, both large and small. Each adopted standards that were consistent on basic principles, but varied on details like the permissibility of mined Chilean nitrate, the requirements for field buffer zones, and the need for pesticide residue testing.[60]

These differences led to complications, especially for processors making multi-ingredient products. The certifier might insist that all ingredients be certified only by itself or a handful of other agencies with which it had equivalency agreements. It was clear that a single national organic standard was desirable, but not clear whether that should be brought about by industry or by federal regulation.

That issue was settled in the late 1980s when an unrelated matter brought things to a head. That matter centered on a popular agricultural chemical called *Alar.* Alar is one of several trade names for daminozide, a plant growth regulator used to regulate fruit growth, make harvest easier, and enhance color. It was commonly used on conventionally grown apples. The U.S. Environmental Protection Agency (EPA) had noted that Alar was a potential carcinogen but, by 1989, had not yet taken any action. In February of that year, the CBS news program *60 Minutes* broadcast a story highlighting the concerns about Alar.[61] As a consequence, market demand for organic apples, and organic products in general, soared. While this was a brief boon for organic growers, the longer term consequences were grim as unscrupulous marketers slapped organic labels on just about everything. The credibility of "organic" was in peril.

The "Alar Scare," as it was called, finally drove representatives of the organic community to Washington to seek regulation for the industry. The result was the passage of the Organic Foods Production Act of 1990.[62]

Enter Federal Regulation

The Organic Foods Production Act (OFPA) mandated creation of a National Organic Program (NOP) and a National Organic Standards Board (NOSB). The NOP is the federal body responsible for writing, interpreting and enforcing the Organic Regulations, which are the National Organic Standard. The NOP is part of the USDA and is administered under the Agricultural Marketing Service (AMS).

The NOSB is a 15-member advisory panel, comprised of individuals from the organic community appointed by the Secretary of Agriculture. The NOSB advises the NOP on how to interpret the National Standard. It also has statutory responsibility for the content of the National List. The National List is the part of the Standard that catalogs the synthetic materials allowed, and the nonsynthetic (natural) products prohibited, in organic production and processing.

The process of drafting the National Standard was slow, but very public. NOSB meetings were held three to four times a year in various parts of the country in an attempt to gather input. From that input, the NOSB developed a number of recommendations to the NOP.

According to many close to the process, the NOP chose to ignore many of those recommendations in the first draft, which was published in late 1997. The draft – which the organic community had waited seven years to see – was greeted with outrage. The problems were many, but three issues drew the most fire. These were the allowance of food irradiation, sewage sludge as fertilizer, and the use of genetically engineered crops and other genetically modified organisms (GMOs).

An astounding 275,000 public comments flowed into the USDA from the organic community. Since the estimated number of certified U.S. organic farms at that time was only about 5,000, it was clearly the voice of organic consumers speaking.[63] The NOP was sent a clear message that this was a community not to be taken lightly— not easily snowed or manipulated by bureaucracy or monyed interests.

A chastened NOP returned to the drawing board and, in the spring of 2000, produced a revised draft that was much less controversial and largely welcomed by the organic community. After reviewing the second round of comments, a Final Rule for the National Organic Standard was published in the Federal Register by late winter. Full implementation went into effect in October 2002.

Organic Agriculture and Genetic Engineering

The 1997 draft of the National Organic Standard flooded the USDA with 275,000 public comments. The tidal wave included a clear and resounding message stating that the organic community would not accept genetic engineering in organic food. As a result, the National Standard contains a broad 86-word definition of genetic engineering, which it refers to as *Excluded Methods* (§205.2). These Excluded Methods are specifically prohibited under §205.105 – *Allowed and prohibited substances, methods, and ingredients in organic production and handling* (§205.105(e)).

The clear and thorough prohibition against genetic engineering surprised many in the biotechnology world. They believed crop technologies, such as Bt crops, would give organic growers a "leg up" in controlling pests without synthetic pesticides. (Genetically engineered Bt crops are implanted with a gene(s) from the soil bacteria *Bacillus thuringiensis,* which is capable of making a biological poison toxic to some insect pests.) Organic growers were already using various commercial spray and dust formulations of Bt in the field and had no compunctions about it. Still, genetically engineered crops, including those with Bt genetics, were rejected by the organic community.

It would be a simple matter to write off the prohibition based simply on consumer fear of "frankenfoods," not that this wouldn't be justified. The biotech industry has fought against the labeling of foods made from or with genetically engineered ingredients. Consumers Union lists only three labels that verify non-genetically engineered contents.[64] Organic is clearly the most widely known and recognizable of these, and the only one backed by federal regulation. It is understandable that consumers might want to have a choice!

However, the rationale for prohibiting genetic engineering in organic agriculture runs both broader and deeper than food quality concerns or preservation of consumer choice. Genetic engineering represents a fundamentally different philosophy and worldview than organic. Organic principles are holistic and based on cooperation with nature. Genetic engineering is highly reductionist, seeking single-factor solutions to complex problems; it seeks to control and manipulate nature.[65,66], Furthermore, humankind does not yet understand the possible environmental and human health impacts of this technology that has been in our midst for less than two decades. Concerns have certainly been raised, and environmental research is only beginning to point to possible consequences. Among the most recent is research published in the *Proceedings of the National Academy of Sciences* suggesting negative effects on aquatic organisms from upstream plantings of Bt corn.[67]

Decisions about new technologies for organic agriculture generally defer to the Precautionary Principle, which reads: *When an activity raises threats of harm to the environment or human health, precautionary measures should be taken even if some cause and effect relationships are not fully established scientifically.*[68] The impacts of genetically engineered crops, animals, and agricultural inputs are not yet well understood and have not been clearly proven harmful, but in the eyes of the organic community, enough concern has been raised to prohibit their use for the foreseeable future.

Keys to the Standard

The National Organic Standard is a large document. The details are well beyond the scope of this paper. However, highlighting some of the key elements of the Regulation can aid in understanding the evolution of organic agriculture and the present state of affairs. In general, key elements of the National Organic Standard include:

Certification Requirement. All organic producers and handlers must be certified through accredited certifying agents. Certification is optional for operations selling less than $5,000 of organic product annually.

Organic System Plans. Every operation must submit an Organic System Plan (OSP) as part of the application for certification. The OSP details how the operation will comply with the National Organic Standard. A complete OSP includes all inputs to be used, production practices, strategies to prevent contamination and commingling, monitoring procedures, and records to be kept.

Records. Detailed documentation of inputs, field activities, crop yields, and sales must be kept. These records should accurately reflect the OSP. Most operations need to develop an audit control system to track production, ensure NOP compliance, and provide critical information in the event of product recall.

For crop production, additional key elements include:

Land Integrity. For land to become certified organic it must have distinct boundaries and be buffered from chemical sprays and other forms of contamination. The National Standard does not specify the width of buffer zones or even specifically require them. It requires only that contamination be prevented. So, in most circumstances, buffers are a practical option. Customarily, certifiers accept 25-foot wide buffer zones, when neighboring farmland or roadsides are ground-sprayed. However, much wider buffers are usually required where aerial application is used.

Biodiversity & Natural Resource Protection. Biodiversity and natural resource protection are at the core of humus/organic farming. Crop rotation is one of the main supportive practices; it is specifically required by the National Organic Standard under §205.205. Since crop rotation is a practice associated with annual crops, it would appear to leave perennial systems without a requirement or a strategy. However, the definition of crop rotation under §205.2 includes the statement: "Perennial cropping systems employ means such as alley cropping, intercropping, and hedgerows to introduce biological diversity in lieu of crop rotation." Therefore, the National Standard requires a temporal biodiversity strategy for annual crops and a spatial strategy for perennial plantings.

As for resource protection, there are several provisions within the National Standard similar to §205.203(c), which reads: "The producer must…not contribute to contamination of crops, soil, or water by plant nutrients, pathogenic organisms, heavy metals, or residues of prohibited substances." As in the case of land integrity, the National Standard is "non-prescriptive." It requires that contamination be prevented and allows the farmer and the certifier to agree on the strategy.

Food Safety. Here, the National Standard becomes quite "prescriptive," requiring that livestock manure either be composted or applied a minimum number of days prior to harvest; it prohibits sewage sludge completely. The composting requirements in the Regulation reflect EPA requirements for the composting of biosolids to ensure safe use.[69]

Seed & Planting Stock. The NOP made it clear at the outset that it sought to create more sources for organic seed and planting stock to bolster organic agriculture. As a result, organic production requires organic seed and planting stock. Only if a needed variety is not commercially available, may the grower use untreated, non-GMO, non-organic seed and stock. Annual transplants must be grown organically, though variances may be granted in cases where a farm's organic transplants are accidentally destroyed.

Prohibited Substances. The rule of thumb is that nonsynthetic (natural) materials may be used in organic crop production unless they are specifically prohibited and cataloged on the National List under §205.602. Synthetic materials are automatically prohibited unless specifically allowed on the National List under §205.601. While this appears straightforward, there are many real world complications. Among the problems:

While manures from conventional confined animal feeding operations are allowed, high levels of contamination with heavy metals or other substances may prohibit their use.

Multi-ingredient pest control products may contain only EPA List 4 and a few select List 3 inert ingredients.

The definitions of synthetic and nonsynthetic lack clarity. This has been discussed by the NOSB for several years, but resolution is slow in coming.

Organic agriculture emphasizes systems design and cultural practices, and shuns input substitution – the strategy of simply replacing conventional inputs with organically acceptable ones. Still, at the farm level, the issue of what can and cannot be used in organic agriculture has become the most compelling. The reason is clear. A single misapplication of a prohibited substance to a crop not only decertifies that crop; the entire field becomes decertified for three years. For those producers dependent on a market premium, such mistakes can be catastrophic.

For livestock production, The National Organic Standard contains additional key elements. These include:

Origin of Livestock. Essentially, the Regulation requires that slaughter stock be under organic management from the last third of gestation. Dairy stock, by contrast, can, in many instances, be transitioned to organic milk production in 12 months. Poultry can be transitioned if under organic management from the second day of life.

Livestock Feed. Organic livestock must be fed 100% organic feed. Synthetic hormones and antibiotics are prohibited in organic feed; so are plastic pellets, urea, manure, and slaughter byproducts. Synthetic feed supplements and additives are allowed only if they are on the National List at §205.603(c) or §205.603(d), respectively.

Living Conditions. When it comes to living conditions, the National Standard reflects the considerable influence the animal welfare community has had on its development. Living conditions must accommodate the natural behavior of each livestock type. Outdoor access, fresh air and sunlight, and space to exercise are required. Shelter must also be provided. It, too, must allow natural maintenance and behavior, must provide protection from temperature extremes, have adequate ventilation, and be safe.

Some specific details include required pasture access for ruminants and provision of bedding, which must be organic if it is consumed.

Temporary confinement is allowed only as protection from inclement weather, if required for a specific stage of production, to protect soil and water quality, or to ensure the health and safety of the animals.

Waste Management. Manure must be managed in a manner that does not contribute to contamination of crops, soil, or water by plant nutrients, heavy metals, or pathogenic organisms, and which optimizes recycling of nutrients. Under ideal circumstances, manure is returned to the land from which feed is harvested, preferably on the same farm.[70]

Health Care. Organic livestock health care begins with prevention. This includes selection of livestock species and type, nutrition, proper housing and pasture, sanitation, stress reduction, and vaccination. There are also restrictions on physical alterations.

Producers may not withhold treatment from a sick animal in an effort to preserve its organic status. Sick animals may be treated using natural therapies such as herbs, homeopathics, flower remedies, essential oils, acupuncture, radionics, etc. Synthetic medications on the National List at §205.603(a) may also be used. All appropriate medications must be used to restore an animal to health when methods acceptable to organic production fail.

Synthetic parasiticides on the National List at §205.603(a) may also be used, but they are highly restricted. External parasites and other pests may be controlled using nonsynthetic pest means such as traps, botanicals, biologicals, and mineral-based materials like diatomaceous earth.

Livestock treated with a prohibited substance must be clearly identified and may not be sold, labeled, or represented as organically produced.

USDA/NOP Organic Meets Humus Farming

Humus farming is, almost by definition, a soil-based system of agriculture. As it evolved directly from humus farming, organic agriculture has also been understood as "soil-based."

However, since the 1960s, the meaning of organic has shifted to mean any production system that does not use synthetic pesticides, fertilizers, or other prohibited substances. Reflecting this shift, the NOP has decided things like fish, shellfish, and mushrooms fall within their scope and can be certified as organic. Even more interesting is NOP recognition of soilless hydroponic production, which it indicates can also be considered for certification.

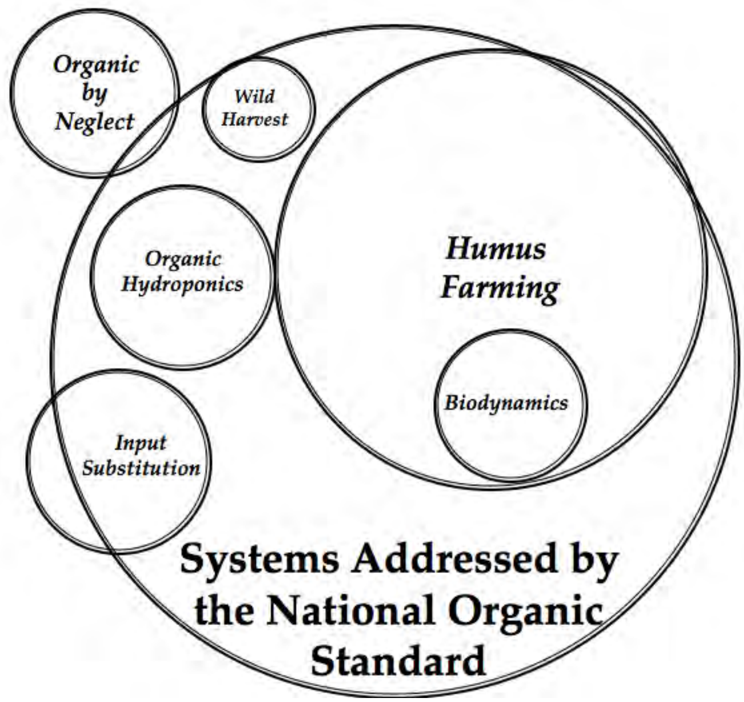


FIGURE 3

USDA/NOP Organic Meets the Counterculture Vision

The National Organic Standard captures only part of the '60s–'70s vision that Michael Pollan described. The National Organic Standard effectively deals only with organic production – advancing a production system that is environmentally sound and capable of producing abundant clean and healthy food and fiber.

As for an alternative food distribution system – the second "leg" of the counterculture vision – it is not addressed at all. In fact, at least 40% of all organic food is now purchased in mainstream, big box stores.[71] Much of it travels great distances from such places as South America and China before it hits the store shelves.

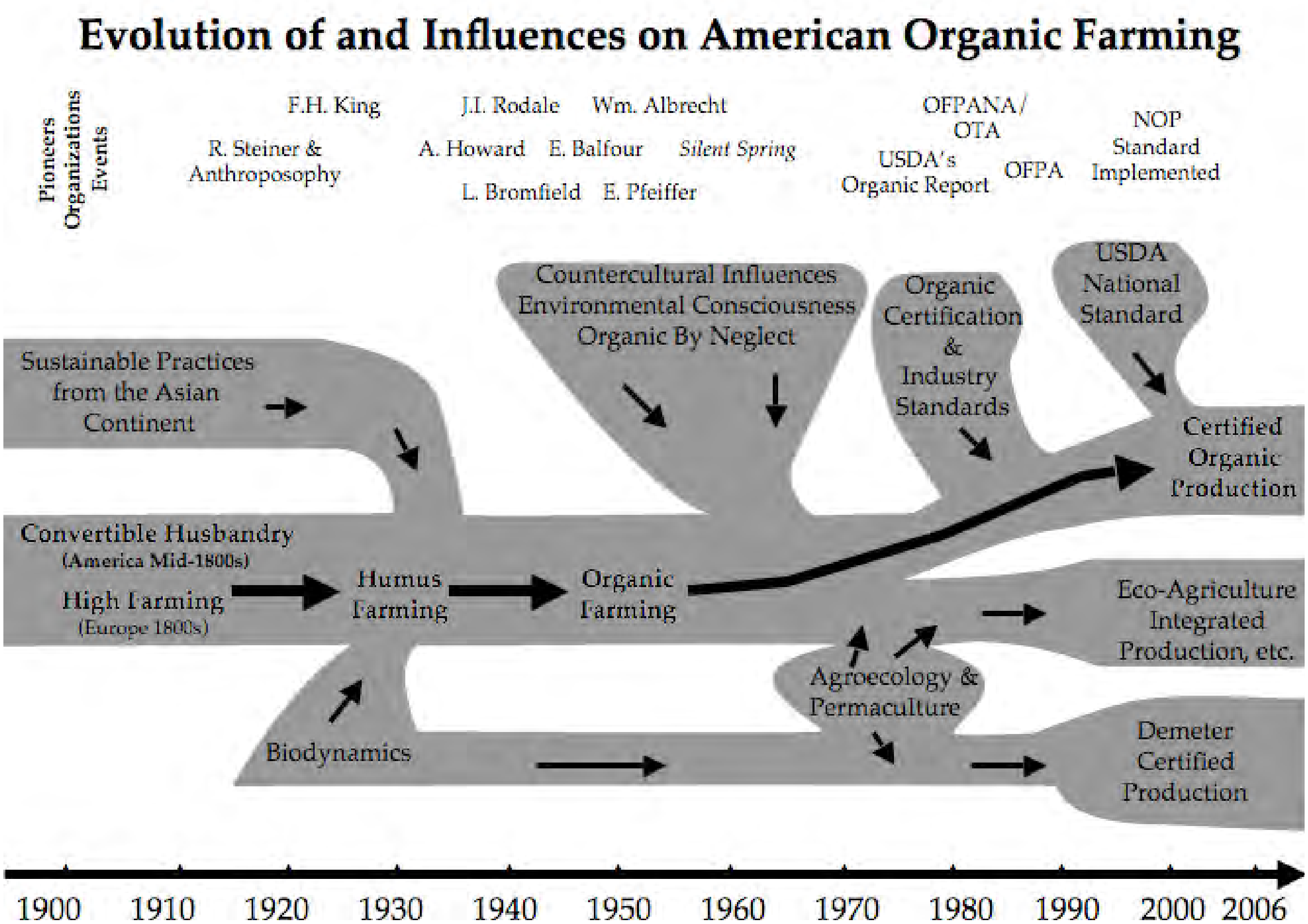
As for the third "leg," processing and handling are part of the National Standard, but the Regulation falls well short of the counterculture vision built solely on whole food, fresh food, and no synthetic ingredients. While non-agricultural food ingredients are limited to those on the National List under §205.605, and irradiation is prohibited, there is nothing to prevent the formulation of what might be called organic "junk food." A number of organic food products might well earn that label, though there is no "organic twinkie"…as yet.

Still, the counterculture vision of organic food and farming remains strong in the marketplace. And the struggle to sustain that vision is at the core of debates over whether or not the organic industry, and even the movement, has lost its soul in the wake of the NOP.

USDA/NOP Organic Meets… Itself

The National Organic Standard contains a two-part definition of organic production. The first part defines it as: *a production system that is managed in accordance with the Act* (OFPA) *and regulations* (National Organic Standard)… The second part says that an organic production system: *respond(s) to site-specific conditions by integrating cultural, biological, and mechanical practices that foster cycling of resources, promote ecological balance, and conserve biodiversity.*

The latter definition is a well-stated definition for sustainable farming that combines the spirit of traditional humus farming with the strong vision and values acquired in recent decades. The regulatory language of Part One – the National Organic Standard – must live up to the spirit of organic embodied in Part Two of the definition. This struggle, too, is about the soul of organic agriculture.



Notes

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38. Howard. *Op. cit.*, p. 12. Howard understood that some crops, especially crucifers, do not form mycorrhizal associations. He argued that non-symbiotic microbial complexes in the soil were still important to plant absorption of nutrients, including larger molecules of nitrogen-bearing compounds (p. 24–25).

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45. During the 18th century, it was commonly believed that plants obtained all their nutrients, including carbon, by directly absorbing organic matter from the soil. (Tisdale, Samuel L. and Werner L. Nelson. 1966. *Soil Fertility and Fertilizers*, 2nd ed. The Macmillan Co., New York. p. 13.) It must be noted, however, that traditional organic farmers still place great importance on those organic compounds that plants *do* take up from the soil, believing they contribute both to plant growth and health.

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Note: This paper produced a strong response from the biotech community. For details, see: Waltz, Emily. 2009. GM Crops: Battlefield. GM Free Cymru Web site. www.gmfreecymru.org/pivotal_papers/battlefield.html

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70. The latter creates a serious challenge for organic operations without an adequate land base. A number of confined feeding operations are certified organic. The author is not aware of how the manure is dealt with, in these cases, to conform to the regulations.

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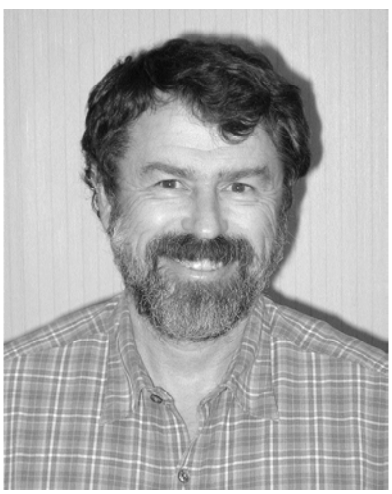

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