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Big Organic

When you hear the word *natural*, what do you think of? How has this term come to carry such powerful and positive associations in our modern food culture? Are these associations always valid? Using the growth of the organic food industry as his case study, Michael Pollan asks some pointed questions about where our enthusiasm for natural foods comes from and whether this ideal always lives up to its billing. Pollan is a contributing writer for the *New York Times Magazine*. His most recent book, *The Omnivore's Dilemma* (2006), follows four different meals on their journey from the farm to the table. He has published three other nonfiction books, *Second Nature* (1991), *A Place of My Own* (1997), and *The Botany of Desire* (2001). He is the Knight Professor of Journalism at the University of California, Berkeley. The following selection is from *The Omnivore's Dilemma*.

SUPERMARKET PASTORAL

I ENJOY SHOPPING AT WHOLE FOODS NEARLY AS MUCH AS I ENJOY browsing a good bookstore, which, come to think of it, is probably no accident: Shopping at Whole Foods is a literary experience, too. That's not to take anything away from the food, which is generally of high quality, much of it "certified organic" or "humanely raised" or "free range." But right there, that's the point: It's the evocative prose as much as anything else that makes this food really special, elevating an egg or chicken breast or bag of arugula from the realm of ordinary protein and carbohydrates into a much headier experience, one with complex aesthetic, emotional, and even political dimensions. Take the "range-fed" sirloin steak I recently eyed in the meat case. According to the brochure on the counter, it was formerly part of a steer that spent its days "living in beautiful places" ranging from "plant-diverse, high-mountain meadows to thick aspen groves and miles of sagebrush-filled flats." Now a steak like that has got to taste better than one from Safeway, where the only accompanying information comes in the form of a number: the price, I mean, which you can bet will be considerably less. But I'm evidently not the only shopper willing to pay more for a good story.

With the growth of organics and mounting concerns about the wholesomeness of industrial food, storied food is showing up in supermarkets everywhere these days, but it is Whole Foods that consistently offers the most cutting-edge grocery lit. On a recent visit I filled my

shopping cart with eggs "from cage-free vegetarian hens," milk from cows that live "free from unnecessary fear and distress," wild salmon caught by Native Americans in Yakutat, Alaska (population 833), and heirloom tomatoes from Capay Farm ($4.99 a pound), "one of the early pioneers of the organic movement." The organic broiler I picked up even had a name: Rosie, who turned out to be a "sustainably farmed" "free-range chicken" from Petaluma Poultry, a company whose "farming methods strive to create harmonious relationships in nature, sustaining the health of all creatures and the natural world." Okay, not the most mellifluous or even meaningful sentence, but at least their heart's in the right place.

In several corners of the store I was actually forced to choose between subtly competing stories. For example, some of the organic milk in the milk case was "ultrapasteurized," an extra processing step that was presented as a boon to the consumer, since it extends shelf life. But then another, more local dairy boasted about the fact they had said no to ultrapasteurization, implying that their product was fresher, less processed, and therefore *more* organic. This was the dairy that talked about cows living free from distress, something I was beginning to feel a bit of myself by this point.

This particular dairy's label had a lot to say about the bovine lifestyle: Its Holsteins are provided with "an appropriate environment, including shelter and a comfortable resting area, . . . sufficient space, proper facilities and the company of their own kind." All this sounded pretty great, until I read the story of another dairy selling raw milk — *completely* unprocessed — whose "cows graze green pastures all year long" which made me wonder whether the first dairy's idea of an appropriate environment for a cow included, as I had simply presumed, a pasture. All of a sudden the absence from their story of that word seemed weirdly conspicuous. As the literary critics would say, the writer seemed to be eliding the whole notion of cows and grass. Indeed, the longer I shopped in Whole Foods, the more I thought that this is a place where the skills of a literary critic might come in handy — those, and perhaps also a journalist's.

Wordy labels, point-of-purchase brochures, and certification schemes are supposed to make an obscure and complicated food chain more legible to the consumer. In the industrial food economy, virtually the only information that travels along the food chain linking producer and consumer is price. Just look at the typical newspaper ad for a supermarket. The sole quality on display here is actually a quantity: tomatoes $0.69 a pound; ground chuck $1.09 a pound; eggs $0.99 a dozen — special this week. Is there any other category of product sold on such a reductive basis? The barebones information travels in both directions, of course, and farmers who get the message that consumers care only about price

will themselves care only about yield. This is how a cheap food economy reinforces itself.

One of the key innovations of organic food was to allow some more information to pass along the food chain between the producer and the consumer — an implicit snatch of narrative along with the number. A certified organic label tells a little story about how a particular food was produced, giving the consumer a way to send a message back to the farmer that she values tomatoes produced without harmful pesticides, or prefers to feed her children milk from cows that haven't been injected with growth hormones. The word *organic* has proved to be one of the most powerful words in the supermarket: Without any help from government, farmers and consumers working together in this way have built an $11 billion industry that is now the fastest growing sector of the food economy.

A certified organic label tells a little story about how a particular food was produced.

Yet the organic label itself — like every other such label in the supermarket — is really just an imperfect substitute for direct observation of how a food is produced, a concession to the reality that most people in an industrial society haven't the time or the inclination to follow their food back to the farm, a farm which today is apt to be, on average, fifteen hundred miles away. So to bridge that space we rely on certifiers and label writers and, to a considerable extent, our imagination of what the farms that are producing our food really look like. The organic label may conjure an image of a simpler agriculture, but its very existence is an industrial artifact. The question is, what about the farms themselves? How well do they match the stories told about them?

Taken as a whole, the story on offer in Whole Foods is a pastoral narrative in which farm animals live much as they did in the books we read as children, and our fruits and vegetables grow in well-composted soils on small farms much like Joel Salatin's. "Organic" on the label conjures up a rich narrative, even if it is the consumer who fills in most of the details, supplying the hero (American Family Farmer), the villain (Agribusinessman), and the literary genre, which I've come to think of as Supermarket Pastoral. By now we may know better than to believe this too simple story, but not *much* better, and the grocery store poets do everything they can to encourage us in our willing suspension of disbelief.

Supermarket Pastoral is a most seductive literary form, beguiling enough to survive in the face of a great many discomfiting facts. I suspect that's because it gratifies some of our deepest, oldest longings, not merely for safe food, but for a connection to the earth and to the handful of domesticated creatures we've long depended on. Whole Foods understands

all this better than we do. One of the company's marketing consultants explained to me that the Whole Foods shopper feels that by buying organic he is "engaging in authentic experiences" and imaginatively enacting a "return to a utopian past with the positive aspects of modernity intact." This sounds a lot like Virgilian pastoral, which also tried to have it both ways. In *The Machine in the Garden* Leo Marx writes that Virgil's shepherd Tityrus, no primitive, "Enjoys the best of both worlds — the sophisticated order of art and the simple spontaneity of nature." In keeping with the pastoral tradition, Whole Foods offers what Marx terms "a landscape of reconciliation" between the realms of nature and culture, a place where, as the marketing consultant put it, "people will come together through organic foods to get back to the origin of things" — perhaps by sitting down to enjoy one of the microwaveable organic TV dinners (four words I never expected to see conjoined) stacked in the frozen food case. How's that for having it both ways?

Of course the trickiest contradiction Whole Foods attempts to reconcile is the one between the industrialization of the organic food industry of which it is a part and the pastoral ideals on which that industry has been built. The organic movement, as it was once called, has come a remarkably long way in the last thirty years, to the point where it now looks considerably less like a movement than a big business. Lining the walls above the sumptuously stocked produce section in my Whole Foods are full-color photographs of local organic farmers accompanied by text blocks setting forth their farming philosophies. A handful of these farms — Capay is one example — still sell their produce to Whole Foods, but most are long gone from the produce bins, if not yet the walls. That's because Whole Foods in recent years has adopted the grocery industry's standard regional distribution system, which makes supporting small farms impractical. Tremendous warehouses buy produce for dozens of stores at a time, which forces them to deal exclusively with tremendous farms. So while the posters still depict family farmers and their philosophies, the produce on sale below them comes primarily from the two big corporate organic growers in California, Earthbound Farm and Grimmway Farms,[1] which together dominate the market for organic fresh produce in America. (Earthbound alone grows 80 percent of the organic lettuce sold in America.)

As I tossed a plastic box of Earthbound prewashed spring mix salad into my Whole Foods cart, I realized that I was venturing deep into the belly of the industrial beast Joel Salatin had called "the organic empire." (Speaking of my salad mix, another small beyond organic farmer, a friend of Joel's, had told me he "wouldn't use that stuff to make compost" — the organic purist's stock insult.) But I'm not prepared to accept the premise that industrial organic is necessarily a bad thing, not if the goal is to

reform a half-trillion-dollar food system based on chain supermarkets and the consumer's expectations that food be convenient and cheap.

And yet to the extent that the organic movement was conceived as a critique of industrial values, surely there comes a point when the process of industrialization will cost organic its soul (to use a word still uttered by organic types without irony), when Supermarket Pastoral becomes more fiction than fact: another lie told by marketers.

The question is, has that point been reached, as Joel Salatin suggests? Just how well does Supermarket Pastoral hold up under close reading and journalistic scrutiny?

About as well as you would expect anything genuinely pastoral to hold up in the belly of an $11 billion industry, which is to say not very well at all. At least that's what I discovered when I traced a few of the items in my Whole Foods cart back to the farms where they were grown. I learned, for example, that some (certainly not all) organic milk comes from factory farms, where thousands of Holsteins that never encounter a blade of grass spend their days confined to a fenced "dry lot," eating (certified organic) grain and tethered to milking machines three times a day. The reason much of this milk is ultrapasteurized (a high-heat process that damages its nutritional quality) is so that big companies like Horizon and Aurora can sell it over long distances. I discovered organic beef being raised in "organic feedlots" and organic high-fructose corn syrup — more words I never expected to see combined. And I learned about the making of the aforementioned organic TV dinner, a microwaveable bowl of "rice, vegetables, and grilled chicken breast with a savory herb sauce." Country Herb, as the entrée is called, turns out to be a highly industrialized organic product, involving a choreography of thirty-one ingredients assembled from far-flung farms, laboratories, and processing plants scattered over a half-dozen states and two countries, and containing such mysteries of modern food technology as high-oleic safflower oil, guar and xanthan gum, soy lecithin, carrageenan, and "natural grill flavor." Several of these ingredients are synthetic additives permitted under federal organic rules. So much for "whole" foods. The manufacturer of Country Herb is Cascadian Farm, a pioneering organic farm turned processor in Washington State that is now a wholly owned subsidiary of General Mills. (The Country Herb chicken entrée has since been discontinued.)

I also visited Rosie the organic chicken at her farm in Petaluma, which turns out to be more animal factory than farm. She lives in a shed with twenty thousand other Rosies, who, aside from their certified organic feed, live lives little different from that of any other industrial chicken. Ah, but what about the "free-range" lifestyle promised on the label? True, there's a little door in the shed leading out to a narrow grassy yard. But the free-range story seems a bit of a stretch when you discover that the door remains firmly shut until the birds are at least five or six

weeks old — for fear they'll catch something outside — and the chickens are slaughtered only two weeks later.

FROM PEOPLE'S PARK TO PETALUMA POULTRY

If you walk five blocks north from the Whole Foods in Berkeley along Telegraph Avenue and then turn right at Dwight Street, you'll soon come to a trash-strewn patch of grass and trees dotted with the tattered camps of a few dozen homeless people. Mostly in their fifties and sixties, some still affecting hippie styles of hair and dress, these men and women pass much of their days sleeping and drinking, like so many of the destitute everywhere. Here, though, they also spend time tending scruffy little patches of flowers and vegetables — a few stalks of corn, some broccoli plants gone to seed. People's Park today is the saddest of places, a blasted monument to sixties' hopes that curdled a long time ago. And yet, while the economic and social distances separating the well-heeled shoppers cruising the aisles at Whole Poods from the unheeled homeless in People's Park could not be much greater, the two neighborhood institutions are branches of the same unlikely tree.

Indeed, were there any poetic justice in the world, the executives at Whole Foods would have long ago erected a commemorative plaque at People's Park and a booth to give away organic fruits and vegetables. The organic movement, much like environmentalism and feminism, has deep roots in the sixties' radicalism that briefly flourished on this site; organic is one of several tributaries of the counterculture that ended up disappearing into the American mainstream, but not before significantly altering its course. And if you trace that particular tributary all the way back to its spring, your journey will eventually pass through this park.

People's Park was born on April 20, 1969, when a group calling itself the Robin Hood Commission seized a vacant lot owned by the University of California and set to work rolling out sod, planting trees, and, perhaps most auspiciously, putting in a vegetable garden. Calling themselves "agrarian reformers," the radicals announced that they wanted to establish on the site the model of a new cooperative society built from the ground up; that included growing their own "uncontaminated" food. One of the inspirations for the commission's act of civil disobedience was the example of the Diggers in seventeenth-century England, who had also seized public land with the aim of growing food to give away to the poor. In People's Park that food would be organic, a word that at the time brimmed with meanings that went far beyond any particular agricultural method.

In *Appetite for Change*, his definitive account of how the sixties' counterculture changed the way we eat, historian Warren J. Belasco writes that the events in People's Park marked the "greening" of the counterculture, the pastoral turn that would lead to the commune movement in the

countryside, to food co-ops and "guerilla capitalism," and, eventually, to the rise of organic agriculture and businesses like Whole Foods. The moment for such a turn to nature was ripe in 1969: DDT was in the news, an oil spill off Santa Barbara had blackened California's coastline, and Cleveland's Cuyahoga River had caught fire. Overnight, it seemed, "ecology" was on everybody's lips, and "organic" close behind.

As Belasco points out, the word *organic* had enjoyed a currency among nineteenth-century English social critics, who contrasted the social fragmentation and atomism wrought by the Industrial Revolution with the ideal of a lost organic society, one where the bonds of affection and cooperation still held. *Organic* stood for everything industrial was not. But applying the word *organic* to food and farming occurred much more recently: in the 1940s in the pages of *Organic Gardening and Farming*. Founded in 1940 by J. I. Rodale, a health-food fanatic from New York City's Lower East Side, the magazine devoted its pages to the agricultural methods and health benefits of growing food without synthetic chemicals — "organically." Joel Salatin's grandfather was a charter subscriber.

Organic stood for everything industrial was not.

Organic Gardening and Farming struggled along in obscurity until 1969, when an ecstatic review in the *Whole Earth Catalog* brought it to the attention of hippies trying to figure out how to grow vegetables without patronizing the military-industrial complex. "If I were a dictator determined to control the national press," the *Whole Earth* correspondent wrote,

> *Organic Gardening* would be the first publication I'd squash, because it's the most subversive. I believe that organic gardeners are in the forefront of a serious effort to save the world by changing man's orientation to it, to move away from the collective, centrist, superindustrial state, toward a simpler, realer one-to-one relationship with the earth itself.

Within two years *Organic Gardening and Farming*'s circulation climbed from 400,000 to 700,000.

As the *Whole Earth* encomium suggests, the counterculture had married the broader and narrower definitions of the word *organic*. The organic garden planted in People's Park (soon imitated in urban lots across the country) was itself conceived of as a kind of scale model of a more cooperative society, a landscape of reconciliation that proposed to replace industrialism's attitude of conquest toward nature with a softer, more harmonious approach. A pastoral utopia in miniature, such a garden embraced not only the humans who tended and ate from it but "as many life kingdoms as possible," in the words of an early account of Berkeley's People's Gardens in an underground paper called *Good Times*. The vegetables harvested

from these plots, which were sometimes called "conspiracies of soil," would supply, in addition to wholesome calories, an "edible dynamic" — a "new medium through which people can relate to one another and their nourishment." For example, organic's rejection of agricultural chemicals was also a rejection of the war machine, since the same corporations — Dow, Monsanto — that manufactured pesticides also made napalm and Agent Orange, the herbicide with which the U.S. military was waging war against nature in Southeast Asia. Eating organic thus married the personal to the political.

Which was why much more was at stake than a method of farming. Acting on the ecological premise that everything's connected to everything else, the early organic movement sought to establish not just an alternative mode of production (the chemical-free farms), but an alternative system of distribution (the anticapitalist food co-ops), and even an alternative mode of consumption (the "countercuisine"). These were the three struts on which organic's revolutionary program stood; since ecology taught "you can never do only one thing," what you ate was inseparable from how it was grown and how it reached your table.

A countercuisine based on whole grains and unprocessed organic ingredients rose up to challenge conventional industrial "white bread food." ("Plastic food" was an epithet thrown around a lot.) For a host of reasons that seem ridiculous in retrospect, brown foods of all kinds — rice, bread, wheat, eggs, sugar, soy sauce, tamari — were deemed morally superior to white foods. Brown foods were less adulterated by industry, of course, but just as important, eating them allowed you to express your solidarity with the world's brown peoples. (Only later would the health benefits of these whole foods be recognized, not the first or last time an organic conceit would find scientific backing.) But perhaps best of all, brown foods was also precisely what your parents *didn't* eat.

How to grow this stuff without chemicals was a challenge, especially to city kids coming to the farm or garden with a head full of pastoral ideals and precisely no horticultural experience. The rural communes served as organic agriculture's ramshackle research stations, places where neophyte farmers could experiment with making compost and devising alternative methods of pest control. The steepness of their learning curve was on display in the food co-ops, where sorry-looking organic produce was the rule for many years. But the freak farmers stuck with it, following Rodale's step-by-step advice, and some of them went on to become excellent farmers.

One such notable success was Gene Kahn, the founder of Cascadian Farm, the company responsible for the organic TV dinner in my Whole Foods cart. Today Cascadian Farm is foremost a General Mills brand, but it began as a quasi-communal hippie farm, located on a narrow, gorgeous shelf of land wedged between the Skagit River and the North Cascades

about seventy-five miles northeast of Seattle. (The idyllic little farmstead depicted on the package turns out to be a real place.) Originally called the New Cascadian Survival and Reclamation Project, the farm was started in 1971 by Gene Kahn with the idea of growing food for the collective of environmentally minded hippies he had hooked up with in nearby Bellingham. At the time Kahn was a twenty-four-year-old grad school dropout from the South Side of Chicago, who had been inspired by *Silent Spring* and *Diet for a Small Planet* to go back to the land — and from there to change the American food system. This particular dream was not so outrageous in 1971, but Kahn's success in actually realizing it surely is: He went on to become a pioneer of the organic movement and probably has done as much as anyone to move organic food into the mainstream, getting it out of the food co-op and into the supermarket. Today, the eponymous Cascadian Farm is a General Mills showcase — "a PR farm," as its founder freely acknowledges — and Kahn, erstwhile hippie farmer, is a General Mills vice president. Cascadian Farm is precisely what Joel Salatin has in mind when he talks about an organic empire.

Like most of the early organic farmers, Kahn had no idea what he was doing at first, and he suffered his share of crop failures. In 1971 organic agriculture was in its infancy — a few hundred scattered amateurs learning by trial and error how to grow food without chemicals, an ad hoc grassroots R & D effort for which there was no institutional support. (In fact, the USDA was actively hostile to organic agriculture until recently, viewing it — quite rightly — as a critique of the industrialized agriculture the USDA was promoting.) What the pioneer organic farmers had instead of the USDA's agricultural extension service was *Organic Gardening and Farming* (to which Kahn subscribed) and the model of various premodern agricultural systems, as described in books like *Farmers of Forty Centuries* by F. H. King and Sir Albert Howard's *The Soil and Health* and *An Agricultural Testament*. This last book may fairly be called the movement's bible.

Perhaps more than any other single writer, Sir Albert Howard (1873–1947), an English agronomist knighted after his thirty years of research in India, provided the philosophical foundations for organic agriculture. Even those who never read his 1940 *Testament* nevertheless absorbed his thinking through the pages of Rodale's *Organic Gardening and Farming*, where he was lionized, and in the essays of Wendell Berry, who wrote an influential piece about Howard in the *The Last Whole Earth Catalog* in 1971. Berry seized particularly on Howard's arresting — and prescient — idea that we needed to treat "the whole problem of health in soil, plant, animal, and man as one great subject."

For a book that devotes so many of its pages to the proper making of compost, *An Agricultural Testament* turns out to be an important work of philosophy as well as of agricultural science. Indeed, Howard's drawing of lines of connection between so many seemingly discrete realms — from

soil fertility to "the national health"; from the supreme importance of animal urine to the limitations of the scientific method — is his signal contribution, his method as well as his message. Even though Howard never uses the term *organic*, it is possible to tease out all the many meanings of the word — as a program for not just agricultural but social renovation — from his writings. To measure the current definition of organic against his genuinely holistic conception is to appreciate just how much it has shrunk.

Like many works of social and environmental criticism, *An Agricultural Testament* is in broad outline the story of a Fall. In Howard's case, the serpent in question is a nineteenth-century German chemist by the name of Baron Justus von Liebig, his tempting fruit a set of initials: NPK. It was Liebig, in his 1840 monograph *Chemistry in its Application to Agriculture*, who set agriculture on its industrial path when he broke down the quasi-mystical concept of fertility in soil into a straightforward inventory of the chemical elements plants require for growth. At a stroke, soil biology gave way to soil chemistry, and specifically, to the three chemical nutrients Liebig highlighted as crucial to plant growth: nitrogen, phosphorus, and potassium, or to use these elements' initials from the periodic table, N-P-K. (The three letters correspond to the three-digit designation printed on every bag of fertilizer.) Much of Howard's work is an attempt to demolish what he called the "NPK mentality."

The NPK mentality embraces a good deal more than fertilizer, however. Indeed, to read Howard is to begin to wonder if it might not be one of the keys to everything wrong with modern civilization. In Howard's thinking, the NPK mentality serves as a shorthand for both the powers and limitations of reductionist science. For as followers of Liebig discovered, NPK "works": If you give plants these three elements, they will grow. From this success it was a short step to drawing the conclusion that the entire mystery of soil fertility had been solved. It fostered the wholesale reimagining of soil (and with it agriculture) from a living system to a kind of machine: Apply inputs of NPK at this end and you will get yields of wheat or corn on the other end. Since treating the soil as a machine seemed to work well enough, at least in the short term, there no longer seemed any need to worry about such quaint things as earthworms and humus.

Humus is the stuff in a handful of soil that gives it its blackish cast and characteristic smell. It's hard to say exactly what humus is because it is so many things. Humus is what's left of organic matter after it has been broken down by the billions of big and small organisms that inhabit a spoonful of earth — the bacteria, phages, fungi, and earthworms responsible for decomposition. (The psalmist who described life as a transit from "dust to dust" would have been more accurate to say "humus to humus.") But humus is not a final product of decomposition so much as a

stage, since a whole other group of organisms slowly breaks humus down into the chemical elements plants need to grow, elements including, but not limited to, nitrogen, phosphorus, and potassium. This process is as much biological as chemical, involving the symbiosis of plants and the mycorrhizal fungi that live in and among their roots; the fungi offer soluble nutrients to the roots, receiving a drop of sucrose in return. Another critical symbiotic relationship links plants to the bacteria in a humus-rich soil that fix atmospheric nitrogen, putting it into a form the plants can use. But providing a buffet of nutrients to plants is not the only thing humus does: It also serves as the glue that binds the minute mineral particles in soil together into airy crumbs and holds water in suspension so that rainfall remains available to plant roots instead of instantly seeping away.

To reduce such a vast biological complexity to NPK represented the scientific method at its reductionist worst. Complex qualities are reduced to simple quantities; biology gives way to chemistry. As Howard was not the first to point out, that method can only deal with one or two variables at a time. The problem is that once science has reduced a complex phenomenon to a couple of variables, however important they may be, the natural tendency is to overlook everything else, to assume that what you can measure is all there is, or at least all that really matters. When we mistake what we can know for all there is to know, a healthy appreciation of one's ignorance in the face of a mystery like soil fertility gives way to the hubris that we can treat nature as a machine. Once that leap has been made, one input follows another, so that when the synthetic nitrogen fed to plants makes them more attractive to insects and vulnerable to disease, as we have discovered, the farmer turns to chemical pesticides to fix his broken machine.

In the case of artificial manures — the original term for synthetic fertilizers — Howard contended that our hubris threatened to damage the health not only of the soil (since the harsh chemicals kill off biological activity in humus) but of "the national health" as well. He linked the health of the soil to the health of all the creatures that depended on it, an idea that, once upon a time before the advent of industrial agriculture, was in fact commonplace, discussed by Plato and Thomas Jefferson, among many others. Howard put it this way: "Artificial manures lead inevitably to artificial nutrition, artificial food, artificial animals, and finally to artificial men and women."

Howard's flight of rhetoric might strike our ears as a bit over the top (we are talking about fertilizer, after all), but it was written in the heat of the pitched battle that accompanied the introduction of chemical agriculture to England in the 1930s and 1940s. "The great humus controversy," as it was called, actually reached the floor of the House of Lords in 1943, a year when one might have thought there were more pressing matters on

the agenda. But England's agriculture ministry was promoting the new fertilizers, and many farmers complained their pastures and animals had become less robust as a result. Howard and his allies were convinced that "history will condemn [chemical fertilizer] as one of the greatest misfortunes to have befallen agriculture and mankind." He claimed that the wholesale adoption of artificial manures would destroy the fertility of the soil, leave plants vulnerable to pests and disease, and damage the health of the animals and peoples eating those plants, for how could such plants be any more nutritious than the soil in which they grew? Moreover, the short-term boosts in yield that fertilizers delivered could not be sustained; since the chemicals would eventually destroy the soil's fertility, today's high yields were robbing the future.

Needless to say, the great humus controversy of the 1940s was settled in favor of the NPK mentality.

Howard pointed down another path. "We now have to retrace our steps," he wrote, which meant jettisoning the legacy of Liebig and industrial agriculture. "We have to go back to nature and to copy the methods to be seen in the forest and prairie." Howard's call to redesign the farm as an imitation of nature wasn't merely rhetorical; he had specific practices and processes in mind, which he outlined in a paragraph at the beginning of *An Agricultural Testament* that stands as a fair summary of the whole organic ideal:

> Mother earth never attempts to farm without live stock; she always raises mixed crops; great pains are taken to preserve the soil and to prevent erosion; the mixed vegetable and animal wastes are converted into humus; there is no waste; the processes of growth and the processes of decay balance one another; the greatest care is taken to store the rainfall; both plants and animals are left to protect themselves against disease.

Each of the biological processes at work in a forest or prairie could have its analog on a farm: Animals could feed on plant wastes as they do in the wild; in turn their wastes could feed the soil; mulches could protect bare soil in the same way leaf litter in a forest does; the compost pile, acting like the lively layer of decomposition beneath the leaf litter, could create humus. Even the diseases and insects would perform the salutary function they do in nature: to eliminate the weakest plants and animals, which he predicted would be far fewer in number once the system was operating properly. For Howard, insects and diseases — the bane of industrial agriculture — are simply "nature's censors," useful to the farmer for "pointing out unsuitable varieties and methods of farming inappropriate to the locality." On a healthy farm pests would be no more prevalent than in a healthy wood or pasture, which should be agriculture's standard. Howard was thus bidding farmers to regard their farms less like machines than living organisms.

The notion of imitating whole natural systems stands in stark opposition to reductionist science, which works by breaking such systems down into their component parts in order to understand how they work and then manipulating them — one variable at a time. In this sense, Howard's concept of organic agriculture is premodern, arguably even antiscientific: He's telling us we don't need to understand how humus works or what compost does in order to make good use of it. Our ignorance of the teeming wilderness that is the soil (even the act of regarding it as a wilderness) is no impediment to nurturing it. To the contrary, a healthy sense of all we don't know — even a sense of mystery — keeps us from reaching for oversimplifications and technological silver bullets.

A charge often leveled against organic agriculture is that it is more philosophy than science. There's some truth to this indictment, if that is what it is, though why organic farmers should feel defensive about it is itself a mystery, a relic, perhaps, of our fetishism of science as the only credible tool with which to approach nature. In Howard's conception, the philosophy of mimicking natural processes precedes the science of understanding them. The peasant rice fanner who introduces ducks and fish to his paddy may not understand all the symbiotic relationships he's put in play — that the ducks and fishes are feeding nitrogen to the rice and at the same time eating the pests. But the high yields of food from this ingenious polyculture are his to harvest even so.

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The philosophy underlying Howard's conception of organic agriculture is a variety of pragmatism, of course, the school of thought that is willing to call "true" whatever works. Charles Darwin taught us that a kind of pragmatism — he called it natural selection — is at the very heart of nature, guiding evolution: What works is what survives. This is why Howard spent so much time studying peasant agricultural systems in India and elsewhere: The best ones survived as long as they did because they brought food forth from the same ground year after year without depleting the soil.

In Howard's agronomy, science is mostly a tool for describing what works and explaining why it does. As it happens, in the years since Howard wrote, science has provided support for a great many of his unscientific claims: Plants grown in synthetically fertilized soils *are* less nourishing than ones grown in composted soils;[2] such plants *are* more vulnerable to diseases and insect pests;[3] polycultures *are* more productive and less prone to disease than monocultures;[4] and that in fact the health of the soil, plant, animal, human, and even nation are, as Howard claimed, connected along lines we can now begin to draw with empirical

confidence. We may not be prepared to act on this knowldge, but we know that civilizations that abuse their soil eventually collapse.[5]

If farms modeled on natural systems work as well as Howard suggests, then why don't we see more of them? The sad fact is that the organic ideal as set forth by Howard and others has been honored mainly in the breach. Especially as organic agriculture has grown more sucessful, finding its way into the supermarket and the embrace of agribusiness, organic farming has increasingly come to resemble the industrial system it originally set out to replace. The logic of that system has so far proven more ineluctable than the logic of natural systems.

The journey of Cascadian Farm from the New Cascadian Survival and Reclamation Project to General Mills subsidiary stands as a parable of this process. On an overcast morning a few winters ago, Kahn drove me out to see the original farm, following the twists of the Skagit River east in a new forest-green Lexus with vanity plates that say ORGANIC. Kahn is a strikingly boyish-looking man in his midfifties, and after you factor in a shave and twenty pounds, it's not hard to pick his face out from the beards-beads-and-tractors photos on display in his office. Walking me through the history of his company as we drove out to the farm, Gene Kahn spoke candidly and without defensiveness about the compromises made along his path from organic farmer to agribusinessman, and about "how everything eventually morphs into the way the world is."

By the late seventies, Kahn had become a pretty good organic farmer and an even better businessman. He had discovered the economic virtues of adding value to his produce by processing it (freezing blueberries and strawberries, making jam), and once Cascadian Farm started processing food, Kahn discovered he could make more money buying produce from other farmers than by growing it himself — the same discovery conventional agribusiness companies had made a long time before.

"The whole notion of a 'cooperative community' we started with gradually began to mimic the system," Kahn told me. "We were shipping food around the country, using diesel fuel — we were industrial organic farmers. I was bit by bit becoming more of this world, and there was a lot of pressure on the business to become more privatized."

"The whole notion of a 'cooperative community' we started with gradually began to mimic the system."

That pressure became irresistible in 1990, when in the aftermath of the "Alar scare" Kahn nearly lost everything — and control of Cascadian Farm wound up in corporate hands. In the history of the organic movement the Alar episode is a watershed, marking the birth pangs of the modern organic industry. Throughout its history, the sharpest growth of organic has closely followed spikes in public concern over the industrial

food supply. Some critics condemn organic for profiting time and again from "food scares," and while there is certainly some truth to this charge, whether it represents a more serious indictment of organic or industrial food is open to question. Organic farmers reply that episodes focusing public attention on pesticides, food poisoning, genetically modified crops, and mad cow disease serve as "teachable moments" about the industrial food system and its alternatives. Alar was one of the first.

After a somewhat overheated 60 Minutes exposé on apple growers' use of Alar, a growth-regulating chemical widely used in conventional orchards that the Environmental Protection Agency had declared a carcinogen, Middle America suddenly discovered organic. "Panic for Organic" was the cover line on one newsweekly, and overnight, demand from the supermarket chains soared. The ragtag industry was not quite ready for prime time, however. Like a lot of organic producers, Gene Kahn borrowed heavily to finance an ambitious expansion, contracted with farmers to grow an awful lot of organic produce — and then watched in horror as the bubble of demand subsided along with the headlines about Alar. Badly overextended, Kahn was forced to sell a majority stake in his company — to Welch's — and the onetime hippie farmer set out on what he calls his "corporate adventure."

"We were part of the food industry now," he told me. "But I wanted to leverage that position to redefine the way we grow food — not what people want to eat or how we distribute it. That sure as hell isn't going to change." Becoming part of the food industry meant jettisoning two of the three original legs on which the organic movement had stood: the countercuisine — what people want to eat — and the food co-ops and other alternative modes of distribution. Kahn's bet was that agribusiness could accommodate itself most easily to the first leg — the new way to grow food — by treating organic essentially as a niche product that could be distributed and marketed through the existing channels. The original organic ideal held that you could not divorce these three elements, since (as ecology taught) everything was connected. But Gene Kahn, for one (and he was by no means the only one), was a realist, a businessman with a payroll to meet. And he wasn't looking back.

"You have a choice of getting sad about all that or moving on. We tried hard to build a cooperative community and a local food system, but at the end of the day it wasn't successful. This is just lunch for most people. Just lunch. We can call it sacred, we can talk about communion, but it's just lunch." . . .

To serve such a scrupulously organic meal begs an unavoidable question: Is organic food better? Is it worth the extra cost? My Whole Foods dinner certainly wasn't cheap, considering I made it from scratch: Rosie cost $15 ($2.99 a pound), the vegetables another $12 (thanks to that six-buck

bunch of asparagus), and the dessert $7 (including $3 for a six-ounce box of blackberries). Thirty-four dollars to feed a family of three at home. (Though we did make a second meal from the leftovers.) Whether organic is better and worth it are certainly fair, straightforward questions, but the answers, I've discovered, are anything but simple.

Better for what? is the all-important corollary to that question. If the answer is "taste," then the answer is, as I've suggested, very likely, at least in the case of produce — but not necessarily. Freshly picked conventional produce is bound to taste better than organic produce that's been riding the interstates in a truck for three days. Meat is a harder call. Rosie was a tasty bird, yet, truth be told, not quite as tasty as Rocky, her bigger nonorganic brother. That's probably because Rocky is an older chicken, and older chickens generally have more flavor. The fact that the corn and soybeans in Rosie's diet were grown without chemicals probably doesn't change the taste of her meat. Though it should be said that Rocky and Rosie both taste more like chicken than mass-market birds fed on a diet of antibiotics and animal by-products; which makes for mushier and blander meat. What's in an animal's feed naturally affects how it will taste, though whether that feed is organic or not probably makes no difference.

Better for what? If the answer is "for my health" the answer, again, is probably — but not automatically. I happen to believe the organic dinner I served my family is healthier than a meal of the same foods conventionally produced, but I'd be hard-pressed to prove it scientifically. What I could prove, with the help of a mass spectrometer, is that it contained little or no pesticide residue — the traces of the carcinogens, neurotoxins, and endocrine disruptors now routinely found in conventional produce and meat. What I probably can't prove is that the low levels of these toxins present in these foods will make us sick — give us cancer, say, or interfere with my son's neurological or sexual development. But that does not mean those poisons are *not* making us sick: Remarkably little research has been done to assess the effects of regular exposure to the levels of organophosphate pesticide or growth hormone that the government deems "tolerable" in our foods. (One problem with these official tolerances is that they don't adequately account for children's exposure to pesticides, which, because of childrens' size and eating habits, is much greater than adults'.) Given what we do know about exposure to endocrine disruptors, the biological impact of which depends less on dose than timing, minimizing a child's exposure to these chemicals seems like a prudent idea. I very much like the fact that the milk in the ice cream I served came from cows that did not receive injections of growth hormone to boost their productivity, or that the corn those cows are fed, like the corn that feeds Rosie, contains no residues of atrazine, the herbicide commonly sprayed on American cornfields. Exposure to vanishingly small

amounts (0.1 part per billion) of this herbicide has been shown to turn normal male frogs into hermaphrodites. Frogs are not boys, of course. So I can wait for that science to be done, or for our government to ban atrazine (as European governments have done), or I can act now on the presumption that food from which this chemical is absent is better for my son's health than food that contains it.

Of course, the healthfulness of a food is not simply a question of its toxicity; we have also to consider its nutritional quality. Is there any reason to think my Whole Foods meal is any more nutritious than the same meal prepared with conventionally grown ingredients?

Over the years there have been sporadic efforts to demonstrate the nutritional superiority of organic produce, but most have foundered on the difficulty of isolating the great many variables that can affect the nutritional quality of a carrot or a potato — climate, soils, geography, freshness, farming practices, genetics, and so on. Back in the fifties, when the USDA routinely compared the nutritional quality of produce from region to region, it found striking differences: Carrots grown in the deep soils of Michigan, for example, commonly had more vitamins than carrots grown in the thin, sandy soils of Florida. Naturally this information discomfited the carrot growers of Florida, which probably explains why the USDA no longer conducts this sort of research. Nowadays U.S. agricultural policy, like the Declaration of Independence, is founded on the principle that all carrots are created equal, even though there's good reason to believe this isn't really true. But in an agricultural system dedicated to quantity rather than quality, the fiction that all foods are created equal is essential. This is why, in inaugurating the federal organic program in 2000, the secretary of agriculture went out of his way to say that organic food is no better than conventional food. "The organic label is a marketing tool," Secretary Glickman said. "It is not a statement about food safety. Nor is 'organic' a value judgment about nutrition or quality."

Some intriguing recent research suggests otherwise. A study by University of California–Davis researchers published in the *Journal of Agriculture and Food Chemistry* in 2003 described an experiment in which identical varieties of corn, strawberries, and blackberries grown in neighboring plots using different methods (including organically and conventionally) were compared for levels of vitamins and polyphenols. Polyphenols are a group of secondary metabolites manufactured by plants that we've recently learned play an important role in human health and nutrition. Many are potent antioxidants; some play a role in preventing or fighting cancer; others exhibit antimicrobial properties. The Davis researchers found that organic and otherwise sustainably grown fruits and vegetables contained significantly higher levels of both ascorbic acid (vitamin C) and a wide range of polyphenols.

The recent discovery of these secondary metabolites in plants has brought our understanding of the biological and chemical complexity of foods to a deeper level of refinement; history suggests we haven't gotten anywhere near the bottom of this question, either. The first level was reached early in the nineteenth century with the identification of the macronutrients — protein, carbohydrate, and fat. Having isolated these compounds, chemists thought they'd unlocked the key to human nutrition. Yet some people (such as sailors) living on diets rich in macronutrients nevertheless got sick. The mystery was solved when scientists discovered the major vitamins — a second key to human nutrition. Now it's the polyphenols in plants that we're learning play a critical role in keeping us healthy. (And which might explain why diets heavy in processed food fortified with vitamins still aren't as nutritious as fresh foods.) You wonder what else is going on in these plants, what other undiscovered qualities in them we've evolved to depend on.

In many ways the mysteries of nutrition at the eating end of the food chain closely mirror the mysteries of fertility at the growing end: The two realms are like wildernesses that we keep convincing ourselves our chemistry has mapped, at least until the next level of complexity comes into view. Curiously, Justus von Liebig, the nineteenth-century German chemist with the spectacularly ironic surname, bears responsibility for science's overly reductive understanding of both ends of the food chain. It was Liebig, you'll recall, who thought he had found the chemical key to soil fertility with the discovery of NPK, and it was the same Liebig who thought he had found the key to human nutrition when he identified the macronutrients in food. Liebig wasn't wrong on either count, yet in both instances he made the fatal mistake of thinking that what we knew about nourishing plants and people was all we needed to know to keep them healthy. It's a mistake we'll probably keep repeating until we develop a deeper respect for the complexity of food and soil and, perhaps, the links between the two.

But back to the polyphenols, which may hint at the nature of that link. Why in the world should organically grown blackberries or corn contain significantly more of these compounds? The authors of the Davis study haven't settled the question, but they offer two suggestive theories. The reason plants produce these compounds in the first place is to defend themselves against pests and diseases; the more pressure from pathogens, the more polyphenols a plant will produce. These compounds, then, are the products of natural selection and, more specifically, the coevolutionary relationship between plants and the species that prey on them. Who would have guessed that humans evolved to profit from a diet of these plant pesticides? Or that we would invent an agriculture that then deprived us of them? The Davis authors hypothesize that plants being defended by man-made pesticides don't need to work as hard to

make their own polyphenol pesticides. Coddled by us and our chemicals, the plants see no reason to invest their resources in mounting a strong defense. (Sort of like European nations during the Cold War.)

A second explanation (one that subsequent research seems to support) may be that the radically simplified soils in which chemically fertilized plants grow don't supply all the raw ingredients needed to synthesize these compounds, leaving the plants more vulnerable to attack, as we know conventionally grown plants tend to be. NPK might be sufficient for plant growth yet still might not give a plant everything it needs to manufacture ascorbic acid or lycopene or resveratrol in quantity. As it happens, many of the polyphenols (and especially a subset called the flavonols) contribute to the characteristic taste of a fruit or vegetable. Qualities we can't yet identify in soil may contribute qualities we've only just begun to identify in our foods and our bodies.

Reading the Davis study I couldn't help thinking about the early proponents of organic agriculture, people like Sir Albert Howard and J. I. Rodale, who would have been cheered, if unsurprised, by the findings. Both men were ridiculed for their unscientific conviction that a reductive approach to soil fertility — the NPK mentality — would diminish the nutritional quality of the food grown in it and, in turn, the health of the people who lived on that food. All carrots are not created equal, they believed; how we grow it, the soil we grow it in, what we feed that soil all contribute qualities to a carrot, qualities that may yet escape the explanatory net of our chemistry. Sooner or later the soil scientists and nutritionists will catch up to Sir Howard, heed his admonition that we begin "treating the whole problem of health in soil, plant, animal, and man as one great subject."

So it happens that these organic blackberries perched on this mound of vanilla ice cream, having been grown in a complexly fertile soil and forced to fight their own fights against pests and disease, are in some quantifiable way more nutritious than conventional blackberries. This would probably not come as earthshaking news to Albert Howard or J. I. Rodale or any number of organic farmers, but at least now it is a claim for which we can supply a scientific citation: *J. Agric. Food. Chem.* vol. 51, no. 5, 2003. . . .

Obviously there is much more to be learned about the relationship of soil to plant, animals, and health, and it would be a mistake to lean too heavily on any one study. It would also be a mistake to assume that the word *organic* on a label automatically signifies healthfulness, especially when that label appears on heavily processed and long-distance foods that have probably had much of their nutritional value, not to mention flavor, beaten out of them long before they arrive on our tables.

The better for what? question about my organic meal can of course be answered in a much less selfish way: Is it better for the evironment?

Better for the farmers who grew it? Better for the public health? For the taxpayer? The answer to all three questions is an (almost) unqualified yes. To grow the plants and animals that made up my meal, no pesticides found their way into any farmworker's bloodstream, no nitrogen runoff or growth hormones seeped into the watershed, no soils were poisoned, no antibiotics were squandered, no subsidy checks were written. If the high price of my all-organic meal is weighed against the comparatively low price it exacted from the larger world, as it should be, it begins to look, at least in karmic terms, like a real bargain.

And yet, and yet . . . an industrial-organic meal such as mine does leave deep footprints on our world. The lot of the workers who harvested the vegetables and gathered up Rosie for slaughter is not appreciably different from that of those on nonorganic factory farms. The chickens lived only marginally better lives than their conventional counterparts; in the end a CAFO is a CAFO [Confined Animal Feeding Operation], whether the food served in it is organic or not. As for the cows that produced the milk in our ice cream, they may well have spent time outdoors in an actual pasture (Stonyfield Farm buys most — though not all — of its milk from small dairy farmers), but the organic label guarantees no such thing. And while the organic farms I visited don't receive direct government payments, they do receive other subsidies from taxpayers, notably subsidized water and electricity in California. The two-hundred-thousand-square-foot refrigerated processing plant where my salad was washed pays half as much for its electricity as it would were Earthbound not classified as a "farm enterprise."

An industrial organic meal such as mine does leave deep footprints on our world.

But perhaps most discouraging of all, my industrial organic meal is nearly as drenched in fossil fuel as its conventional counterpart. Asparagus traveling in a 747 from Argentina; blackberries trucked up from Mexico; a salad chilled to thirty-six degrees from the moment it was picked in Arizona (where Earthbound moves its entire operation every winter) to the moment I walk it out the doors of my Whole Foods. The food industry burns nearly a fifth of all the petroleum consumed in the United States (about as much as automobiles do). Today it takes between seven and ten calories of fossil fuel energy to deliver one calorie of food energy to an American plate. And while it is true that organic farmers don't spread fertilizers made from natural gas or spray pesticides made from petroleum, industrial organic farmers often wind up burning more diesel fuel than their conventional counterparts: in trucking bulky loads of compost across the countryside and weeding their fields, a particularly energy-intensive process involving extra irrigation (to germinate the weeds before planting) and extra cultivation. All told, growing food organically uses

about a third less fossil fuel than growing it conventionally, . . . though that savings disappears if the compost is not produced on site or nearby.

Yet growing the food is the least of it: only a fifth of the total energy used to feed us is consumed on the farm; the rest is spent processing the food and moving it around. At least in terms of the fuel burned to get it from the farm to my table, there's little reason to think my Cascadian Farm TV dinner or Earthbound Farm spring mix salad is any more sustainable than a conventional TV dinner or salad would have been.

Well, at least we didn't eat it in the car.

So is an industrial organic food chain finally a contradiction in terms? It's hard to escape the conclusion that it is. Of course it is possible to live with contradictions, at least for a time, and sometimes it is necessary or worthwhile. But we ought at least face up to the cost of our compromises. The inspiration for organic was to find a way to feed ourselves more in keeping with the logic of nature, to build a food system that looked more like an ecosystem that would draw its fertility and energy from the sun. To feed ourselves otherwise was "unsustainable," a word that's been so abused we're apt to forget what it very specifically means: *Sooner or later it must collapse.* To a remarkable extent, farmers succeeded in creating the new food chain on their farms; the trouble began when they encountered the expectations of the supermarket. As in so many other realms, nature's logic has proven no match for the logic of capitalism, one in which cheap energy has always been a given. And so, today, the organic food industry finds itself in a most unexpected, uncomfortable, and, yes, unsustainable position: floating on a sinking sea of petroleum.

NOTES

[1]Grimmway Farms owns Cal-Organic, one of the most ubiquitous organic brands in the supermarket.

[2]Asami, et al. (2003); Benbrook (2005); Carbonaro and Mattera (2001); Davis, et al. (2004).

[3]Altieri (1995); Tilman (1998).

[4]Altieri (1995, 1999); Tilman (1998); Wolfe (2000).

[5]Diamond (2005).

WORK CITED

Altieri, Miguel. *Agroecology: The Science of Sustainable Agriculture* (Boulder, CO: Westview Press, 1995).

———. "The Ecological Role of Biodiversity in Agroecosystems," *Agric. Ecosyst. and Env.* 74 (1999), 19–31.

Asami, Danny K., et al. "Comparison of the Total Phenolic and Ascorbic Acid Content of Free-Dried and Air-Dried Marionberry, Strawberry, and Corn Using Conventional, Organic, and Sustainable Agricultural Practices," *Journal of Agricultural and Food Chemistry* 51 (2003), 1237–41. This is the study I discuss at some length.

Benbrook, Charles M. *Elevating Antioxidant Levels in Food Through Organic Farming and Food Processing: An Organic Center State of Science Review* (Foster, RI: Organic Center, 2005).

Carbonaro, Marina, and Maria Mattera. "Polyphenoloxidase Activity and Polyphenol Levels in Organically and Conventionally Grown Peaches," *Food Chemistry* 72 (2001), 419–24.

Davis, Donald R., et al. "Changes in USDA Food Composition Data for 43 Garden Crops, 1950 to 1999," *Journal of the American College of Nutrition* 23, no. 6 (2004), 669–82.

Diamond, Jared. *Collapse: How Societies Choose to Fail or Succeed* (New York: Viking, 2005).

Tilman, David. "The Greening of the Green Revolution," *Nature*, 396 (November 19, 1998).

Wolfe, M. S. "Crop Strength Through Diversity," *Nature* 406, no. 17 (August 2000).