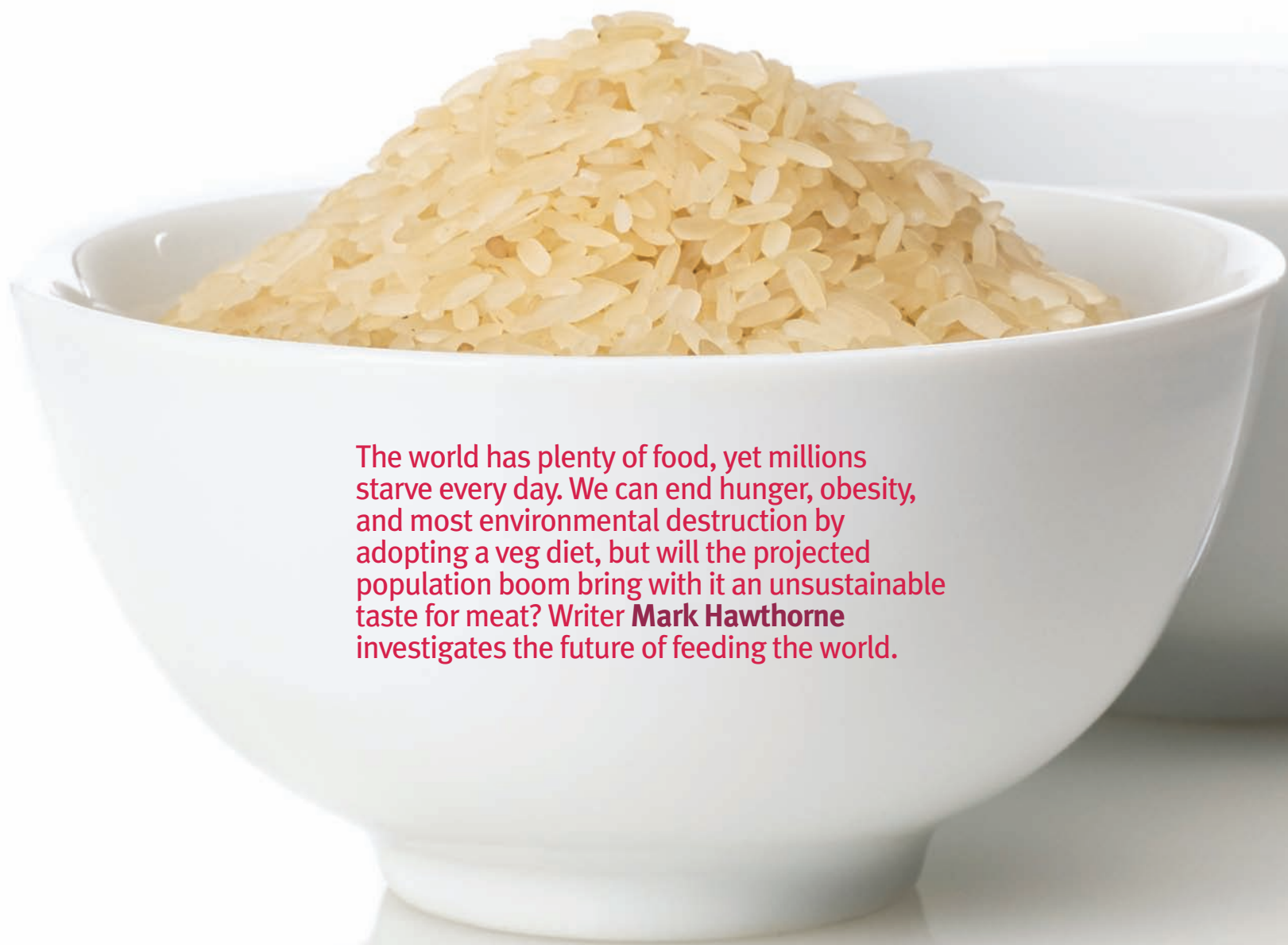


# Feeding the Future



The world has plenty of food, yet millions starve every day. We can end hunger, obesity, and most environmental destruction by adopting a veg diet, but will the projected population boom bring with it an unsustainable taste for meat? Writer **Mark Hawthorne** investigates the future of feeding the world.



WITH 1.3 BILLION MOUTHS TO FEED (AND 44,000 babies born every day), China knows a thing or two about hunger. The world's most populous country, China instituted a strict policy of one child per family 30 years ago, yet it still faces food-security challenges. Though rice has been an Asian staple for thousands of years, there's been a dramatic shift toward animal protein in China, where an emerging middle class is scaling back on traditional grain- and vegetable-based diets in favor of more industrially produced meat, eggs, and dairy foods. In fact, the country recently emerged as the largest meat producer in the world, thanks to help from such international food giants as Smithfield and Tyson Foods and their pack-'em-in-tight model of agriculture. Large-scale operations in China are adapting quickly to their Western counterparts, with some businesses developing a streamlined food-production system in which everything involved in the farm-to-fork trade—raising animals, producing feed, pharmaceuticals, transportation, and slaughter—is owned and managed by a single company.

City dwellers are also contributing to the country's demand for factory flesh, says Mia MacDonald, executive director of Brighter Green, a nonprofit that is documenting the growth of factory farming in Africa, Central and Latin America, and most of Asia, known collectively as the Global South. "Nearly half of China's people live in urban areas more than six months of the year, and urban Chinese consume more meat and dairy products than people in rural areas of China," she says. "Considering that every fifth person on the planet is Chinese, even a small increase in China's meat and dairy consumption will have a major impact on the environment. Clearly, what the Chinese eat, and how they produce their food, affects not only China, but the world."

But why their demand for meat in the first place? For millennia, the foundations of the Chinese diet were grains (especially rice) and vegetables. Meat was rare, a side dish at best. Like India and other cultures that have prospered, China's recent economic success has been reflected in its cuisine, with more Chinese viewing animal-based foods as both status symbols and protein sources they were denied in previous generations. Famine is still a painful memory for those who survived under Mao Zedong's attempts at radical social transformation in the 1950s and '60s.

Determined to turn China into an industrial power to rival the US and the former Soviet Union, Mao forced farmers off their land to work on massive infrastructure projects, creating a loss of food production that left tens of millions of people dead from starvation. As if to exorcise those years of extreme scarcity, today's Chinese are choosing to eat several rungs up the food ladder. Thirty years ago, when China had a population just shy of 1 billion, the average Chinese person ate 44 pounds of meat annually. Today, an additional 300 million people later, the average is 120 pounds—still well below the whopping 260 pounds of meat consumed by the average American each year.

This movement toward more expensive, "luxury" foods is also demonstrated in an eight-year study published in 2003 by the American Society for Nutritional Sciences, which noted that while the intake of vegetables declined in China, the consumption of fruits, generally more costly than veggies, increased. The country's nascent love of pears and mandarin oranges hasn't been enough to offset the chronic ailments associated with eating meat and dairy, however. Osteoporosis, for example, has been linked to increased levels of animal-based proteins. Once practically unheard of in Asia, this disease of compromised bone density has become a major health concern in China, where the International Osteoporosis Foundation believes cases of osteoporosis will more than quadruple in the next decade to 286 million. China is also seeing an increase in obesity, cardiovascular disease, and diabetes—all linked to meat-based diets.

### Traditional Turmoil

For generations, Subhash Mahapatra's family has grown rice on their loamy parcel of land in Odisha, a mountainous Indian state formerly known as Orissa. Mahapatra, 41, is among India's 600 million farmers—who comprise half of the country's 1.2 billion population—and he relies on his nine-acre paddy to feed his family and earn enough rupees to scrape by. Farmers throughout the subcontinent revere the soil, reaping from its fertility life itself, and they take pride in every nutritious crop. "I was born a farmer, and I will die one," says Mahapatra. But state officials have other ideas for the land: They are eager to make way for a manufacturing plant that will provide the community with jobs and help industrialize a traditionally agrarian society.

## FastFoodPlanet

Fueling Asia's growing appetite for meat, KFC, McDonald's, Burger King, and other fast-food mega-chains have extended their fatty franchise fingers across the Pacific, tailoring their menus to local tastes and positioning themselves as family-oriented restaurants. In the US, where rising prices and unemployment have contributed to a 14-year high in the nation's hungry (now pegged at 49 million), cash-strapped households often rely on burger joints and other "convenience" retailers as a way to fill up on cheap calories and keep starvation at bay. Not only are fast-food outlets consuming a high percentage of grain through meat production, but they are helping to pack unhealthy pounds on diners.

The paradox of poor families becoming obese is a concern for Lauren Ornelas, founder and executive director of the Food Empowerment Project (FEP), which helps consumers recognize the power of their food choices. "One of the areas we work on when it comes to food insecurity is the lack of conveniently accessible, healthy foods in low-income communities and communities of color," she says, adding that liquor stores and fast-food restaurants in these neighborhoods promote animal-based diets. "The way we at FEP look at this is that the corporations that are exploiting and killing animals are the same ones exploiting these communities. Their only interest is money." Ornelas explains that often people who would otherwise choose plant-based foods cannot regularly reach farmers' markets or grocery stores, making convenience stores and junk food their only option. "It's an injustice when such communities cannot obtain healthy foods, making it difficult to even attempt to follow a vegan diet."



Displacing farmers like Mahapatra in favor of enterprises that supplant productive farmland with pollution-spewing factories certainly seems shortsighted—at least from a food perspective. With the world's human population on track to hit 7 billion by 2011, and more than 9 billion by midcentury, scientists, food-security advocates, and the green cognoscenti are debating how best to feed all those stomachs. Perhaps the family farm cannot compete with hyper-productive systems, especially with powerful multinational interests and vertically integrated agribusinesses nudging small-scale farmers out of the way. Or can it? According to the United Nations Food and Agriculture Organization (FAO), one-third of the world is made up of farmers owning and working a small piece of land, and FAO Director General Jacques Diouf says that supporting them would be "the most effective way to eliminate hunger from the face of the earth."

## “Food experts often argue about scarcity versus distribution. But it's not one or the other—it's both.”

Others are even blunter. When asked recently if we can feed the planet without help from industrialized agriculture, Michael Pollan, author of *The Omnivore's Dilemma* and *In Defense of Food*, quipped that we're not currently feeding the world *with* it. Indeed, although agribusiness apologists continue to tout mega-farms as The Answer to starvation, mounting evidence suggests that organic agriculture, which rejects the use of genetically modified crops and synthetic pesticides and fertilizers, can match or even surpass conventional methods of producing food. A lengthy initiative at Iowa State University, for example, concluded that agro-ecological practices outpace their industrial counterparts through greater crop yields, lower production costs, replenished groundwater supplies, and reduced soil runoff. Researchers at the University of Michigan, meanwhile, found that on average organic farming can produce 30 percent more food than non-organic systems worldwide and as much as 80 percent more in developing countries. And all this comes without burdening the planet with the environmental and social devastation that are the hallmarks of corporate farming models—namely, deforestation, degradation of soils and ecosystems, hazardous work environments,

excessive use of water, depressed property values, and loss of crop and species diversity.

## The Grain Drain

Whether we favor the output of modern technology or the GMO-free harvests of organic farming, the question staring us in the gut is the same: Why are more than a billion people living with chronic hunger when there are just as many people overweight? The short answer is that, well, there are no short answers. The global food system is so complex that even a capricious change in the weather can affect food supplies, costs, and distribution. Droughts in India and flooding in the Philippines last year, for example, are expected to double the price of rice on international markets this year. Elsewhere, political instability, trade protectionism, and economics put even greater strain on the malnourished, while the world's growing desire for meat can leave farmers wondering where their next meal will come

from. "Instead of using their land to grow food for their families and become self-reliant, farmers in Third World countries devote their resources to meat production, either in the form of raising livestock or crops to feed those animals," says John Robbins, who asserts in his book *The Food Revolution* that using 2.5 acres of land to raise cattle would only support the energy requirements of one human being, while the same land growing potatoes will meet the needs of 22. "Initially, the hope was that increased beef production would help the people in poor countries. This hasn't been the case. In Latin America, for example, more than half the beef produced is exported to wealthier countries, and what remains is too expensive for most of the farmers to purchase. In Costa Rica, the average family consumes less meat than the average house cat eats in the United States."

Robbins thinks it's no coincidence that the hunger crisis grows while 40 percent of the world's grain (about 740 million tons) is used for meat production. "The truth is, the more grain that goes to feed livestock, the less there is to feed people," he says. "The National Cattlemen's Beef Association has said that the amount of grain needed to produce a pound of beef in the US is four and a half pounds,





In China —  
home to 1.3 billion  
people—the average  
person eats  
120 pounds of  
meat per year.

which is bad enough. But that estimate is too conservative. According to the USDA Economic Research Service and Agricultural Research Service, the amount of grain needed to produce one pound of US feedlot beef is actually 16 pounds.”

These figures matter because farmers grow about 2 billion tons of grain a year—plenty to satisfy our nutritional needs—but humanity’s myopic appetite for animal flesh overlooks the much better use of corn, soybeans, and other food resources. “If we were to all eat like people in India, we could support 10 billion people,” says Janet Larsen, director of research at the Earth Policy Institute, a Washington, DC-based environmental think tank. “Average Indians consume about 200 kilograms of grain per year, most of it directly because they have largely vegetarian diets.” Heavy meat-eating countries like the US tip the scales at 800 kilograms of grain per capita a year for food and animal feed, she says, leaving enough food for only about 2 billion people. “Clearly, we’ve overshot our population if we’re all going to be eating like the average American.” Larsen’s recommendation is becoming a familiar refrain: Cut back on foods made from animals, and eat more vegetables, fruits, and grains. “That helps not only in terms of distributing limited resources to growing numbers of people, but on the climate front because livestock production has a heavy carbon footprint.” (Does it ever. According to a widely cited 2006 UN report, the meat industry accounts for 18 percent of worldwide greenhouse gas emissions, while a 2009 study by the Worldwatch Institute reckons the figure at an astounding 51 percent.)

### Food Fight

Clearly, there’s no one-size-fits-all approach to alleviating world hunger. Two easy marks long targeted by development veterans are food’s limited supply and getting those supplies to the underfed. “Food experts often argue about scarcity versus distribution. But it’s not one or the other—it’s both,” says Dawn Moncrief, executive director of A Well-Fed World, which promotes the benefits of plant-based solutions to global food-security issues. “When scarcity is high, distribution problems become exacerbated because there is even less food to go around. Increased scarcity increases hunger, and meat increases both scarcity *and* distribution disparities,” since meat is resource-intensive, exacerbating the demand for grain, and raises the cost of all food.

Annie Shattuck doesn’t agree scarcity is the problem. An analyst at the Institute for Food and Development Policy (better known as Food First), Shattuck cautions that “The largest mistake is the myth that if we just ramp up production we can solve hunger. That approach has been failing for the past 30 years and will continue to fail. Increases in food production have been outstripping population growth for two decades.” Shattuck illustrates her point by observing that agricultural output expanded during the Green Revolution (an initiative that used technology and plant breeding to boost crop yields in many developing nations during the latter half of the 20th century), but hunger escalated nonetheless. “In the 1970s, the Global South exported about a billion dollars a year in food. By the year 2000, they were importing more than \$11 billion worth of food,” she says.

## BioHazard

It makes sense that an excellent way to reduce our dependence on petroleum is to embrace fuels derived from plant-based sources. Trouble is, biofuels not only swallow up international grain production, but what remains then becomes more expensive, further exacerbating the food crisis. “About 75 percent of the calories produced worldwide—the raw sources of all food—come from just four crops: corn, soybeans, wheat, and rice,” says Michael Roberts, agricultural and resource economist at North Carolina State University. Of that 75 percent, he says, roughly five percent goes toward making biofuels. According to the FAO, that five percent represented 104 million metric tons in 2009, most of it corn. “We estimate that prices of the staple grains—corn, soybeans, wheat, and rice—would go down by about a third, on average, if we got rid of corn-based ethanol,” says Roberts. “That would probably make for less hunger in the world.”

“If you look at the numbers, at first glance it appears that world hunger dropped as a result of the Green Revolution.” But most of that progress was occurring in China; in the rest of the world, hunger actually increased by 11 percent per capita. “The economies of scale, necessary to cash in on the Green Revolution’s technological gains, put many small farmers out of business and into urban slums,” says Shattuck. “These small farmers turned slum dwellers and seasonal workers are now dependent on the increasingly volatile global market for their daily bread.”

Shattuck believes sustainable practices hold the answer, and she cites a report from the International Assessment of Agricultural Knowledge, Science, and Technology for Development (IAASTD) that recommends focusing on small-scale agriculture and expanding low-input farming that makes greater use of traditional knowledge. “The IAASTD suggested we shift our technological development toward technologies that are locally controlled and easily adaptable—toward locally controlled seed systems, small-scale family farms, and agro-ecology—not

## The World's Waists

The planet simultaneously has too much and too little food—both obesity and hunger could be mitigated by adopting a plant-based diet. Here's what the world weighs.

### United States

Hunger: < 5%  
Obesity: 33.2%

### Mexico

Hunger: < 5%  
Obesity: 28.1%

### Brazil

Hunger: < 5%  
Obesity: 13.1%

### Ethiopia

Hunger: 30.8%  
Obesity: .7%

### India

Hunger: 23.9%  
Obesity: 2.8%

### China

Hunger: 5.7%  
Obesity: 3.4%

### Japan

Hunger: < 5%  
Obesity: 3.3%

chemical fertilizer and genetically engineered seeds," she says. "Technology is never neutral. Hunger is not due to lack of production, but rather lack of control over food producing or other economic resources, and in order to actually end hunger we need to attack poverty at the root—something industrial ag technologies have never done."

This argument has found traction among other social-justice advocates, including *Diet for a Small Planet* author Frances Moore Lappé, who maintains that a lack of democracy—people having no say in where their food comes from—undermines production and access to food worldwide. With her daughter Anna, Lappé founded the Small Planet Institute to support grassroots democracy movements addressing hunger and poverty. "As my mother has been articulating for nearly 40 years, hunger isn't caused by a scarcity of food, but by a scarcity of democracy," says Anna Lappé. "We will end hunger when all of us, including the most vulnerable communities, have a real voice in what food is grown, how our food is raised, and what happens to the food once it leaves the fields."

### Seeds of Change

Though humanity has its issues, we're nothing if not dreamers; we love a challenge. Perhaps the biggest one facing us today is balancing efficiency, abundance, and equitable food distribution (in which everyone counts) with agriculture that is sustainable, safe, and ethical. This may prove especially difficult in sub-Saharan Africa, where the hunger crisis is the greatest, soil can be poor, and irrigation water is scarce. It will certainly take more than food relief from China, India, and the US—the world's three biggest producers—to

benefit a region in which one-third of people are malnourished. "Fortunately, numbers do not reflect the creativity, diversity, and resilience of the world's small farmers," says Shattuck. "The UN recently conducted a study on organic agriculture in Africa, which said that small farmers there have already built truly sustainable African agricultural systems that are better at fighting hunger and poverty than the Western industrial model. The ingenuity of these communities—their steadfast refusal to lose hope—that is what is inspiring."

Far from the African continent, Patrick Brown isn't losing hope, either. A Stanford University biochemist, Brown is currently exploring ways to increase the world's consumption of plant-based foods, which will ease the hunger crisis and global warming. "In principle, because the human-useable protein and most other nutrients in the crops we feed to livestock greatly exceeds what we recover from those animals in meat and milk and eggs, the net effect [of eating less meat] should be much greater food security," says Brown. He is networking with experts in agricultural economics, environmental sciences, food security, international trade, and behavioral economics to alter the way humans farm and eat. "I'm also trying to persuade people in the food industry that they should be working to develop and market plant-based alternatives to animal-based mass-market

## Humane Assistance

Rather than donating to hunger-relief organizations that exploit animals, such as Heifer and Oxfam, consider these humane alternatives that help underfed people in developing countries:

- ❖ Food for Life Global: [ffl.org](http://ffl.org)
- ❖ Fruit Tree Planting Foundation: [ftpf.org](http://ftpf.org)
- ❖ HIPPO: [hippocharity.org.uk](http://hippocharity.org.uk)
- ❖ Sustainable Harvest International: [sustainableharvest.org](http://sustainableharvest.org)
- ❖ Vegfam: [vegfamcharity.org.uk](http://vegfamcharity.org.uk)

Finally, brush up on your vocabulary and help feed the world at [FreeRice.com](http://FreeRice.com), which asks users to define words and then donates rice to the UN's World Food Program with each correct answer.

foods, anticipating the likelihood that the costs of animal-based foods will skyrocket as soon as we have an effective greenhouse-gas cap-and-trade system or other GHG limits, creating a huge opportunity for any company with the foresight to develop inexpensive, yummy plant-based competing products.”

Moreover, says Brown, reducing the huge carbon hoof print from animal farming should help mitigate climate change and the risks it presents to global food security. “Reducing consumption of animal-based foods in the developed world would almost certainly

is up, or so says Dickson Despommier, a professor of environmental health sciences and microbiology at New York’s Columbia University. Despommier’s vision is that cities of the future will rely on vertical farms—sort of like high-rise greenhouses in which produce is cultivated via hydroponics within a self-sufficient ecosystem. How many people would a skyscraper farm feed? “It would depend on how big it was,” he says. “My class computed that a 30-story vertical farm one New York City square block in footprint could feed around 50,000 people.” Vertical farms are strictly

## Vertical farms are strictly theoretical today, but Despommier expects China or the Netherlands to build the first one within three years.

have a rapid positive effect by decreasing the inefficiencies in converting the nutrients in plant-based foods into meat and milk and eggs. But the answer is certainly much more complicated, and I don’t want to give a glib answer because there are enormous differences in the flexibility and resilience of food-production systems from one part of the world to another, and the economics of food production and trade are complicated enough that any change can have unintended consequences.” To that end, Brown is consulting with experts in agricultural economics and trade to develop a carefully considered strategy that avoids unintended harm to food security.

### Growing Solutions

Of course, one need not be a scientist or development expert to initiate sustainable food programs, although being a trendsetter certainly doesn’t hurt. When Michelle Obama converted part of the White House lawn into a vegetable garden last year, the first lady was planting more than seeds: She was inspiring the world to take direct control of their access to nutrition, even in cities. Though not many backyards can accommodate 1,100 square feet of sweet potatoes, spinach, kale, berries, herbs, and other organic goodies, urban farming can be as simple as a tomato plant on the balcony, as creative as a rooftop crop, or as civic-oriented as the 1 million community gardens that have taken root in neighborhoods across the US.

Where real estate is really tight (think downtown Manhattan), the best way to grow

theoretical today, but Despommier expects China or the Netherlands to build the first one within three years.

If vertical farms sound like a fairy tale, animal flesh grown in a laboratory may smack of science fiction. But lab-grown meat, also called cultured or in vitro meat, is currently being developed, and it’s poised to revolutionize the way the world eats. “Yes, I think cultured meat could play a role in feeding a growing world population,” says Jason Matheny, cofounder of New Harvest, which funds research on in vitro meat. “Due to population growth and increases in per-capita meat consumption in the developing world, global meat consumption is expected to double before 2050. It might be possible for conventional livestock-based agriculture to satisfy this growing demand, but it would do so at a severe cost to the environment, human health, and animal welfare.” Matheny’s answer calls for fat stem cells and muscle to be extracted from an animal, soaked in a nutrient-rich solution, and “grown” into real meat. Though it’s a concept that is getting plenty of attention, Matheny guesses we’re still about 10 years away from in vitro burgers.

Animal flesh in some form will likely be on the world’s menu for a while—at least until vegan entrées are universally available and the international community accepts ethical eating as the most practical option for enduring food security. In the meantime, advocates like John Robbins will continue to be vocal opponents of inequitable agricultural practices and the corporate policies that protect their existence. “I believe that truly sustainable

## Spreading Solutions

Bernard Brown has four words in response to the hunger crisis: peanut butter and jelly. Using social media sites, Brown and his volunteers at the PB&J Campaign ([pbjcampaign.org](http://pbjcampaign.org)) have launched an initiative to raise awareness about global issues and extol the virtues of one of nature’s perfect foods. Though the tone of the campaign is mostly fun (a recent Twitter post asked “Does Anthony Bourdain want a PB&J?”), the message is serious: Eating a plant-based meal rather than meat, eggs, or dairy foods can have a significant impact on the world. “We grow more than enough food to feed all the people in the world,” says Brown. “Eating a PB&J, a bean burrito, or a bowl of vegetarian chili is a vote for a rational, efficient, and ultimately a more equitable way to run our food system.”

solutions to the problem of world hunger are rooted in consuming more plant foods and fewer animal products,” says Robbins. “It gives me tremendous hope that the food choices most likely to rid the world of hunger are also those that are easiest on the environment, are clearly the safest, contribute the most to the long-term health of humans, and are also by far the most compassionate toward the beings with whom we share this planet.”

Back in India, farmers have been waging their own battle against corporate hegemony: POSCO, South Korea’s largest steelmaker, has been coveting Odisha’s mineral-rich land and is eager to turn the fertile rice paddies in Subhash Mahapatra’s rural village into a massive manufacturing plant. Though the state granted POSCO building rights years ago, local farmers recognize the significance of growing their food, and they have refused to surrender the only way they know to keep their families from going hungry. “They can offer me a million rupees, but I will not part with even one hectare,” says a defiant Mahapatra. “This is our livelihood.” [VN](#)

**Mark Hawthorne** is the author of *Striking at the Roots: A Practical Guide to Animal Activism* ([strikingattheroots.com](http://strikingattheroots.com)).