

NINE

BIG ORGANIC

I. 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 ap-

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 a \$11 billion industry that is now the fastest growing sector of the food economy.

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 in tact." 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,* 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.”

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

(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 Food 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, labo-

ratories, 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.

2. 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 Foods 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 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 or-

ganic 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 coops), 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 agricultural. 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 as-

sume 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 a 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 farmer 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.

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;¹ such plants are more vulnerable to diseases and insect pests;² polycultures are more productive and less prone to disease than monocultures;³ 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 knowledge, but we know that civilizations that abuse their soil eventually collapse.⁴

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 successful, 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

1. Asami, et al (2003); Benbrook (2005); Carbonaro (2001); Davis, et al (2004).

2. Altieri (1995); Tilman (1998).

3. Altieri (1995, 1999); Tilman (1998); Wolfe (2000).

4. Diamond (2005).

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."

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."

IN THE YEARS after the Alar bubble burst in 1990, the organic industry recovered, embarking on a period of double-digit annual growth and rapid consolidation, as mainstream food companies began to take organic (or at least the organic market) seriously. Gerber's, Heinz, Dole, ConAgra, and ADM all created or acquired organic brands. Cascadian Farm itself became a miniconglomerate, acquiring Muir Glen, a California organic tomato processor, and the combined company changed its name to Small Planet Foods. Nineteen ninety also marked the beginning of federal recognition for organic agriculture: That year, Congress passed the Organic Food and Production Act (OFPA). The legislation instructed the Department of Agriculture—which historically had treated organic farming with undisguised contempt—to establish uniform national standards for organic food and farming, fixing the definition of a word that had always meant different things to different people.

Settling on that definition turned out to be a grueling decade-long process, as various forces both within and outside the movement battled for control of a word that had developed a certain magic in the marketplace. Agribusiness fought to define the word as loosely as possible, in part to make it easier for mainstream companies to get into organic, but also out of fear that anything deemed not organic—such as genetically modified food—would henceforth carry an official stigma. At first, the USDA, acting out of long-standing habit, obliged its agribusiness clients, issuing a watery set of standards in 1997 that—astoundingly—allowed for the use of genetically modified crops and irradiation and sewage sludge in organic food production. Some saw the dark hand of companies like Monsanto or ADM at work, but it seems more likely the USDA was simply acting on the reasonable assumption that the organic industry, like any other industry, would want as light a regulatory burden as possible. But it turned out organic wasn't like other industries: It still had a lot of the old movement values in its genetic makeup, and it reacted to the weak standards with fury. An un-

precedented flood of public comment from outraged organic farmers and consumers forced the USDA back to the drawing board, in what was widely viewed as a victory for the movement's principles.

Yet while the struggle with the government over the meaning of organic was making headlines in 1997, another equally important struggle was underway within the USDA between Big and Little Organic—or, put another way, between the organic industry and the organic movement—and here the outcome was decidedly more ambiguous. Could a factory farm be organic? Was an organic dairy cow entitled to graze on pasture? Did food additives and synthetic chemicals have a place in processed organic food? If the answers to these questions seem like no-brainers, then you too are stuck in an outdated pastoral view of organic. Big Organic won all three arguments. The final standards do a good job of setting the bar for a more environmentally responsible kind of farming but, as perhaps was inevitable as soon as bureaucratic and industrial thinking was brought to bear, many of the philosophical values embodied in the word organic—the sorts of values expressed by Albert Howard—did not survive the federal rule-making process.

From 1992 to 1997 Gene Kahn served on the USDA's National Organic Standards Board, where he played a key role in making the standards safe for the organic TV dinner and a great many other organic processed foods. This was no small feat, for Kahn and his allies had to work around the original 1990 legislation, which had prohibited synthetic food additives and manufacturing agents outright. Kahn argued that you couldn't have organic processed food without synthetics, which are necessary to both the manufacture and preservation of such supermarket products. Several of the consumer representatives on the standards board contended that this was precisely the point, and if no synthetics meant no organic TV dinners, then TV dinners were something organic simply shouldn't do. At stake was the very idea of a countercuisine.

Joan Dye Gussow, a nutritionist and an outspoken standards-board

words, “everything eventually morphs into the way the world is.” And yet the pastoral values and imagery embodied in that word survive in the minds of many people, as the marketers of organic food well understand: Just look at a container of organic milk, with its happy cows and verdant pastures. Thus is a venerable ideal hollowed out, reduced to a sentimental conceit printed on the side of a milk carton: Supermarket Pastoral.

3. DOWN ON THE INDUSTRIAL ORGANIC FARM

Get over it, Gene Kahn would say. The important thing, the real value of putting organic on an industrial scale, is the sheer amount of acreage it puts under organic management. Behind every organic TV dinner or chicken or carton of industrial organic milk stands a certain quantity of land that will no longer be doused with chemicals, an undeniable gain for the environment and the public health. I could see his point. So I decided to travel around California to see these farms for myself. Why California? Because the state’s industrial agriculture grows most of America’s produce, and organic has in large part become a subset, or brand, of that agriculture.

No farms I have ever visited before prepared me for the industrial organic farms I saw in California. When I think about organic farming, I think family farm, I think small scale, I think hedgerows and compost piles and battered pickups—the old agrarian idea (which in fact has never had much purchase in California). I don’t think migrant labor crews, combines the size of houses, mobile lettuce-packing factories marching across fields of romaine, twenty-thousand-broiler-chicken houses, or hundreds of acres of corn or broccoli or lettuce reaching clear to the horizon. To the eye, these farms look exactly like any other industrial farm in California—and in fact some of the biggest organic operations in the state are owned and operated by conventional mega-farms. The same farmer who is applying toxic fumigants to sterilize the

soil in one field is in the next field applying compost to nurture the soil’s natural fertility.

Is there anything wrong with this picture? I’m not sure, frankly. Gene Kahn makes the case that the scale of a farm has no bearing on its fidelity to organic principles, and that unless organic “scales up [it will] never be anything more than yuppie food.” To prove his point Kahn sent me to visit several of the large-scale farms that supply Small Planet Foods. These included Greenways, the Central Valley operation that grows vegetables for his frozen dinners (and tomatoes for Muir Glen), and Petaluma Poultry, which grows the chicken in his frozen dinner as well as Rosie, the organic chicken I made the acquaintance of in Whole Foods. I also paid a visit to the Salinas Valley, where Earthbound Farm, the largest organic grower in the world, has most of its lettuce fields.

My first stop was Greenways Organic, a successful two-thousand-acre organic produce operation tucked into a twenty-four-thousand-acre conventional farm in the Central Valley outside Fresno; the crops, the machines, the crews, the rotations, and the fields were virtually indistinguishable, and yet two different kinds of industrial agriculture are being practiced here side by side.

In many respects the same factory model is at work in both fields, but for every chemical input used in the farm’s conventional fields, a more benign organic input has been substituted in the organic ones. So in place of petrochemical fertilizers, Greenways’s organic acres are nourished by compost made by the ton at a horse farm nearby, and by poultry manure. Instead of toxic pesticides, insects are controlled by spraying-approved organic agents (most of them derived from plants) such as rotenone, pyrethrum, and nicotine sulfate, and by introducing beneficial insects like lacewings. Inputs and outputs: a much greener machine, but a machine nevertheless.

Perhaps the greatest challenge to farming organically on an industrial scale is controlling weeds without the use of chemical herbicides. Greenways tackles its weeds with frequent and carefully timed tilling. Even before the crops are planted, the fields are irrigated to germinate

member, made the case against synthetics in a 1996 article that was much debated at the time: "Can an Organic Twinkie Be Certified?" Demonstrating that under the proposed rules such a thing was entirely possible, Gussow questioned whether organic should simply mirror the existing food supply, with its highly processed, salted, and sugary junk food, or whether it should aspire to something better—a counter-cuisine based on whole foods. Kahn responded with an argument rooted in the populism of the market: If the consumer wants an organic Twinkie, then we should give it to him. As he put it to me on the drive back from Cascadian Farm, "Organic is not your mother." In the end it came down to an argument between the old movement and the new industry and the new industry won: The final standards simply ignored the 1990 law, drawing up a list of permissible additives and synthetics, from ascorbic acid to xanthan gum.*

"If we had lost on synthetics," Kahn told me, "we'd be out of business."

The same might be said for the biggest organic meat and dairy producers, who fought to make the new standards safe for the organic factory farm. Horizon Organic's Mark Retzloff labored mightily to preserve the ability of his company—which is the Microsoft of organic milk, controlling more than half of the market—to operate its large-scale industrial dairy in southern Idaho. Here in the western desert, where precious little grass can grow, the company was milking several thousand cows that, rather than graze on pasture (as most consumers presume their organic cows are doing), spend their days milling around a dry lot—a grassless fenced enclosure. It's doubtful a dairy could pasture that many cows even if it wanted to—you would need at least an acre of grass per animal and more hours than there are in a day to move that many cows all the way out to their distant acre and then back again to the milking parlor every morning and evening. So in-

* After Arthur Harvey, a Maine blueberry farmer, won a 2003 lawsuit forcing the USDA to obey the language of the 1990 law, lobbyists working for the Organic Trade Association managed in 2005 to slip language into a USDA appropriations bill restoring—and possibly expanding—the industry's right to use synthetics in organic foods.

stead, as in the typical industrial dairy, these organic cows stood around eating grain and silage when they weren't being milked three times a day. Their organic feed was shipped in from all over the West, and their waste accumulated in manure ponds. Retzloff argued that keeping cows in confinement meant that his farmhands, who all carried stethoscopes, could keep a closer eye on their health. Of course, cows need this sort of surveillance only when they're living in such close quarters—and can't be given antibiotics.

Such a factory farm didn't sound terribly organic to the smaller dairy farmers on the board, not to mention to the consumer representatives. Also, the OFPA had spelled out that the welfare of organic animals should take into account, and accommodate, their "natural behavior," which in the case of cows—ruminants who have evolved to eat grass—surely meant grazing on pasture. You might say the whole pastoral idea was hardwired into these animals and stood squarely in the way of industrializing them. So how could the logic of industry ever hope to prevail?

The USDA listened to the arguments on both sides and finally ruled that dairy cows must have "access to pasture," which sounds like more of a victory for the pastoral ideal than it turned out to be in practice. By itself "access to pasture" is an extremely vague standard (What constitutes "access"? How much pasture per animal? How often could it graze?), and it was weakened further by a provision stating that even access could be dispensed with at certain stages of the animal's life. Some big organic dairies have decided that lactation constitutes one such stage, and thus far the USDA has not objected. Some of its organic certifiers have complained that "access to pasture" is so vague as to be meaningless—and therefore unenforceable. It's hard to argue with them.

Along with the national list of permissible synthetics, "access to pasture," and, for other organic animals, "access to the outdoors" indicate how the word organic has been stretched and twisted to admit the very sort of industrial practices for which it once offered a critique and an alternative. The final standards also demonstrate how, in Gene Kahn's

the weed seeds present in the soil; a tractor then tills the field to kill them, the first of several passes it will make over the course of the growing season. When the crops stand too high to drive a tractor over, farm workers wielding propane torches will spot kill the biggest weeds by hand. The result is fields that look just as clean as the most herbicide-soaked farmland. But this approach, which I discovered is typical of large-scale organic operations, represents a compromise at best. The heavy tillage—heavier than in a conventional field—destroys the tilth of the soil and reduces its biological activity as surely as chemicals would; frequent tilling also releases so much nitrogen into the air that these weed-free organic fields require a lot more nitrogen fertilizer than they otherwise might. In a less disturbed, healthier soil, nitrogen-fixing bacteria would create much of the fertility that industrial organic growers must add in the form of compost, manures, fish emulsion, or Chilean nitrate—all inputs permitted under federal rules. (International organic rules, however, forbid the use of Chilean nitrate, a mineral form of nitrogen mined in Chile, often using child labor.) Not surprisingly the manufacturers of these inputs lobbied hard to shape the federal organic rules; in the end it proved easier to agree on a simple list of approved and prohibited materials rather than to try to legislate a genuinely more ecological model of farming.

Yet the best organic farmers deplore this sort of input substitution as a fall from the organic ideal, which envisions farms that provide for as much of their own fertility as possible, and control pests by means of crop diversification and rotation. It is too simple to say that smaller organic farms automatically hew closer to the organic ideals set forth by Albert Howard: Many small organic farms practice input substitution as well. The organic ideal is so exacting—a sustainable system modeled on nature that requires not only no synthetic chemicals but also no purchased inputs of any kind, and that returns as much to the soil as it removes—that it is mostly honored in the breach. Still, standing in a 160-acre block of organic broccoli in the Central Valley makes you appreciate why the farmers who come closest to achieving this ideal tend to be smaller in scale. These are the farmers who can plant

literally dozens of different crops in fields that resemble quilts and practice long and elaborate rotations, thereby achieving the rich biodiversity in space and time that is the key to making a farm sustainable in something of the way a natural ecosystem is.

For better or worse, these are not the kinds of farms a big company like Small Planet Foods, or Whole Foods, does business with today. It's simply more cost-efficient to buy from one thousand-acre farm than ten hundred-acre farms. That's not because those big farms are necessarily any more productive, however. In fact, study after study has demonstrated that, measured in terms of the amount of food produced per acre, small farms are actually more productive than big farms; it is the higher transaction costs involved that makes dealing with them impractical for a company like Kahn's—that and the fact that they don't grow tremendous quantities of any one thing. As soon as your business involves stocking the frozen food case or produce section at a national chain, whether it be Wal-Mart or Whole Foods, the sheer quantities of organic produce you need makes it imperative to buy from farms operating on the same industrial scale you are. *Everything's connected.* The industrial values of specialization, economies of scale, and mechanization wind up crowding out ecological values such as diversity, complexity, and symbiosis. Or, to frame the matter in less abstract terms, as one of Kahn's employees did for me, "The combine just can't make the turn in a five-acre corn field"—and Small Planet Foods now consumes combine quantities of organic corn.

The big question is whether the logic of an industrial food chain can be reconciled to the logic of the natural systems on which organic agriculture has tried to model itself. Put another way, is industrial organic ultimately a contradiction in terms?

Kahn is convinced it is not, but others both inside and outside his company see an inescapable tension. Sarah Huntington is one of Cascadian Farm's oldest employees. She worked alongside Kahn on the original farm and at one time or another has held just about every job in the company. "The maw of that processing beast eats ten acres of cornfield in an hour," she told me. "And you're locked into planting a particular

variety like Jubilee that ripens all at once and holds up in processing. So you see how the system is constantly pushing you back toward monoculture, which is anathema in organic. But that's the challenge—to change the system more than it changes you.”

One of the most striking ways companies like Small Planet Foods is changing the system is by helping conventional farms convert a portion of their acreage to organic. Several thousand acres of American farmland are now organic as a result of the company's efforts, which go well beyond offering contracts to providing instruction and even management. Kahn has helped to prove to the skeptical that organic farming—dismissed as “hippie farming” only a few short years ago—can work on a large scale. The environmental benefits of this process cannot be overestimated. And yet the industrialization of organic comes at a price. The most obvious is consolidation down on the farm: Today two giant growers sell most of the fresh organic produce from California.

ONE OF THEM IS Earthbound Farm, a company that arguably represents industrial organic farming at its best. If Cascadian Farm is a first-generation organic farm, Earthbound is second generation. It was started in the early eighties by Drew and Myra Goodman, two entirely improbable farmers who came to the land from the city with exactly no farming experience. The two had grown up within a few blocks of one another on the Upper East Side of Manhattan, where they attended the same progressive private high school. They didn't get together until after both had gone off to college in California, Drew to Santa Cruz, Myra to Berkeley. While living near Carmel, killing time before heading to graduate school, Drew and Myra started a roadside organic farm on a few rented acres, growing raspberries and the sort of baby greens that chefs were making trendy in the eighties. Every Sunday Myra would wash and bag a bunch of lettuce for their own use, a salad for each night of the week. They discovered that the whole-leaf lettuces held up remarkably well right through to dinner the following Saturday.

One day in 1986 the Goodmans learned that the Carmel chef who

bought the bulk of their lettuce crop had moved on, and that his replacement wanted to use his own supplier. Suddenly they were faced with a field of baby greens to get rid of, greens that wouldn't stay baby for very long. So they decided to wash and bag them, and try to sell a prewashed salad mix at retail. Produce managers greeted the novel product with skepticism, so the Goodmans offered to take back any unsold bags at the end of the week. None of them were returned. The “spring mix” business had been born.

So at least goes the Earthbound creation story, as recounted to me by Myra Goodman, now a tanned, leggy, and loquacious forty-two-year-old, over lunch at the company's roadside stand in the Carmel Valley. Like Cascadian Farm, Earthbound still maintains a showplace farm and roadside stand, a tangible reminder of its roots. Unlike Cascadian, however, Earthbound is still very much in the farming business, though most of their production land is an hour and a half north of Carmel, in the Salinas Valley. Opening onto the Pacific near Monterey, the fertile, sea breeze-conditioned valley offers ideal conditions for growing lettuces nine months of the year. In winter, the company picks up and moves its operation, and many of its employees, south to Yuma, Arizona.

The prewashed salad business became one of the great success stories in American agriculture during the eighties and nineties, a time when there wasn't much to celebrate, and the Goodmans are directly responsible for much of that success. They helped dethrone iceberg, which used to dominate the Valley, by introducing dozens of different salad mixes, and innovating the way lettuces were grown, harvested, cleaned, and packed. Myra's father is an engineer and inveterate tinkerer, and while the business was still headquartered in their Carmel Valley living room, he designed gentle-cycle washing machines for lettuce; later the company introduced one of the first customized baby lettuce harvesters, and helped pioneer the packing of greens in specially formulated plastic bags pumped with inert gases to extend shelf life.

Earthbound Farm's growth exploded after Costco placed an order in 1993. “Costco wanted our prewashed spring mix, but they didn't want organic,” Myra told me. “To them, organic sent the wrong message:

high price and low quality.” At the time, organic was still recovering from the boom and bust following the Alar episode. But the Goodmans were committed to organic farming practices, so they decided to sell Costco their organically grown lettuce without calling it that.

“Costco was moving two thousand cases a week to start,” Myra said, “and the order kept increasing.” Wal-Mart, Lucky’s, and Albertson’s soon followed. The Goodmans quickly learned that in order to feed the maw of this industrial beast, Earthbound would have to industrialize itself. Their days of washing lettuce in the living room and selling at the Monterey farmer’s market were over. “We didn’t know how to farm on that scale,” Drew told me, “and we needed a lot more land—fast.” So the Goodmans entered into partnership with two of the most established conventional growers in the Salinas Valley, first Mission Ranches in 1995, and then Tanimura & Antle in 1999. These growers (no one in the Valley calls himself a farmer) controlled some of the best land in the Valley; they also knew how to grow, harvest, pack, and distribute tremendous quantities of produce. What they didn’t know was organic production; in fact, Mission Ranches had tried it once and failed.

Through these partnerships, the Goodmans have helped convert several thousand acres of prime Salinas Valley land to organic; if you include all the farmland growing produce for Earthbound—which has expanded beyond greens to a full line of fruits and vegetables—the company represents a total of 25,000 organic acres. (This includes the acreage of the 135 farms that grow under contract to Earthbound.) The Goodmans estimate that taking all that land out of conventional production has eliminated some 270,000 pounds of pesticide and 8 million pounds of petrochemical fertilizer that would otherwise have been applied, a boon to both the environment and the people who work in those fields. Earthbound also uses biodiesel fuel in their tractors.

I expected a field of spring mix to look a lot like the stuff in the bag: a dozen varieties tossed together in happy profusion. But it turns out the mixing comes later. Each variety, which has its own slightly different cultural requirements and life span, is grown in a monoculture of several acres each, which has the effect of turning this part of the valley

into a mosaic of giant color blocks: dark green, burgundy, pale green, blue green. As you get closer you see that the blocks are divided into a series of eighty-inch-wide raised beds thickly planted with a single variety. Each weed-free strip is as smooth and flat as a tabletop, leveled with a laser so that the custom-built harvester can snip each leaf at precisely the same point. Earthbound’s tabletop fields exemplify one of the most powerful industrial ideas: the tremendous gains in efficiency to be had when you can conform the irregularity of nature to the precision and control of a machine.

Apart from the much higher level of precision—time as well as space is scrupulously managed on this farm—the organic practices at Earthbound resemble those I saw at Greenways farm. Frequent tilling is used to control weeds, though crews of migrant workers, their heads wrapped in brightly colored cloths against the hot sun, do a last pass through each block before harvest, pulling weeds by hand. To provide fertility—the farm’s biggest expense—compost is trucked in; some crops also receive fish emulsion along with their water and a side dressing of pelleted chicken manure. Over the winter a cover crop of legumes is planted to build up nitrogen in the soil.

To control pests, every six or seven strips of lettuce is punctuated with a strip of flowers: sweet alyssum, which attracts the lacewings and syrphid flies that eat the aphids that can molest lettuces. Aside from some insecticidal soap to control insects in the cruciferous crops, pesticides are seldom sprayed. “We prefer to practice resistance and avoidance,” Drew Goodman explained. Or, as their farm manager put it, “You have to give up the macho idea that you can grow anything you want anywhere you want to.” So they closely track insect or disease outbreaks in their many fields and keep vulnerable crops at a safe distance; they also search out varieties with a strong natural resistance. Occasionally they’ll lose a block to a pest, but as a rule growing baby greens is less risky since, by definition, the crop stays in the ground for so short a period of time—usually thirty days or so. Indeed, baby lettuce is one crop that may well be easier to grow organically than conventionally: Harsh chemicals can scorch young leaves, and nitrogen fertilizers ren-

der lettuces more vulnerable to insects. It seems the bugs are attracted to the free nitrogen in their leaves, and because of the more rapid growth of chemically nourished plants, insects find their leaves easier to pierce.

From the moment an organic lettuce plant is ready for harvest, the rest of its journey from field to produce aisle follows a swift and often ingenious industrial logic that is only nominally organic. "The only way we can sell organic produce at a reasonable price is by moving it into a conventional supply chain the moment it's picked," Drew Goodman explained. There is nothing particularly sustainable about that chain: It relies on the same crews of contract workers that pick produce throughout the Valley on a per piece basis, and on the same prodigious quantities of energy required to deliver any bag of prewashed salad to supermarkets across the country. (Though Earthbound does work to offset their fossil fuel consumption by planting trees.)

That conventional supply chain begins with the clever machine Earthbound developed to harvest baby greens: a car-size lettuce-shaving machine that moves down the rows, cutting the baby greens at a precise point just above the crown. Spidery arms extended in front of the machine gently rake through the bed in advance of the blade, scaring off any mice that might find their way into the salad. A fan blows the cut leaves over a screen to shake out any pebbles or soil, after which a belt conveys the greens into white plastic totes that workers stack on pallets on a wagon trailing alongside. At the end of each row the pallets are loaded onto a refrigerated tractor trailer, entering a "cold chain" that will continue unbroken all the way to the produce section at your supermarket.

Earthbound's own employees (who receive generous benefits by Valley standards, including health insurance and retirement) operate the baby greens harvester, but on the far side of the field I saw a contract crew of Mexicans, mostly women, slowly moving through the rows pulling weeds. I noticed that some of the workers had blue Band-Aids on their fingers. The Band-Aids are colored so inspectors at the plant can easily pick them out of the greens; each Band-Aid also con-

tains a metal filament so that the metal detector through which every Earthbound leaf passes will pick it up before it winds up in a customer's salad.

Once filled, the trucks deliver their cargo of leaves to the loading dock at the processing plant in San Juan Bautista, essentially a 200,000-square-foot refrigerator designed to maintain the lettuce at exactly thirty-six degrees through the entire process of sorting, mixing, washing, drying, and packaging. These employees, most of them Mexicans, are dressed in full-length down coats; they empty totes of arugula, radicchio, and frisée into stainless steel rivers of lightly chlorinated water, the first of three washes each leaf will undergo. Viewed from overhead, the lettuce-packing operation looks like a hugely intricate Rube Goldberg contraption, a tangle of curving silver water courses, shaking trays, and centrifuges, blue Band-Aid detectors, scales, and bagging stations that in about a half hour propels a freshly harvested leaf of baby lettuce into a polyethylene bag or box of ready-to-dress spring mix. The plant washes and packs 2.5 million pounds of lettuce a week; when you think just how many baby leaves it takes to make a pound, that represents a truly stupendous amount of lettuce. It also represents a truly stupendous amount of energy: to run the machines and chill the building, not to mention to transport all that salad to supermarkets across the country in refrigerated trucks and to manufacture the plastic containers it's packed in. A one-pound box of prewashed lettuce contains 80 calories of food energy. According to Cornell ecologist David Pimental, growing, chilling, washing, packaging, and transporting that box of organic salad to a plate on the East Coast takes more than 4,600 calories of fossil fuel energy, or 57 calories of fossil fuel energy for every calorie of food. (These figures would be about 4 percent higher if the salad were grown conventionally.)

I had never before spent quite so much time looking at and thinking about lettuce, which when you do think about it—at least in the confines of the world's biggest refrigerator packed to the rafters with the stuff—is truly peculiar stuff. There are few things humans eat that are quite so elemental—a handful of leaves, after all, consumed raw.

When we're eating salad we're behaving a lot like herbivores, drawing as close as we ever do to all those creatures who bend their heads down to the grass, or reach up into the trees, to nibble on plant leaves. We add only the thinnest veneer of culture to these raw leaves, dressing them in oil and vinegar. Much virtue attaches to this kind of eating, for what do we regard as more wholesome than tucking into a pile of green leaves?

The contrast of the simplicity of this sort of eating, with all its pastoral overtones, and the complexity of the industrial process behind it produced a certain cognitive dissonance in my refrigerated mind. I began to feel that I no longer understood what this word I'd been following across the country and the decades really meant—I mean, of course, the word "organic." It is an unavoidable and in some ways impolite question, and very possibly besides the point if you look at the world the way Gene Kahn or Drew and Myra Goodman do, but in precisely what sense can that box of salad on sale in a Whole Foods three thousand miles and five days away from this place truly be said to be organic? And if that well-traveled plastic box deserves that designation, should we then perhaps be looking for another word to describe the much shorter and much less industrial food chain that the first users of the word organic had in mind?

This at least is the thinking of the smaller organic farmers who, not surprisingly, are finding it impossible to compete against the impressive industrial efficiencies achieved by a company like Earthbound Farm. Supermarket chains don't want to deal with dozens of different organic farmers; they want one company to offer them a complete line of fruits and vegetables, every SKU in the produce section. And Earthbound has obliged, consolidating its hold on the organic produce section of the American supermarket, and in the process growing into a \$350 million company. "Everything eventually morphs into the way the world is." Drew Goodman told me a day had come several years ago when he suddenly no longer felt comfortable manning his usual stall at the Monterey farmer's market. He looked around and understood "we didn't belong here anymore. We're really in a whole different business now." Goodman makes no apologies for that, and rightly so: His company has

done a world of good, for its land, its workers, the growers it works with, and its customers.

Yet his success, like Gene Kahn's, has opened up a gulf between Big and Little Organic and convinced many of the movement's founders, as well as pioneering farmers like Joel Salatin, that the time has come to move beyond organic—to raise the bar on the American food system once again. Some of these innovating farmers are putting their emphasis on quality, others on labor standards, some on local systems of distribution, and still others on achieving a more thoroughgoing sustainability. Michael Ableman, one of the self-described beyond organic farmers I interviewed in California, said, "We may have to give up on the word 'organic,' leave it to the Gene Kahns of the world. To be honest, I'm not sure I want that association, because what I'm doing on my farm is not just substituting inputs."

A few years ago, at a conference on organic agriculture in California, a corporate organic grower suggested to a small farmer struggling to survive in the competitive world of industrial organic agriculture that "you should really try to develop a niche to distinguish yourself in the market." Holding his fury in check, the small farmer replied as levelly as he could manage:

"I believe I developed that niche twenty years ago. It's called 'organic.' And now you, sir, are sitting on it."

4. MEET ROSIE, THE ORGANIC FREE-RANGE CHICKEN

The last stop on my tour of California industrial organic farming took me to Petaluma, where I tried without success to find the picturesque farmstead, with its red barn, cornfield, and farmhouse, depicted on the package in which the organic roasting chicken I bought at Whole Foods had been wrapped; nor could I find Rosie herself, at least not outdoors, ranging freely.

Petaluma Poultry has its headquarters not on a farm but in a sleek

modern office building in an industrial park just off Route 101; there's little farmland left in Petaluma, which is now a prosperous San Francisco bedroom community. The survival of Petaluma Poultry in the face of this development (it's one of what were once dozens of chicken farms in the area) is a testament to the company's marketing acumen. When its founder, Allen Shainsky, recognized the threat from integrated national chicken processors like Tyson and Purdue, he decided that the only way to stay in business was through niche marketing. So he started processing, on different days of the week, chickens for the kosher, Asian, natural, and organic markets. Each required a slightly different protocol: to process a kosher bird you needed a rabbi on hand, for example; for an Asian bird you left the head and feet on; for the natural market you sold the same bird minus head and feet, but played up the fact that Rocky, as this product was called, received no antibiotics or animal by-products in its feed, and you provided a little exercise yard outside the shed so Rocky could, at his option, range free. And to call a bird organic, you followed the natural protocol except that you also fed it certified organic feed (corn and soy grown without pesticides and chemical fertilizer) and you processed the bird slightly younger and smaller, so it wouldn't seem quite so expensive. Philosophy didn't really enter into it.

(Petaluma Eggs, a nearby egg producer with corporate ties to Petaluma Poultry, pursues a similar niche strategy, offering natural free-range eggs [no drugs in the chickens' feed, no battery cages]; fertile eggs [all of the above plus the hens have access to a rooster]; enhanced omega-3 natural eggs [all of the above, save the rooster, plus kelp in the feed to boost levels of omega-3 fatty acids]; and certified organic eggs [cage-and drug-free plus certified organic feed]. These last are sold under the label Judy's Family Farm, a brand that until my visit to Petaluma I hadn't connected to Petaluma Eggs. The Judy's label had always made me picture a little family farm, or maybe even a commune of back-to-the-land lesbians up in Sonoma. But it turns out Judy is the name of the wife of Petaluma's principal owner, a marketer who has clearly mastered the conventions of Supermarket Pastoral. Who could begrudge a

farmer named Judy \$3.59 for a dozen organic eggs she presumably has to get up at dawn each morning to gather? Just how big and sophisticated an operation Petaluma Eggs really is I was never able to ascertain: The company was too concerned about biosecurity to let a visitor get past the office.)

Rosie the organic chicken's life is little different from that of her kosher and Asian cousins, all of whom are conventional Cornish Cross broilers processed according to state-of-the-art industrial practice. (Though Petaluma Poultry sets the bar higher than many of its competitors, who routinely administer antibiotics and use feed made from animal by-products.) The Cornish Cross represents the pinnacle of industrial chicken breeding. It is the most efficient converter of corn into breast meat ever designed, though this efficiency comes at a high physiological price: The birds grow so rapidly (reaching oven-roaster proportions in seven weeks) that their poor legs cannot keep pace, and frequently fail.

After a tour of the fully automated processing facility, which can translate a chicken from a clucking, feathered bird to a shrink-wrapped pack of parts inside of ten minutes, the head of marketing drove me out to meet Rosie—preprocessing. The chicken houses don't resemble a farm so much as a military barracks: a dozen long, low-slung sheds with giant fans at either end. I donned what looked like a hooded white hazmat suit—since the birds receive no antibiotics yet live in close confinement, the company is ever worried about infection, which could doom a whole house overnight—and stepped inside. Twenty thousand birds moved away from me as one, like a ground-hugging white cloud, clucking softly. The air was warm and humid and smelled powerfully of ammonia; the fumes caught in my throat. Twenty thousand is a lot of chickens, and they formed a gently undulating white carpet that stretched nearly the length of a football field. After they adjusted to our presence, the birds resumed sipping from waterers suspended from the ceiling, nibbled organic food from elevated trays connected by tubes to a silo outside, and did pretty much everything chickens do except step outside the little doors located at either end of the shed.

Compared to conventional chickens, I was told, these organic birds have it pretty good: They get a few more square inches of living space per bird (though it was hard to see how they could be packed together much more tightly), and because there were no hormones or antibiotics in their feed to accelerate growth, they get to live a few days longer. Though under the circumstances it's not clear that a longer life is necessarily a boon.

Running along the entire length of each shed was a grassy yard maybe fifteen feet wide, not nearly big enough accommodate all twenty thousand birds inside should the group ever decide to take the air en masse. Which, truth be told, is the last thing the farm managers want to see happen, since these defenseless, crowded, and genetically identical birds are exquisitely vulnerable to infection. This is one of the larger ironies of growing organic food in an industrial system: It is even more precarious than a conventional industrial system. But the federal rules say an organic chicken should have "access to the outdoors," and Supermarket Pastoral imagines it, so Petaluma Poultry provides the doors and the yard and everyone keeps their fingers crossed.

It would appear Petaluma's farm managers have nothing to worry about. Since the food and water and flock remain inside the shed, and since the little doors remain shut until the birds are at least five weeks old and well settled in their habits, the chickens apparently see no reason to venture out into what must seem to them an unfamiliar and terrifying world. Since the birds are slaughtered at seven weeks, free range turns out to be not so much a lifestyle for these chickens as a two-week vacation option.

After I stepped back outside into the fresh air, grateful to escape the humidity and ammonia, I waited by the chicken door to see if any of the birds would exercise that option and stroll down the little ramp to their grassy yard, which had been mowed recently. And waited. I finally had to conclude that Rosie the organic free-range chicken doesn't really grok the whole free-range conceit. The space that has been provided to her for that purpose is, I realized, not unlike the typical American front

lawn it resembles—it's a kind of ritual space, intended not so much for the use of the local residents as a symbolic offering to the larger community. Seldom if ever stepped upon, the chicken-house lawn is scrupulously maintained nevertheless, to honor an ideal nobody wants to admit has by now become something of a joke, an empty pastoral conceit.

5. MY ORGANIC INDUSTRIAL MEAL

My shopping foray to Whole Foods yielded all the ingredients for a comforting winter Sunday night dinner: roast chicken (Rosie) with roasted vegetables (yellow potatoes, purple kale, and red winter squash from Cal-Organics), steamed asparagus, and a spring mix salad from Earthbound Farm. Dessert would be even simpler: organic ice cream from Stonyfield Farm topped with organic blackberries from Mexico.

On a hunch it probably wasn't quite ready for prime time (or at least for my wife), I served the Cascadian Farm organic TV dinner I'd bought to myself for lunch, right in its microwaveable plastic bowl. Five minutes on high and it was good to go. Peeling back the polyethylene film covering the dish, I felt a little like a flight attendant serving meals, and indeed the entrée looked and tasted very much like airline food. The chunks of white meat chicken had been striped nicely with grill marks and impregnated with a salty marinade that gave the meat that slightly abstract chicken taste processed chicken often has, no doubt owing to the "natural chicken flavor" mentioned on the box's list of ingredients. The chicken chunks and allied vegetables (soft carrots, peas, green beans, and corn) were "blanketed in a creamy rosemary dill sauce"—a creaminess that had evidently been achieved synthetically, since no dairy products appeared among the ingredients. I'm betting it's the xanthan gum (or maybe the carrageenan?) that bears responsibility for the sauce's unfortunate viscosity. To be fair, one shouldn't compare an organic TV dinner to real food but to a conventional TV

dinner, and by that standard (or at least my recollection of it) Cascadian Farm has nothing to be ashamed of, especially considering that an organic food scientist must work with only a tiny fraction of the synthetic preservatives, emulsifiers, and flavor agents available to his colleagues at Swanson or Kraft.

Rosie and her consort of fresh vegetables fared much better at dinner, if I don't mind saying so myself. I roasted the bird in a pan surrounded by the potatoes and chunks of winter squash. After removing the chicken from the oven, I spread the crinkled leaves of kale on a cookie sheet, sprinkled them with olive oil and salt, and slid them into the hot oven to roast. After ten minutes or so, the kale was nicely crisped and the chicken was ready to carve.

All but one of the vegetables I served that night bore the label of Cal-Organic Farms, which, along with Earthbound, dominates the organic produce section in the supermarket. Cal-Organic is a big grower of organic vegetables in the San Joaquin Valley. As part of the consolidation of the organic industry, the company was acquired by Grimmway Farms, which already enjoyed a virtual monopoly in organic carrots. Unlike Earthbound, neither Grimmway or Cal-Organic has ever been part of the organic movement. Both companies were started by conventional growers looking for a more profitable niche and worried that the state might ban certain key pesticides. "I'm not necessarily a fan of organic," a spokesman for Grimmway recently told an interviewer. "Right now I don't see that conventional farming does harm. Whether we stay with organic for the long haul depends on profitability." Philosophy, in other words, has nothing to do with it.

The combined company now controls seventeen thousand acres across California, enough land that it can, like Earthbound, rotate production up and down the West Coast (and south into Mexico) in order to insure a twelve-month national supply of fresh organic produce, just as California's conventional growers have done for decades. It wasn't many years ago that organic produce had only a spotty presence in the supermarket, especially during the winter months. Today, thanks in

large part to Grimmway and Earthbound, you can find pretty much everything, all year round.

Including asparagus in January, I discovered. This was the one vegetable I prepared that wasn't grown by Cal-Organic or Earthbound; it had been grown in Argentina and imported by a small San Francisco distributor. My plan had been a cozy winter dinner, but I couldn't resist the bundles of fresh asparagus on sale at Whole Foods, even though it set me back six dollars a pound. I had never tasted organic South American asparagus in January, and felt my foray into the organic empire demanded that I do. What better way to test the outer limits of the word "organic" than by dining on a springtime delicacy that had been grown according to organic rules on a farm six thousand miles (and two seasons) away, picked, packed, and chilled on Monday, flown by jet to Los Angeles Tuesday, trucked north to a Whole Foods regional distribution center, then put on sale in Berkeley by Thursday, to be steamed, by me, Sunday night?

The ethical implications of buying such a product are almost too numerous and knotty to sort out: There's the expense, there's the prodigious amounts of energy involved, the defiance of seasonality, and the whole question of whether the best soils in South America should be devoted to growing food for affluent and overfed North Americans. And yet you can also make a good argument that my purchase of organic asparagus from Argentina generates foreign exchange for a country desperately in need of it, and supports a level of care for that country's land—farming without pesticides or chemical fertilizer—it might not otherwise receive. Clearly my bunch of asparagus had delivered me deep into the thicket of trade-offs that a global organic marketplace entails.

Okay, but how did it taste?

My jet-setting Argentine asparagus tasted like damp cardboard. After the first spear or two no one touched it. Perhaps if it had been sweeter and tenderer we would have finished it, but I suspect the fact that asparagus was out of place in a winter supper made it even less ap-

petizing. Asparagus is one of a dwindling number of foods still firmly linked in our minds to the seasonal calendar.

All the other vegetables and greens were much tastier—really good, in fact. Whether they would have been quite so sweet and bright after a cross-country truck ride is doubtful, though the Earthbound greens, in their polyethylene bag, stayed crisp right up to the expiration date, a full eighteen days after leaving the field—no small technological feat. The inert gases, scrupulous cold chain and space-age plastic bag (which allows the leaves to respire just enough) account for much of this longevity, but some of it, as the Goodmans had explained to me, owes to the fact that the greens were grown organically. Since they're not pumped up on synthetic nitrogen, the cells of these slower-growing leaves develop thicker walls and take up less water, making them more durable.

And, I'm convinced, tastier, too. When I visited Greenways Organic, which grows both conventional and organic tomatoes, I learned that the organic ones consistently earn higher Brix scores (a measure of sugars) than the same varieties grown conventionally. More sugars means less water and more flavor. It stands to reason the same would hold true for other organic vegetables: slower growth, thicker cell walls, and less water should produce more concentrated flavors. That at least has always been my impression, though in the end freshness probably affects flavor even more than growing method.

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 children's 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 at-

tack, 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 checked, 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. (Several other such studies have appeared since; see the Sources section at the back of this book.)

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 environment? 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, 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."

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, according to David Pimental, 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.