Companion Reading Guide

MYTH#1: We Need Industrial Agriculture to Feed the World

For more than ten years, I've been circling the globe, talking with farmers and farming families from Mali, Kenya, Brazil, India, Poland, Bangladesh, China, Mexico, the Midwest, California, the Gulf of Mexico, and beyond. Across such diversity of geography, language, and history, I've heard the same story: the damage—to the environment, to farmers, and to eaters—of industrial agriculture, and the power and potential of sustainable farming.

These stories have shaped my understanding of our food—how we best grow food, and how we can ensure all have access to nourishing food—and shaped the story you hear in this film. This companion reading guide helps you dig deeper and learn more. You can find more resources at foodmyths.org.

– Anna Lappe, Food MythBusters

"The **world's population** keeps growing.
By 2050, we'll have to **double food production.**

For that we'll need genetic engineering, advanced pesticides, and fertilizer - lots of fertilizer. That's why we're working every day, hand-in-hand with farmers and their families."

What's the real story about population growth?

When I started this project, it felt like I couldn't pick up a newspaper without reading that we needed to get serious about producing more food because we have to double food production by 2050, or we'll all go hungry. One reason, we heard, is that population is going to hit 9 billion. Maybe you've heard it too?

But dig beneath those numbers and a different story emerges, one that belies the myth that we need industrial agriculture to feed the world. Those tracking population growth tell us we could indeed top 9 billion by 2050, but it's not inevitable. We have a choice. We'll get there *only* if we fail to empower women around the world.

Here is what I mean.

First, let's get clear: There is no "population explosion" today. Over the last four decades the average family size worldwide has dropped by about half, stabilizing the annual increment of the world's population growth.[1] This progress largely reflects women's increased educational and economic opportunities, as well as access to contraception and healthcare.[2] Whether we halt population growth soon depends on whether we continue to invest in these improvements. For example, today more than 40 percent of births are unintended, but if "all births resulted from women actively intending to conceive," the fertility rate would quickly fall to "slightly below the replacement level," predicts WorldWatch president Robert Engelman. And we now know what it takes in terms of the availability of health services and opportunities for women so that they can make such reproductive choices.

Plus, because sustainable farming empowers women in part because it doesn't require credit to buy farm inputs—often selectively denied to women farmers—and because sustainable farming emphasizes knowledge-intensive practices, it directly contributes to women's advancement. That is linked directly to slowing population growth.

Do we really need to double food production by 2050?

We've been hearing this claim a lot lately—from politicians to CEOs of food corporations.[3] Doubling food production sure sounds daunting; we certainly can't afford to double the amount of farmland, so this must mean we've got to figure out how to produce twice as much for every acre—right?

But what's the real story? It turns out the United Nations, the alleged source of the "doubling" estimate, actually says that agricultural production and consumption are projected to increase by 60 percent—not to double.[4]

But whatever the projection, a fixation on producing more with high-input farming can blind us both to the ways to increase the food supply that has nothing to do with production *and* to sustainable agriculture's potential to expand production.

Reducing waste can increase supply without any of the ecological downsides of growing more. And opportunities to reduce waste abound!

Globally, over a third of the world's grain goes to livestock on factory farms that are expanding into new markets every year, especially in China and Eastern Europe.[5] Of course, when livestock graze and eat waste products, they turn inedible substances into high-grade protein, but factory farming creates a protein factory in reverse. By contrast, localizing grazing livestock on family farms can reinstate efficient production with ecological benefits—all the while diverting less grain to animals and increasing the supply for people to eat directly.

To get a sense of the potential to increase supply by expanding production, consider that even after accounting for all the food we get from livestock, the calories we lose from feeding cereals to livestock instead of directly to people totals an equivalent that could feed *3.5 billion people,* according to the United Nations Environment Program.[6]

The projected need to double food production assumes that the expansion of this wasteful food production system continues unabated here and around the world.[7]

Another waste we can reduce is the land now diverted to producing "fuel crops." Field corn—the biggest U.S. crop—destined for agrofuel now makes up a whopping 40 percent of all U.S. corn production.[8]

And then there is the literal waste—what's left in the fields, thrown out, or rots—that we can reduce. Today, as much as one third of all food worldwide is wasted—plowed under by farmers who can't find markets for it; rotted post-harvest because of poor storage; or just tossed out by processors, distributors, restaurants, or consumers.[9]

Moreover, claims about needing to double production often ignore the potential productivity untapped on many farms in developing countries. And the reason has nothing to do with agricultural savvy. Without dependable access to markets, many poor farmers simply don't grow as much as they could. Would you knock yourself out all year growing enough to sell, if you had no idea whether there would be buyers for what you'd produced? Not likely! So, in a very real sense, this lack of dependable markets is a source of food waste—the wasted potential of what farmers could grow, but don't. Improve farmers' access to markets and we'd likely see production—on the same acreage—go way up.[10]

And then there's the proven potential of sustainable agriculture to increase production, as noted below with links to significant studies.

Finally, as I will emphasize again in a moment, even if food production were to double, we wouldn't necessarily end hunger—no matter how big the planet's population was. For hunger isn't today—and won't be tomorrow—a question of productivity. Today, the world produces over 2,800 calories for every human being on earth every day—*more than enough.*[11] Yet, hundreds of millions go hungry. Hunger, at its root, is not about a lack of food but about people's lack of power to secure land and income to grow and buy food. And this reflects a deeper lack: the lack of real democracy. Fortunately, sustainable family-scale farming is one way to increase production that also can help address this root cause as it empowers farmers.

"Messages like this one seem to be popping up everywhere. **But who's really behind them?** Turns out it's the corporations profiting from this way of farming – like those selling the pesticides, fertilizers, and chemicals.

They're spending billions to warn us that their way is the only way, with industry groups like the Alliance to Feed the Future, whose members include the Association for Dressings and Sauces and The National Frozen Pizza Institute."

Who's spinning the story that people will starve without industrial agriculture, and how are they doing it?

I've been looking into the story of our food for more than ten years and over all these years I've kept stumbling on emphatic declarations about the inadequacy of organic agriculture and the need for the industrial and chemical path. I've also noticed that so many of the *most emphatic* declarations extolling industrial agriculture come from those profiting from it.[12]

News articles appear like the one in *Fast Company* that quotes Peter Brabeck-Letmathe, Chairman of the Board of Nestlé, one of the world's largest food companies, saying he is "skeptical" of organic food.[13] But I can't help but wonder if someone who made $10.7 million in 2010 from a company selling foods produced with industrial and chemical inputs might have some self-interest in questioning organic production.[14] It is no surprise, either, that the East Africa head of Syngenta—one of the world's largest chemical manufacturers—would say: "Organic agriculture is not a choice for Africa at the moment. Africa needs to be able to produce enough food for itself.... This is not possible through organic agriculture."[15]

But if we listen, instead, to agronomists,[16] economists,[17] epidemiologists,[18] and public health[19] and food security experts[20] —we'd know of the strong and growing evidence that directly contradicts Brabeck-Letmathe's claims.

Unfortunately, such evidence keeps getting drowned out by louder voices. How are these companies spending their billions to convince us their way—their chemicals, fertilizer, seeds, and more—is the only way?

Advertising Campaigns: In 2011 alone, Monsanto budgeted $1.1 billion to market their seeds and chemicals to farmers and to convince the broad public they are needed and safe.[21] This biotech behemoth controls more than 85 percent of the market for genetically engineered seeds and brought us chemicals like 2,4-D, a component of the infamous toxic defoliant Agent Orange, which was used in the Vietnam War.[21] With glossy sustainability reports and well-funded print advertisements, the company has been working to position its products as key to conservation in efforts, as with its "Produce More/Conserve More" advertising campaign. The campaign includes a website — ProduceMoreConserveMore.com—and an ad that ran in *The New Yorker, Wall Street Journal, The New York Times,* and *The Hill*. The company's full-page spread asks the leading question: "How can we squeeze more food from a raindrop?" Monsanto's answer is genetic engineering—even though there had not been one single drought-resistant genetically engineered seed successfully commercialized.

Front Groups: The food industry also works to spread its message by creating organizations that sound like they're backed by regular Joes, but are actually designed and funded by the industry. A few years ago, for instance, you may have read about the American Farmers for the Advancement and Conservation of Technology (AFACT). These salt-of-the-earth farmers were speaking out to defend rBGH—a synthetic hormone used in dairy production—against public health and animal welfare advocates who were fighting to ban it. But scratch beneath the surface and you'd discover that AFACT was actually formed by a communications firm whose biggest client is Monsanto. And guess who makes rBGH? Yup, Monsanto.[23]

Trade Associations: It is common practice for companies in the same sector to pool resources to lobby, advocate, and message together. The food industry is no different. In recent years, a few trade associations have been created to proactively shape the narrative about food—and to fight back against the success of *Food Inc.*, Michael Pollan, Eric Schlosser, and other thought leaders who have raised the public consciousness about the true costs of industrial agriculture.

In March 2011, for instance, a new group called the Alliance to Feed the Future was officially launched to "tell the real story of modern food production" in response to "misperceptions about modern food production and technology."[24] Its members include groups like the National Frozen Pizza Institute and the Association for Dressings and Sauces. Other members include CropLife America (formerly known as the National Chemical Manufacturers Association), and the Calorie Control Council, which represents the sugar and fat substitutes industry—they're the people who brought us aspartame, saccharin, and fat replacers like olestra.

Call me a cynic, but I don't think Ranch-style dressing and diet sodas are the way to address hunger —or agriculture's harmful environmental impacts—in the world.[25]

Launched in 2011 as well, the United States Farmers and Ranchers Alliance gets much of its funding from the nation's biggest commodity grower groups and corporate sponsors including DuPont, John Deere, and Monsanto, among others. Estimates put its annual budget in the tens of millions of dollars.[26] It was founded, says its website, to "rebuild trust in modern agriculture" and has launched "food dialogues" to allegedly do just that, but in fact dismissing public concerns about antibiotics in meat production, genetically modified organisms, and toxic pesticides.[27]

The Alliance hired the communications firm of Frank Luntz "to strengthen the image of agriculture and enhance public trust in today's best production practices."[28] You might remember Frank Luntz as the communications maestro who led the Republican campaign to foment public doubt about the veracity of climate change science—a strategy revealed in a leaked memo.[29]

"But ask farmers who really know how to feed us and you'll get a very different story – a heartbreaking and hopeful story that I've heard talking to hundreds of families.

Fifty years of this myth – and lobbying dollars to support it – **have tilted the playing field** to favor corporate-controlled, chemical agriculture, giving farmers little or no support for any other path. So it's easy to understand a lot of farmers feel it's either 'get on board or get out.'"

How is the playing field tilted to favor industrial agriculture?

Agribusinesses and chemical agriculture companies are some of the biggest lobbyists on Capitol Hill, pushing for policies that benefit their industries—and tilt the playing field. Over the decades, they've been hugely successful—and have spent a lot of money to be so.[30]

Agricultural special interests spent $173.5 million lobbying for the 2008 farm bill alone, according to analysis from Food and Water Watch.[31] Among the benefits captured by the largest players in the food system are the commodity subsidy titles in the farm bill.[32] For example, between 2003 and 2005 corn producers received a whopping $17.6 billion in subsidies; soybean producers got another $2 billion.[33]

While we might think of these subsidies as just benefiting the commodity growers, they've been a big benefit to livestock factory farm operators. Think about it: Feed accounts for 60 percent or more of the cost of production for most factory farm operations, so government policies that keep prices for grain and soy low are a boon to processors.[34] By one estimate, federal corn and soybean subsidies saved factory farms $35 billion between 1997 and 2005.[35]

And that's just one example of what lobbying on the farm bill will get you. The biggest players in the food industry

also actively lobby around trade policy, food safety regulation, and environmental protection policies, for instance. Groups like the Pesticide Policy Coalition, funded by chemical companies, have been fighting tougher Environmental Protection Agency regulations, including the use of the Endangered Species Act to control toxic pesticides.[36]

In striking contrast, farmers who want to grow food sustainably have historically received little support, whether in tax-funded incentives or in training opportunities. The first organic agriculture major in a university "school of agriculture" was introduced only six years ago at Washington State University. Moreover, farmers who want to cut a different path face many barriers: with the consolidation of rural banking, farmers who want to go organic often find it hard (if not impossible) to secure working capital to make the shift. At the highest levels, our priorities have not been organic. Consider, for instance, that just two percent of research dollars at the Department of Agriculture go toward research and training for organic farming practices.[37]

"'Getting on board' means farmers stop practices that keep soil healthy and go for single crops. Livestock that used to be raised on the farm get crammed into polluting factories. To keep **this unnatural system** going, these farmers now buy expensive inputs, all from ever-fewer corporations demanding ever-rising prices.

It's a quick addiction: pests become resistant so you've got to use more chemicals; livestock become sicker so you've got to use more drugs; soil loses its natural fertility so you've got to use more chemical fertilizer."

How do you define "industrial agriculture"?

One way to think about "industrial agriculture" is that it's a food production system that replaces natural cycles and ecological processes with synthetic inputs and fossil fuels. In an era when we know fossil fuels and mined minerals are becoming more expensive (not to mention running out) this system becomes ever more costly and irrational.

Industrial agriculture takes what was once a highly efficient system—farming that turns solar energy into food we humans can eat—into a highly energy-intensive one. Where sustainable farms build soil fertility through ecology, through techniques like planting nitrogen-fixing crops, industrial operations must import fertility to the farm using a mixture of nitrogen, mined phosphorus, and potash (N, P, and K).[38]

Planting single varieties across vast acreage—called monocultures—is at the heart of the industrial model. Monocultures enable you to plant uniform rows, spray uniform chemicals and fertilizers, and use large-scale machinery, cutting down on labor costs. But planting a monoculture means farmers don't actively build healthy soil, and they forego the benefits to plants and soil that come from planting a variety of crops.[39] Many industrial farms also leave their fields bare much of the year, making the land vulnerable to erosion.

Industrial agriculture's approach to raising livestock separates animals from their source of food, as livestock move off fields and into factories.[40] One result? Livestock become more vulnerable to disease—and drug use on the farm become commonplace.[41] Another result? What was once a great source of nutrients for farming—animal manure—becomes a source of serious air, water, and soil pollution. Stored in what the industry euphemistically calls "lagoons," waste runoff from factory farms has become a major public health and environmental problem. In addition, manure stored in cesspits breaks down without oxygen (anaerobically), which releases methane into the atmosphere, which is a potent greenhouse gas.[42]

What's a "CAFO"?

Animal factory farms are also known as CAFOs (concentrated animal feeding operations). They're defined by the EPA as facilities that contain animals in pens for at least 45 days or more a year and don't raise their own feed. Large CAFOs house 1,000 or more cattle, 2,500 or more hogs, or 125,000 broilers (poultry raised to eat) and laying hens.[43] In the past thirty years, we've seen a fast-paced consolidation in livestock production, with fewer operations raising more animals every year.[44]

What's the pesticide treadmill?

Industrial farmers also rely on chemicals to fend off pests, kill weeds and fungi, and otherwise protect plants. But we're seeing that the use of these chemicals over time leads to weeds and pests developing resistance, with farmers needed to apply even more chemicals to achieve the same effect. Resistance to pesticides is a widely known problem in chemical agriculture. According to Dr. David Pimentel of Cornell University, more crops are lost to pests today than in the 1940's, even though we use 33 times more chemicals with at least ten times higher potency. Crops genetically engineered to be resistant to the herbicide glyphosate have also led to worrisome weed resistance. Today, over 12 million acres are choked with "superweeds," as some call them.[45]

This chemical addiction is also costly. Take industrial corn growers, for instance, who use three times as many chemical pesticides as soy and significantly more than wheat and cotton and many other crops. These growers also use significant amounts of synthetic fertilizer.[46] So it should be no surprise that nearly half an industrial corn farmer's costs per acre go to paying for synthetic fertilizer and paying for chemicals like these:[47]

Acetochlor	*2,4-D*	*Chlorpyrifos*	*Lamda-cyhalothrin*
Atrazine	*Bifenthrin*	*Nicosulfuron*	*Methomyl*
S-Metolachlor	*Cyfluthrin*	*Permethrin*	*Thiodicarb*
Mesotrione	*Zeta-cypermethrin*	*Indoxacarb*	
Terbufos	*Esfenvalerate*	*Spinosad*	

"Then, on the other side, when farmers try to sell their crops, they face **only a few big buyers** offering unpredictable prices. The economics don't work for long.

Over the last fifty years, millions of desperate farmers have had to **sign contracts with corporations** that dictate their every move or have lost their farms altogether.[48] More and more, farm income is concentrating at the top so now only one in ten U.S. farms can support a family."[49]

Why does concentration of control in the food system matter?

University of Missouri professor Dr. William Heffernan and his colleague Mary Hendrickson have been tracking consolidation in the food industry for years. Whereas many companies used to compete in the market across the food chain, today a handful of companies control large portions of it. A general rule of thumb among economists is that once four or fewer companies control forty percent or more of a market, you lose true competitiveness, which impacts all customers. In the case of food and farming, that customer is the farmer—and the consumer—and consolidation means higher prices and less choice. It also means more muscle in the policy-making arena, so that fewer and fewer food corporations are influencing our policy makers.

By 2007, just four companies controlled over 80 percent of beef packing.[50] And most meat production had been concentrated into the hands of a few multinational companies, shifting control from independent producers to companies that dictate almost every aspect of the supply chain, from breeding to slaughter and processing.[51] In retail, consolidation is just as extreme. Today, nearly one in four food dollars is spent at a Walmart, and in some communities the percentage is even higher.

But don't farmers benefit from higher productivity?

Industrial agriculture defenders say the system helps farmers produce more per acre. Sounds good—at first. But the reality on the ground looks quite different, because farmers' input costs go up, too. Take corn. Industrial corn growers have seen their bushels per acre shoot through the roof since the 1970s—nearly doubling—but that's come at a big cost.[52] From 1975 to 2010, chemical costs for corn growers rose over threefold, fertilizer costs went up three-and-a-half fold, and seed costs went up almost tenfold. Overall, from 1960 to 2010, fertilizer use climbed nearly 300 percent, but price increases were even greater: During that same period, prices went up at least 500 percent.[53]

"In many other countries, a similar thing is happening. Small farmers who buy into the promise that corporate agriculture is the solution often get **trapped by debt and dependency.**[54]

So yes, corporate agriculture is good for some folks - including some of the largest growers - but not the typical farm family.[55] And that's strike one for this myth."

How does industrial agriculture impact farmers around the world?

When I traveled to the Punjab in India, I heard firsthand the experience of farmers who had been sold on the Green Revolution model of high-input agriculture. Many decades later, their soils were eroding, crops were dying in the fields, and the costs of chemicals and fertilizer had so indebted so many of them that suicides had become epidemic in their communities.

The model of industrial agriculture also encourages production of commodities for export versus actual food that nourishes communities. Faced with pressure to serve export markets not local communities many small-scale farmers around the world find themselves going hungry.[56]

There are many other impacts on local communities, including loss of biodiversity affecting native seeds and plant species and the impact on local ecosystems that become more vulnerable to weather extremes.

"But we have to feed the world, right? If not this way, what choice do we have? A great one. We just don't see ads for it and it certainly isn't getting the subsidies going to corporate ag. State-of-the-art sustainable farming ends this unnatural chemical addiction.

It uses **better practices,** not ever-more expensive purchases. Sustainable farmers build healthy soil by planting a variety of crops and rotating them. They raise their animals on the farm, not in cramped factories. They fertilize using compost and livestock or planting soil-nourishing crops. Healthier plants with good crop rotation also help keep pests in check without hurting the bugs we need – like those all-important pollinators."

How do you define "sustainable farming"?

Chemical giants Monsanto and Syngenta say they're in the business of "sustainable agriculture" but so does the organic vegetable grower selling at your weekly farmers market. So what does "sustainable agriculture" really mean?[57]

Here's one definition from the 1990 farm bill. That year, the farm bill defined sustainable agriculture as a way of farming that satisfies human food and fiber needs; enhances environmental quality and natural resources; makes the most efficient use of nonrenewable resources and on-farm resources; sustains the economic viability of farm operations; and enhances the quality of life for farmers and society as a whole.[58]

That's a good definitional start. There are other terms you might encounter. Below you'll find a few of them and a little bit about what makes each unique. I chose to talk about "sustainable farming" in the film—not specifically organic agriculture, for instance. Because there are many practices along the spectrum of sustainability that still make huge improvements in terms of human, environmental, and animal welfare impact, but that are not organic farming by the letter of the law. And, of course, there are many farmers that go well beyond the requirements of organic, bringing even greater soil health and biodiversity to the farm.

Biodynamic farming: Pioneered in the early twentieth century by German philosopher Rudolf Steiner, biodynamic farming emphasizes the relationship between all parts of a farm—the soil, the plants, the animals—and considers all these elements as part of a whole living and self-sustaining system.

Agroecology: Some prefer this term for sustainable agriculture because it puts "ecology" front-and-center. From the Greek *oikos*, or house, ecology is the study of the relationship between living organisms and their environment. Whereas industrial agriculture methods divorce the farm from the natural environment, agroecological farmers work in concert with the ecosystem, and see the health of the surrounding environment as central to the health of their crops and their farm overall.

Agroforestry: All sustainable farming is defined by biodiversity: planting a variety of crops, rotating crops across the fields, planting cover crops, etc. But agroforestry, in particular, emphasizes the integration of trees and shrubs with crops and/or livestock production. Integrating trees has numerous benefits. Certain trees help "fix" nitrogen—a key element in plant growth—helping take nitrogen out of the air and accumulate it in the soil biologically. Trees also provide fodder for animals and protection from rainfall as well as erosion-preventing roots—not to mention, in many cases, food in the form of fruit or nuts.

Certified organic: Since 2002, when the USDA National Organic Program Regulations took effect, farmers in the United States have had a clear, third-party certification system for communicating production practices in the marketplace. Organic-certified foods in the United States are grown in ways that "foster cycling of resources, promote ecological balance, and conserve biodiversity."[59] Synthetic fertilizer, sewage sludge, irradiation, and genetic engineering are not allowed. Certified organic meat and dairy is raised without antibiotics and fed on organic feed.[60]

Are organic farming practices safe?

A few years ago, I watched a food industry flack pooh-pooh organic food by noting that organic farmers use manure for fertilizer, putting (as he said) "the 'ick' in organic." Sure, at first blush adding manure to soils might seem icky, but sustainable farmers integrate manure on the farm with practices that are completely safe. Certified organic growers, in fact, must follow strict rules about how long before harvesting manure can be applied, to ensure that any possible pathogens have died. For centuries, incorporating manure into the cycle of life on a farm has been a vital, safe, and smart way to build soil fertility.

And, don't forget, industrial growers use manure, too. But unsafely. Unlike organic growers, they're bound by no such regulations. And industrial growers regularly use manure from CAFOs that contains everything from pharmaceutical residues, traces of antibiotics, to chemicals and other concerning impurities. Industrial growers also regularly use sewage sludge on their fields, a practice banned from organic production.[61] Now, there's the real "ick" factor!

Aren't there some crops you simply can't grow with organic methods?

We certainly hear this a lot. Take strawberries: Industrial growers argue that they must rely on pesticides like the cancer-causing methyl iodide or ozone-depleting methyl bromide to kill off the fungus that would otherwise kill strawberry plants.[62]

But plenty of organic strawberry growers prove them wrong. To give just one example, organic strawberry farmers have a variety of natural ways of dealing with the most common fungus that threatens strawberry crops. Called *Verticillium dahlia*, the fungus can survive as long as a decade in the soil and causes a disease that kills the plant by blocking water and nutrients from getting to the strawberries. So how do sustainable strawberry growers deal with the fungus? Simple but ingenuous approaches like a fruit-vegetable crop rotation. Broccoli plants, it turns out, have a compound that suppresses the fungus and creates a healthy soil environment teaming with life, so that no particular bacteria is dominant. Planting broccoli in the off-season keeps the fungus in check so the strawberry plants are healthy. Broccoli plants also provide 'green manure'—more soil nutrients—for newly planted strawberries; even as they provide farmers an additional source of income.[63]

"And how does this choice impact everyone else? Massively. Industrial farms degrade and erode precious **topsoil** – 64 tons per acre are being lost every year in some spots in our heartland.[64] They suck up huge amounts of water – a lot of it from deep underground – essentially irreplaceable. And they use millions of pounds of **antibiotics** – a practice that leads to dangerous new bacteria.[65]

They also produce **toxic run-off** that pollutes our rivers, our oceans, and us![66] The average American already has at least 13 pesticides in our bodies.[67] And thanks to **chemicals** in the field, farmers and farm-workers have higher rates of many cancers."[68]

What are some of the true costs of industrial agriculture?

Soil loss: One of the greatest harms of industrial agriculture is what its farming methods do to our soil. You don't have to be a farmer to know that soil is important—very important. Yet, mainly because of industrial methods, 90 percent of US cropland is losing its topsoil—what we depend on to grow food—faster than nature can build it.[69]

Public health: Antibiotic-resistant bacteria are just one of the public health crises connected to industrial meat production. Today, an estimated 80 percent of antibiotics used in the United States are being used on factory farms, and mostly at subtherapeutic levels to promote growth.[70] We've known about this public health concern for decades. Thirty years ago my father, Dr. Marc Lappé, wrote a book about it called *Germs That Won't Die: Medical Consequences of the Misuse of Antibiotics*. Despite the public health risk—strains of bacteria infecting humans that have become drug resistant because of overuse on animals—the livestock industry continues to misuse antibiotics on the factory floor.[71]

While most of the antibiotics in livestock farming are used to promote growth—not to handle illness—CAFOs are also breeding grounds for parasites, and drugs are the preferred method of treating them. "Animal Pharma" is a lucrative segment of the pharmaceutical industry.

Water pollution: Toxic agricultural chemicals and pharmaceuticals used in livestock production leach from manure cesspits or agricultural fields into our groundwater—the source of much of our drinking water. Moreover, one EPA study found that agricultural activity was a source of pollution for 48 percent of streams and rivers and 41 percent of lakes in our country.[72]

Chemical fertilizer not taken up by plants also finds its way into our oceans. Runoff that flows into the Mississippi has created massive algal blooms in the Gulf of Mexico that make it impossible for any other aquatic life to thrive in what is known as a dead zone. Every year, it swells to the size of New Jersey. Another massive dead zone in the Chesapeake Bay, mainly caused by runoff from industrial poultry operations, is a major environmental crisis—not to mention a threat to food supplies in that area. The United Nations Environment Program calls the hundreds of dead zones like these around the world one of the gravest environmental problems of our time.[73]

Farmer and farm worker health: One of the most compelling cases for reducing pesticide use is the impact of these chemicals on farmers and others who come into contact with them. In one of the best studies of pesticide impacts, the Agricultural Health Study found that farmers and farming communities have higher rates of leukemia, non-Hodgkin lymphoma, multiple myeloma, and soft tissue sarcoma, as well as cancers of the skin, lip, stomach, brain, and prostate.[74] Acute pesticide poisonings on the farm are also cause for concern, with the World Health Organization estimating that there are 25 million cases of occupational pesticide poisoning every year, though the bulk of these poisonings don't get reported because farmers or farm workers typically don't have access to medical care or public health services.[75]

You might hear a different story, though. I've heard chemical-agriculture apologists suggest that because farmers typically live longer and are healthier than the general public, farm chemicals are obviously harmless. The difference in overall longevity is accurate because farmers tend to have healthier lifestyles than most Americans: They drink and smoke less and enjoy lower rates of obesity. But it's also true that farmers and farming communities suffer higher rates of certain cancers and other illnesses linked to chemical exposure. That we know is true.

"So the sustainable farm is better for farmers and the environment but can it really feed the world? Study after study is saying yes! Sustainable farms produce as well… and in drought years even better. This is important news for small farmers who grow 70 percent of the world's food - to **increase production** they don't have to follow the chemical path."[76]

What are the best studies about sustainable agriculture's benefits?

In the past decade, we've seen significant new research coming out of major institutions around the world that builds a strong case for sustainable farming. From the United Nations Food and Agriculture Organization to the International Assessment of Agricultural Knowledge, Science, and Technology for Development, these studies emphasize sustainable agriculture's productivity benefits and, even more importantly, its power to produce today without undermining the resources needed to produce tomorrow.[77]

In one of the largest studies of its kind, researchers at the University of Essex analyzed 286 farming projects in fifty-seven countries, including 12.6 million farmers, and found that yields across a wide variety of crops jumped on average 79 percent when farmers transitioned to sustainable agriculture practices.[78] In East African projects, the improvement was even more striking: Transitioning to sustainable agriculture increased average yields by 116 percent.[79]

The well-respected Rodale Institute, based in Pennsylvania, has conducted a multi-decade side-by-side study of organic and non-organic farming systems. The researchers have found that organic yields in most years match those of the chemically grown crops and that organic production methods outperform chemical ones in drought years by as much as 31 percent. Other benefits? Organic methods used 45 percent less energy and produced 40 percent less greenhouse gases.[80]

The Iowa-based Leopold Center recently completed a 12-year, peer-reviewed study of organic versus chemical corn-soybean rotations. The research found that the organic crop systems had similar yields, but a much higher economic return to the farmer.[81]

Considered perhaps the world's most credible research-based assessment of global agriculture, the International Assessment of Agricultural Knowledge, Science, and Technology for Development (IAASTD) was a four-year initiative commissioned by the World Bank, among others, and now endorsed by fifty-four governments. The study involved 400 authors and peer-reviewers from around the world. Among its conclusions, the IAASTD stresses the benefits of agroecology and small-scale farming and the importance of sustainable management of livestock, forests, and fisheries. Based on the results of this extensive research, the IAASTD authors urge a transition to "biological substitutes for agrochemicals" and the reduction of "the dependency of the agricultural sector on fossil fuels."[82]

Another important paper was completed a few years ago by researchers at the University of Michigan. In a review of 300 studies comparing yields from certified organic, industrial, and low-input agriculture, the researchers found that by adopting agroecological approaches farmers could grow between twice to four times as much food compared with their previous practices. Based on the data analysis, the authors estimated that global food supply would be greater for every single food category they investigated if we transitioned to organic agriculture methods.[83]

"And **the future** we're all talking about feeding? The industrial farm requires more fossil fuels,[84] water,[85] and mined minerals[86] - all stuff that will only get more expensive as it runs out.

So down the line, the chemical path not only can't work for farmers; it won't be a choice at all. Corporate agriculture doesn't reliably grow more food in the future - or even today. And that's strike two for this myth."

What's the future availability of the "inputs" that industrial agriculture depends on?

The future ain't too pretty for these inputs. All farmers need a source of fertility and industrial growers get theirs by purchasing the big "nutrients"—nitrogen, potash, and phosphorus. But their procurement is only going to get tougher—and more expensive. While nitrogen itself is abundant in the atmosphere, it requires enormous amount of energy to synthesize it into a usable form. In China, 70 percent of nitrogen production is powered by coal; in the United States, fertilizer production uses significant amounts of natural gas.[87]

Phosphorus, a mined mineral and another component of manmade fertilizer, is getting increasingly hard to mine. Some estimate that within a few decades it could be gone completely. But before it runs out, it will become increasingly difficult to source. Today, most phosphate-bearing rock is found only in a handful of countries: Morocco, China, South Africa, Jordan, and the United States.[88] And mining it produces a troubling side effect: For every ton we secure, we produce many more tons of radioactive waste. Today, the US is home to more than one billion tons of this waste now stored in seventy locations, some towering as high as a twenty-story building and as large as 605 football fields.[89]

"But we still haven't looked at the biggest hole of all. They say we need to double food production or we'll go hungry. Really? We already have almost 3,000 calories a day available for every human being on Earth[90] - more than enough.

And that's after wasting a third of all food grown,[91] and most of what is grown isn't food we eat directly. A third of the world's grain is going to livestock.[92] In the U.S. our biggest crop is corn, but less than one percent of all corn planted is what we eat.[93]

Most goes to fuel or feed. Staying on this track, we could increase production and still have **more hunger.**[94] To end it, everybody has to have the power to buy or grow the food they need. And that's what sustainable farming is all about. Strike three for this dangerous myth."

What are the real root causes of hunger?

They're not hard to see: Hunger exists amid increasing plenty in large part because too many economies concentrate wealth in the hands of a few.[95] Today, 71 percent of all people live in countries where economic inequality is increasing.[96] Start with the United States. Economic inequality here is worse than in Egypt. So, even though the United States is the world's largest agricultural exporter, over 46 million of us—about one in seven—is so poor that we must turn to food stamps to be able to eat.[97] Or consider India, the country that is home to about one-quarter of all the world's hungry people.[98] In mid-2012, India had enough surplus grain that if it was stacked in bags end to end, one could walk on Indian grain to the moon and back![99]

"So the next time someone who makes frozen pizza – or toxic pesticides – tells you there's only one way to feed the future, tell them their story is full of holes. The evidence is clear: sustainable farmers prove we all can enjoy healthy food – and **we each have power** to make this happen.

We can redirect our own food dollars and the billions in public money now going into the pockets of Big Ag. We can stand up and speak out for sustainable farmers here and around the world."

Visit FoodMyths.org to learn more, connect with the hundreds of groups at the front lines of this struggle, and get involved.

1. Robert Engelman, "The End of Population Growth," *Solutions Journal* 3(2), April, 201. http://www.thesolutionsjournal.com

2. Laurie Mazur, "Women's Rights Are Key. Sustainability Forum on the Population Factor," Policy Innovations Magazine, September 19, 2011. "Over the last half century, we've learned that the best way to slow growth is not through coercive "population control," but by ensuring that all people are able to make real choices about childbearing. Women's rights are key... Nations can raise women's status by educating girls, by enforcing laws that prohibit child marriage, and by improving women's access to credit, land, jobs, and training. Where women enjoy these fundamental rights, smaller (and healthier) families become the norm."

3. See for instance, comments like this one from Hugh Grant, Chairman and CEO of Monsanto: "The figures from the United Nations are daunting: By 2050 our current food production will have to be doubled to feed an anticipated world population of 9.3 billion." http://www.nysemagazine.com/monsanto/.
Or this one: "By 2050 we will have to feed 9.3 billion people and food production has to double." -Peter Brabeck-Letmathe, Chairman of the Board, Nestlé. http://www.nestle.com/csv/Nestle/messagechairman/Pages/messageChairman.aspx

4. United Nations, "World Agriculture Toward 2030/2050: The 2012 Revision," Agricultural Development Economics Division, Food and Agriculture Organization. June 2012.

5. "At present, nearly half of the world's cereal production is used to produce animal feed, and meat consumption is predicted to increase from 37.4 kg/person/year in 2000 to over 52 kg/person/year by 2050, so that by mid-century, 50 percent of total cereal production may go to increasing meat production." Report submitted by the Special Rapporteur on the Right to Food, Olivier De Schutter to the UN Human Rights Council, December 2010, pg. 4.
http://www.srfood.org/images/stories/pdf/officialreports/20110308_a-hrc-16-49_agroecology_en.pdf
Food and Agriculture Organization (FAO), World Agriculture: towards 2030/2050, Interim Report, Rome, 2006.
Factory farms are cropping up all over the developing world - especially in the Phillipines, Mexico, China, India, and the former Soviet Union. See for instance: Danielle Nierenberg, "Factory Farming in the Developing World," World Watch May/June 2003. http://www.worldwatch.org/node/534

6. United Nations Environment Program, "The Environmental Food Crisis: The Environment's Role in Averting Future Food Crises." February 2009, pg. 27. http://www.unep.org/pdf/foodcrisis_lores.pdf

7. See, for instance the expansion of factory farming in China: Mia MacDonald and Sangamithra Iyer, "Skillful Means: The Challenges of China's Encounter with Factory Farming," *Brighter Green*, August 2008.
http://brightergreen.org/files/brightergreenchinaprint4.pdf

8. 40.9 percent of corn planted went toward fuel production in 2011/12. USDA Economic Research Service Feed Grains Database. http://www.ers.usda.gov/data-products/feed-grains-database/feed-grains-custom-query.aspx

9. The results of a UN study on food waste suggest that about one-third of food produced globally is wasted, amounting to about 1.3 billion tons per year. Jenny Gustavsson, Christel Cederberg, and Ulf Sonesson, "Global Food Losses and Food Waste: Extent, Causes and Prevention," UN Food and Agriculture Organization, 2011. For more on food waste, see: Jonathan Bloom, *American Wasteland: How America Throws Away Nearly Half of Its Food (And What You Can Do About It)*. Boston, MA: Da Capo Press, 2010. www.americanwastelandbook.com

10. To ensure market access, smallholder farmers need infrastructure and supports so that prices are high enough to cover their costs. "Dumping" from countries with excess commodities (often artificially so through subsidies) to many countries in the Global South often disrupts internal market and prices out local farmers - it's these local markets that need protections, not more trade agreements to export markets. Access and infrastructure to local markets is critical to the question of feeding the world – or better said – the world feeding itself. See: Gretchen Gordon, "Food Crisis in the Age of Unregulated Global Markets," *Food First*. April 2008.

11. For 2009, the most recent year available, the UN Food and Agriculture Organization estimates a food supply of 2,831 calories per capita per day. FAOSTAT, food balance sheets, searchable at:
http://faostat.fao.org/site/368/DesktopDefault.aspx?PageID=368#ancor

12. And profiting, they are. Just one example: Ellen Kullman, CEO of DuPont, the largest chemical maker in the U.S., expects profits to rise as much as 12 percent in 2012 to $42 billion due to growth in insecticides, genetically modified seeds, food ingredients, and biofuels. Jack Kaskey, "DuPont 2012 Profit May Rise 12% On Agriculture, Chemicals," *Bloomberg Businessweek*, December 13, 2011.

13. Paul Glader. "Nestle Chairman Skeptical of Growth in Organic Food Market," *Fast Company*. August 23, 2011. http://www.fastcompany.com/1775047/nestle-chairman-skeptical-of-growth-in-organic-food-market

14. Nigel Cassidy, "Nestle Profits Grow Amid Raw Food Price Rise," *BBC Business News*, February 17, 2011. http://www.bbc.co.uk/news/business-12492845

15. Interview with Andy Watt, managing director of Syngenta East Africa. How We Made It In Africa, "Organic Agriculture Not an Option For Africa At The Moment," June 10, 2010. http://www.howwemadeitinafrica.com/organic-agriculture-not-an-option-for-africa-at-the-moment/1101/

16. See Land Stewardship Project: http://www.landstewardshipproject.org/

17. See Crossroads Resource Center: http://www.crcworks.org/?submit=about

18. See Center for Environmental Health: http://www.ceh.org/index.php

19. See Pew Commission on Industrial Farm Animal Production: http://www.ncifap.org/

20. See United Nations Special Rapporteur on the Right to Food, Olivier De Schutter: http://www.srfood.org/

21. See Monsanto 10-k. www.secinfo.gov

22. Based on industry statistics, ETC Group estimates that Monsanto's biotech seeds and traits (including those licensed to other companies) accounted for 87 percent of the total world area devoted to genetically engineered seeds in 2007. "Who Owns Nature? Corporate Power and the Final Frontier in the Commodification of Life," *ETC Group*. November 2008.

23. Andrew Martin,"Fighting on a Battlefield the Size of a Milk Label," *New York Times*. March 9, 2008.

24. See the press release announcing the launch of the Alliance: "Alliance to Feed the Future Forms to Tell the Story of Modern Food Production," March 15, 2011.
http://www.alliancetofeedthefuture.org/rejected-by-urlscan/Newsroom/PressReleases/AlliancetoFeedtheFuture.aspx

25. For the full list of Alliance to Feed the Future partner institutions:
http://www.alliancetofeedthefuture.org/portals/0/farm/AbouttheAlliance/Partners.aspx

26. USFRA's annual budget ranges from $11 million a year or $30 million depending on who you ask.
USFRA FAQs, "Questions Being Asked About USFRA." http://www.fooddialogues.com/about/faqs/
Alan Rappeport, "US Farming Groups Hit Back at Activists," *Financial Times*. August 16, 2011.

27. Anna Lappé, "Who's Behind the U.S. Farmers & Ranchers Alliance and Why It Matters," *Civil Eats*, September 23, 2011.

28. See the press release announcing the launch of the Alliance: "Alliance to Feed the Future Forms to Tell the Story of Modern Food Production," March 15, 2011.
http://www.alliancetofeedthefuture.org/rejected-by-urlscan/Newsroom/PressReleases/AlliancetoFeedtheFuture.aspx

29. Oliver Burkeman, "Memo Exposes Bush's New Green Strategy," *Guardian*. March 3, 2003.

30. See for instance Ross Choma, "Pharma, Utilities and Big Ag Lead Lobbying in 2012." www.OpenSecrets.org, April 27, 2012. For a history of the influence of agribusiness interests on policy making, see Wenonah Hauter's *Foodopoly: The Battle Over the Future of Food and Farming in America*. New York, NY: The New Press, 2012.

31. "Cultivating Influence: The 2008 Farm Bill Lobbying Frenzy," *Food & Water Watch*. July 2012.
http://documents.foodandwaterwatch.org/doc/FarmBillLobby.pdf

32. The biggest players in the industrial food chain receive benefits in a multitude of ways, through regulatory loopholes that put the environmental cleanup burden of toxic farms on taxpayer shoulders, through commodity subsidies that enable grain traders to pay artificially low prices to growers, and more. To learn more about some of the benefits accrued to the biggest players, see: Environmental Working Group, "Government Records Show Crop Insurance Subsidies Are A Boon To Big Farm Interests," May 31, 2012.

33. Data from Environmental Working Group. To access the EWG farm subsidy database: farm.ewg.org

34. Doug Gurian-Sherman, "CAFOs Uncovered: The Untold Costs of Confined Animal Feeding Operations," Washington D.C.: Union of Concerned Scientists, 2008, pg. 2.

35. Timothy A. Wise and Elanor Starmer, "Feeding at the Trough: Industrial Livestock Firms Saved $35 Billion From Low Feed Prices," ed. Global Development and Environment Institute. Medford, Massachusetts: Tufts University, 2007.

36. Anna Lappé, "Who's Behind the U.S. Farmers & Ranchers Alliance and Why It Matters," *Civil Eats*, September 23, 2011.

37. In 2011, USDA only dedicated roughly 2 percent of its total Research, Education, and Extension (REE) portfolio to research and extension for organic systems. See USDA FY2011 Budget: http://www.obpa.usda.gov/budsum/FY11budsum.pdf.

38. On the consolidation of ownership in the food system, see the work of Dr. Heffernan and Dr. Hendrickson at the University of Missouri, viewable at the Food Circles Networking Project at http://www.foodcircles.missouri.edu/consol.htm. See also, Phil Howard, "Consolidation in Food and Agriculture: Implications for Farmers & Consumers," The Natural Farmer, Spring 2006.

39. For research on the impact of one-crop plantings, or monocultures, on soil fertility see the work of the Pennsylvania-based Rodale Institute at www.rodaleinsitute.org. See also Deborah Koons Garcia's documentary, *Symphony of the Soil* at www.symphonyofthesoil.com.

40. To learn about the consolidation of the livestock industry and the growth of factory farming, see: James M. MacDonald and William D. McBride, "The Transformation of U.S. Livestock Agriculture: Scale, Efficiency, and Risks," U.S. Department of Agriculture, Economic Research Service, January 2009. For more on livestock factory farms, or CAFOs (concentrated animal feeding operations), and their impact on our health, the environment, animal welfare, as well as labor, politics, and economics, see: Dan Imhoff, ed., *The CAFO Reader: The Tragedy of Industrial Farmed Factories*. Healdsburg, CA: Watershed Media, 2010.

41. National Academies Press, *The Use of Drugs in Food Animals: Benefits and Risks*, Washington D.C.: NAP, 1999: 12-13. There are five major types of pharmaceuticals used in factory farming including: antiseptics, bactericides, and fungicides for skin and hoof cuts and infections; ionophores to facilitate digestion for ruminants like cattle and to protect against parasites; steroid anabolic growth promoters; antiparasite drugs; and antibiotics at a subtherapeutic level to promote growth or at higher level to address disease. Those are just the main drugs. Poultry growers, for instance, also use drugs with arsenic, like Roxarsone.

42. Union of Concerned Scientists, "The Hidden Cost of CAFOs: Issue Briefing," September 2008: "CAFO manure has contaminated drinking water in many rural areas, caused fish kills, and contributed to oxygen-depleted "dead zones" (areas devoid of valuable marine life) in the Gulf of Mexico, the Chesapeake Bay, and elsewhere. Ammonia in manure contributes to air pollution that causes respiratory disease and acid rain. Leakage under liquid manure storage "lagoons" pollutes groundwater with harmful nitrogen and pathogens, and some lagoons have even experienced catastrophic failures, sending tens of millions of gallons of untreated waste into streams and estuaries, killing millions of fish."

43. See the EPA Regulatory Definitions of Large, Medium, and Small CAFOs: http://www.epa.gov/npdes/pubs/sector_table.pdf . For detailed scope and definitions, see Code of Federal Regulations 40 CFR 122.23 (4) available at this permanent link: http://cfr.vlex.com/vid/19812671.
Communities across the country are working to stop CAFOs from moving in. Read this heroic account of the impact of CAFOs and one-woman's community-based struggle to fight back, here: www.animalfactorybook.com.

44. For more on livestock factory farms, or CAFOs (concentrated animal feeding operations), and their impact on our health, the environment, animal welfare, as well as labor, politics, and economics, see: Dan Imhoff, ed., *The CAFO Reader: The Tragedy of Industrial Farmed Factories*. Healdsburg, CA: Watershed Media, 2010. To learn about the consolidation of the livestock industry and the growth of factory farming, see: James M. MacDonald and William D. McBride, "The Transformation of U.S. Livestock Agriculture: Scale, Efficiency, and Risks," U.S. Department of Agriculture, Economic Research Service, January 2009.

45. See, for example, Cornell University Professor David Pimentel's study on pesticide residence, including: "Environmental and Economic Impact of Reducing U.S. Agricultural Pesticide Use," *Handbook of Pest Management in Agriculture*, Vol. I. Boca Raton, FL: CRC Press, 1991: 679-718. See, for example, Marion Nestle, "Superweeds: A Long Predicted Problem For GM Crops Has Arrived," *The Atlantic*, May 15, 2012.

46. According to data captured by the USDA, synthetic fertilizer (nitrogen, phosphate, and potash) use in the United States has gone up 279 percent from 1960-2010; prices have far outpaced the rise in usage with increases of at least 500 percent. Phosphate and potassium chloride have seen prices rise twelve to seventeen times since 1960. See: Economic Research Service U.S. Department of Agriculture, "Data Set: Fertilizer Use and Price," 2010.

47. US Department of Agriculture, "U.S. Corn Production Costs and Returns per Planted Acre, Excluding Government Payments." Download the spreadsheet at: http://cta.ornl.gov/bedb/feedstocks/Grains/Corn_Production_Costs_and_Returns_by_Region.xls

48. Contract farming accounts for nearly two-fifths of U.S. agricultural production today. The poultry sector has the highest rate of contracts, with 85 percent of growers under contract. At least half of the production of peanuts, tobacco, sugarbeets, dairy products, and hogs are now grown and raised under contract. Data from: Robert A. Hoppe and David E. Banker, "Structure and Finances of U.S. Farms Family Farm Report, 2010 Edition," U.S. Department of Agriculture, Economic Research Service, July 2010. To learn more about the effect of contract farming on farmer economic security, read Susan E. Stokes, "The Dilemma of Contracting: Risk Management or Risky Business," 2006. To learn more about how much farmland and farms we're losing, read the American Farmland Trust's "Farming On The Edge," Center for Agriculture in the Environment, 2007. Viewable at http://www.farmland.org/resources/fote/default.asp. According to the Trust, we lose more than an acre of farmland every minute in the United States.

49. Only the largest 10 percent of farms support a household from farm income alone. In 2009, earnings from farming made up an estimated 9 percent of the average income from farm operator households. Economic Research Service U.S. Department of Agriculture, "Farm Household Economics and Well-Being: Farm Household Income," 2011. To learn more about the impact of farming loss on rural communities and the impact of companies like Walmart on the rural economy, read: Nelson Lichtenstein, *The Retail Revolution: How Wal-Mart Created a Brave New World of Business*. New York, NY: Picador, 2010.

50. By 2007, Tyson, Cargill, Swift & Co., and National Beef Packing Co. controlled 83.5 percent of the beef packing market. Elanor Starmer, Hogging the Market: How Powerful Meat Packers are Changing our Food System and What We Can Do About It, *The Agribusiness Accountability Initiative*. Also see: James M. MacDonald, et. al., "Consolidation in U.S. Meatpacking," Agricultural Economic Report. USDA, 2000, pg. 47.

51. On the consolidation of ownership in the food system, see the work of Dr. Heffernan and Dr. Hendrickson at the University of Missouri, viewable at the Food Circles Networking Project at http://www.foodcircles.missouri.edu/consol.htm. See also, Phil Howard, "Consolidation in Food and Agriculture: Implications for Farmers & Consumers," The Natural Farmer, Spring 2006.

52. US Department of Agriculture, "U.S. Corn Production Costs and Returns per Planted Acre, Excluding Government Payments." Download the spreadsheet at: http://cta.ornl.gov/bedb/feedstocks/Grains/Corn_Production_Costs_and_Returns_by_Region.xls

53. Economic Research Service, U.S. Department of Agriculture, "Data Set: Fertilizer Use and Price," 2010. Download the spreadsheet at: http://www.ers.usda.gov/data-products/fertilizer-use-and-price.aspx#26718

54. This debt and dependency is a primary factor in many social crises in the global South, especially the epidemic of farmer suicides in rural India. See, for instance, George Lerner, "Farmer Suicides in India Linked to Debt, Globalization," *CNN World*, January 5, 2010. To learn more about this dynamic, see: Frances Moore Lappé and Anna Lappé, *Hope's Edge*. New York, NY: Penguin, 2003, Chapter: Seeking Annapurna. See also this powerful video about sustainable farmers in Andhra Pradesh, India: http://www.youtube.com/watch?v=ve4QdJjxuPo&feature=youtu.be

55. Data from the USDA's Economic Research Service shows that 82 percent of full-time small to midsized family farmers receive subsidies. In 2009, after accounting for land, labor, equipment and input costs, the average family farmer in this category netted only $19,274 from full-time farming. Government payments made up nearly half of that amount. Earnings from off-farm jobs made up the rest of the household's income. To learn more about the role of farm subsidies—and who really benefits—see for instance: Timothy Wise, "Understanding the Farm Problem: Six Common Errors in Presenting Farm Statistics," Global Development and Environment Institute, Tufts University, March 2005.

56. http://www.time.com/time/world/article/0,8599,2110890-2,00.html

57. Read more about sustainable agriculture on Sustainable Table's website: http://www.sustainabletable.org/intro/whatis/

58. "Sustainable agriculture" was addressed by Congress in the 1990 "Farm Bill" Food, Agriculture, Conservation, and Trade Act of 1990 (FACTA), Public Law 101-624, Title XVI, Subtitle A, Section 1603 (Government Printing Office, Washington, DC, 1990) NAL Call # KF1692.A31 1990. http://www.nal.usda.gov/afsic/pubs/terms/srb9902.shtml#toc2

59. Agricultural Marketing Service, U.S. Department of Agriculture, National Organic Program website, viewable at: http://www.ams.usda.gov/AMSv1.0/nop

60. For more about USDA organic certification, terms and requirements, visit the electronic Code of Federal Regulations at: http://www.ecfr.gov/cgi-bin/text-idx?c=ecfr&sid=3f34f4c22f9aa8e6d9864cc2683cea02&tpl=/ecfrbrowse/Title07/7cfr205_main_02.tpl

61. Union of Concerned Scientists, "Confined Animal Feeding Operations Cost Taxpayers Billions, New Report Finds," April 24, 2008. See also: Center for Food Safety, "Sewage Sludge," at: http://www.centerforfoodsafety.org/campaign/sewage-sludge/

62. Although methyl iodide is now banned due to links to miscarriages, thyroid problems, and cancer - big berry growers pushed back hard against regulation. The California Department of Pesticide Regulation was even found to be cherry-picking data to support smaller buffer zones and higher concentrations of the chemical. Jen Quraishi, "California Defied Own Scientists With Pesticide Approval," *Mother Jones*, August 26, 2011. For more on the ban: Twilight Greenaway, "Strawberry Lovers Rejoice: Methyl Iodide Off the Market For Now," *Grist*, March 21, 2012.

63. University of California Agriculture & Natural Resources, Statewide Integrated Pest Management Program. "Pest Management Guidelines: Strawberry, Verticillium Wilt," viewable at: http://www.ipm.ucdavis.edu/PMG/r734100811.html

64. See: Craig Cox, Andrew Hug, and Nils Bruzelius, "Losing Ground," Environmental Working Group, 2011. As much as 90 percent of U.S. cropland is losing soil above the sustainable rate, according to Dr. Pimentel. "In the last 200 years of U.S. farming, approximately 30% of farmland has been abandoned because of erosion, salinization, and waterlogging." See: David Pimentel and Nadia Kounang. "Ecology of Soil Erosion in Ecosystems." *Ecosystems*: 1998, page 418. See also: David Pimentel et al, "Environmental and Economic Costs of Soil Erosion and Conservation Benefits," *Science*, New Series, Vol. 267, No. 5201, February 24, 1995: 1117.

65. According to the FDA, 28.8 million pounds of antibiotics were sold and distributed for food use in animals in 2009. U.S. Food and Drug Administration, "2009 Summary Report on Antimicrobials Sold or Distributed for Use in Food-Producing Animals," Table 1. To put this figure in perceptive, this is about 80 percent of all antibiotics used in the United States. Ralph Loglisci, "New FDA Numbers Reveal Food Animals Consume Lion's Share of Antibiotics." Center for a Livable Future blog, December 23, 2010.

66. In the 2000 National Water Quality Inventory conducted by the EPA, agricultural activity was identified as a source of pollution for 48 percent of stream and river water, and for 41 percent of lake water. U.S. Environmental Protection Agency, "2000 National Water Quality Inventory," (Chapter 2, 3). According to a study by Environmental Working Group, agricultural runoff plays a critical role in the doubling of drinking water violations in the U.S. because of nitrate contamination between 1998-2008. This same runoff of nitrogen and phosphorus is carried into the ocean, creating aquatic "dead zones." In 2010, the dead zone in the Gulf of Mexico grew to the size of the state of New Jersey. Craig Cox, Andrew Hug, and Nils Bruzelius, "Losing Ground," Environmental Working Group, 2011.

67. Kristin S. Schafer et al., "Chemical Trespass: Pesticides in Our Bodies and Corporate Accountability," Pesticide Action Network North America, May 2004. Data is based on the January 2003 CDC National Report on Human Exposure to Environmental Chemicals.

68. National Cancer Institute, "Agricultural Health Study," National Institutes of Health, 2011.

69. As much as 90 percent of U.S. cropland is losing soil above the sustainable rate, according to Dr. Pimentel. "In the last 200 years of U.S. farming, approximately 30% of farmland has been abandoned because of erosion, salinization, and waterlogging." See: David Pimentel and Nadia Kounang. "Ecology of Soil Erosion in Ecosystems." *Ecosystems*: 1998, page 418. See also: David Pimentel et al, "Environmental and Economic Costs of Soil Erosion and Conservation Benefits," *Science*, New Series, Vol. 267, No. 5201, February 24, 1995: 1117

70. U.S. Food and Drug Administration, "Summary Report on Antimicrobials Sold or Distributed for Use in Food-Producing Animals," (2009).
Ralph Loglisci, "New FDA Numbers Reveal Food Animals Consume Lion's Share of Antibiotics," December 23, 2010.

71. "Prescription for Trouble: Using Antibiotics to Fatten Livestock" and "Antibiotic Resistance and Food Safety," available via www.ucsusa.org Proof that antibiotics aren't a necessary input for animal food production, Sweden, Denmark, and other countries in Europe have instituted a ban on antibiotics used to promote growth, and yet production continues to thrive. See: Carol Cogliani, Herman Goossens, and Christina Greko, "Restricting Antimicrobial Use in Food Animals: Lessons from Europe," *Microbe*, Volume 6, Number 6, 2011: 274-279.

72. In the 2000 National Water Quality Inventory conducted by the Environmental Protection Agency (EPA), agricultural activity was identified as a source of pollution for 48 percent of stream and river water and for 41 percent of lake water. U.S. Environmental Protection Agency, "2000 National Water Quality Inventory," August 2002.

73. United Nations Environment Programme, "2009 Year Book: New Science and Developments in Our Changing Environment," (2009): pg. 19. Between 60 and 70 million pounds of atrazine are applied annually to crops (mainly corn), golf courses and lawns, this agricultural runoff eventually causes large dead zones – particularly in the Chesapeake Bay and the Gulf of Mexico. See: Jonathan Stein, "Atrazine in the Water," *Mother Jones*, March/April 2006.

74. Farming communities have higher rates of leukemia, non-Hodgkin lymphoma, multiple myeloma, and soft tissue sarcoma, as well as cancers of the skin, lip, stomach, brain, and prostate. National Cancer Institute, "Agricultural Health Study," National Institutes of Health, 2011.
P.K. Mills and R Yang, "Prostate Cancer Risk in California Farm Workers," Occupational and Environmental Medicine March 2003 no. 45(3) (2003).

75. Jeyaratnam. "Acute Pesticide Poisoning: A Major Global Health Problem." *World Health Statistics Quarterly* 43, No. 3 (1990): 139-44.

76. See for instance, ETC Group: Action Group on Erosion, Technology, and Concentration, "Who Will Feed Us? Questions for the Food and Climate Crises." November 2009: 1. Jules Pretty and Rachel Hine, "Reducing Food Poverty with Sustainable Agriculture," Center for Environment and Society, University of Essex, UK, February 2001 and Badgley, C. et al., "Organic Agriculture and the Global Food Supply," *Renewable Agriculture and Food Systems* 22 (2007): 86-108.

77. There are many great studies on the resiliency of sustainable farms, especially during weather extremes like droughts. The Pennsylvania-based Rodale Institute found that during a ten-year period comparing organic and non-organic corn growing systems, the organic corn fields yielded on average 30 percent higher during dry years. Rodale Institute, "The Farming Systems Trial: Celebrating 30 Years." Kutztown, PA: 2011. For an example of a study from sub-Saharan Africa, see Amede Tilahun, "Yield Gain and Risk Minimization in Maize (Zea Mays) through Cultivar Mixtures in Semi-arid Zones of the Rift Valley in Ethiopia," *Experimental Agriculture* 31, no. 02 (1995). Researchers found that fields in this drought-prone region of Ethiopia planted with biodiverse fields yielded about 30 percent more than monocultures during normal rainfall years, and yielded 60 percent more during dry years.

78. Jules Pretty, "Agroecological Approaches to Agricultural Development," (Essex: University of Essex, 2006).

79. United Nations Environment Program Conference on Trade and Development, "Organic Agriculture and Food Security in Africa," September 2008.

80. The Farming Systems Trial out of the Rodale Institute has shown that diversified organic agriculture with cover crops used 45 percent less energy and produced 40 percent less greenhouse gases. Rodale Institute, "The Farming Systems Trial: Celebrating 30 Years," Kutztown, PA (2011). Other studies about the benefits of organic farming in drought years include: Amede Tilahun, "Yield Gain and Risk Minimization in Maize (Zea Mays) through Cultivar Mixtures in Semi-arid Zones of the Rift Valley in Ethiopia," *Experimental Agriculture* 31, no. 02 (1995).

81. Leopold Center for Sustainable Agriculture, "Long-Running Experiment Shows Organic Farming is Profitable," (2011).

82. IAASTD, "Summary Report" (paper presented at the International Assessment of Agricultural Science and Technology for Development Johannesburg, South Africa, April 2008), Executive Summary, 9

83. Badgley, C. et al., "Organic Agriculture and the Global Food Supply," *Renewable Agriculture and Food Systems* 22 (2007): 86-108.

84. The Farming Systems Trial out of the Rodale Institute has shown that diversified organic agriculture with cover crops uses less energy and produces less greenhouse gases; the Institute's organic no-till system also reduces fossil fuel use by 75 percent over conventional tillage farming. Rodale Institute, "The Farming Systems Trial: Celebrating 30 Years," Kutztown, PA (2011). See, for example, David Pimentel, "Impact of Organic Farming on the Efficiency of Energy Use in Agriculture." 2006:40. See for instance, a discussion of the study in: David Pimentel et al, "Environmental, Energetic, and Economic Comparisons of Organic and Conventional Farming Systems," Bioscience 55 (7): 573-582.

85. The Ogallala Aquifer that supports a quarter of U.S. farmland is being drained so fast it could be dry in a few decades. The Aquifer is essentially "fossil water—irreplaceable. Committee on Twenty-First Century Systems Agriculture and National Research Council, Toward Sustainable Agricultural Systems in the 21st Century. The National Academies Press, 2010. See also: Kumar et al., "Ecologically Sound, Economically Viable: Community Managed Sustainable Agriculture in Andhra Pradesh, India." Chris Reij, "Food Security and Water in Africa's Drylands," in *African Re-greening Initiatives* March 8, 2012.

86. According to the Global Phosphorus Research Initiative, worldwide phosphorus supplies won't be able to match agricultural demand within fifty years. James Elser and Stuart White, "Peak Phosphorus," *Foreign Policy*, April 20, 2010.

87. Anna Lappé, *Diet for a Hot Planet: The Climate Crisis at the End of Your Fork and What You Can Do About It*. New York: Bloomsbury USA (2011).

88. According to the Global Phosphorus Research Initiative, nearly ninety percent of the world's estimated phosphorus reserves are found in five countries: Morocco, China, South Africa, Jordan and the United States. James Elser and Stuart White, "Peak Phosphorus," *Foreign Policy*, April 20, 2010.

89. US Environmental Protection Agency, "Fertilizer and Fertilizer Production Wastes," http://www.epa.gov/radiation/tenorm/fertilizer.html.

90. For 2009, the most recent year available, the UN Food and Agriculture Organization estimates a food supply of 2,831 calories per capita per day. FAOSTAT, food balance sheets, searchable at: http://faostat.fao.org/site/368/DesktopDefault.aspx?PageID=368#ancor

91. The results of a UN study on food waste suggest that about one-third of food produced globally is wasted, amounting to about 1.3 billion tons per year. Jenny Gustavsson, Christel Cederberg, and Ulf Sonesson, "Global Food Losses and Food Waste: Extent, Causes and Prevention," UN Food and Agriculture Organization, 2011. For more on food waste, see: Jonathan Bloom, *American Wasteland: How America Throws Away Nearly Half of Its Food (And What You Can Do About It)*. Boston, MA: Da Capo Press, 2010.

92. Roughly one-third (35 percent) of the world's grain becomes feed. United Nations Food and Agriculture Organization, FAOSTAT "Crop Prospects and Food Situation" (2007).

93. Based on data from USDA National Agricultural Statistics Service, "Vegetable Summary," 2011: page 22-23, 77 and from USDA, Economic Research Service, Feed Grains Database: 0.65% of all corn planted is sweet corn; other corn that makes it into our food supply in the form of high fructose corn syrup, for example, is not eaten directly.

94. 925 million people were hungry in 2010, according to the FAO. United Nations Food and Agriculture Organization, "Global Hunger Declining, But Still Unacceptably High: International Hunger Targets Difficult To Reach," September 2010.

95. The Conference Board of Canada, "World Income Inequality, Is the World Becoming More Unequal?" 2012, http://www.conferenceboard.ca/hcp/hot-topics/worldInequality.aspx#anchor1 Also: Wang Feng, "The End of 'Growth with Equity'?" *Asia-Pacific Issues*, East-West Center, No. 101, June 2011.

96. Carmen De Navas-Walt, et al., "Income, Poverty and Health Insurance Coverage in the United States: 2011," The United States Census Bureau, Sept. 2012, p.13, http://www.census.gov/prod/2012pubs/p60-243.pdf

97. http://www.fns.usda.gov/pd/34SNAPmonthly.htm. From 2008-2012 the number of participants on food stamps (SNAP) has gone up more than 16 million.

98. United Nations World Food Programme, "India: Overview," Accessed Oct. 18, 2012 http://www.wfp.org/countries/india/overview

99. Santosh Singh, "Grain Voluntary Update – June 2012," USDA Foreign Agricultural Service GAIN Report, June 7, 2012, http://gain.fas.usda.gov/Recent%20GAIN%20Publications/Grain%20Voluntary%20Update%20%E2%80%93%20June%202012_New%20Delhi_India_6-7-2012.pdf
Also see: Vikas Bajaj, "As Grain Piles Up, India's Poor Still Go Hungry," *The New York Times*, June 7, 2012, http://www.nytimes.com/2012/06/08/business/global/a-failed-food-system-in-india-prompts-an-intense-review.html?_r=0