

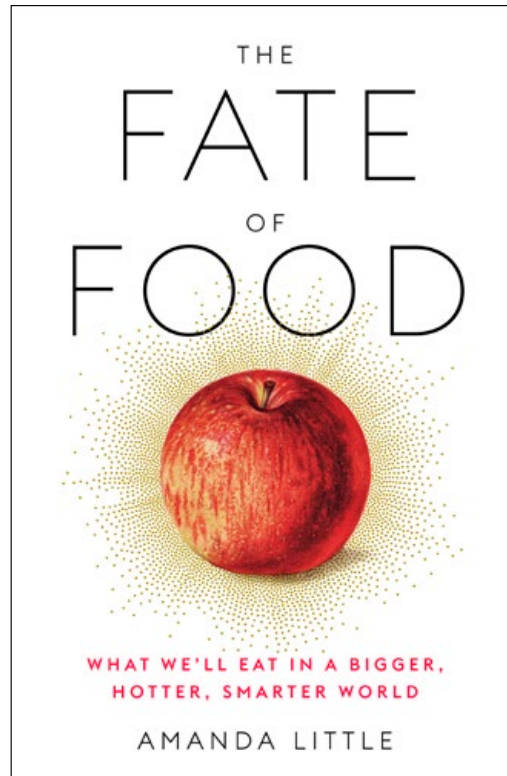
## A Taste of the Future

KAI N. LEE

“The main way that most people will experience climate change is through its impact on food—what they eat, how it’s grown, the price they pay for it, and the availability and choice they have,” according to Tim Gore of Oxfam International. This proposition motivates Amanda Little’s *The Fate of Food*. Little, a professor of journalism and writer-in-residence at Vanderbilt University, adopts a solutions-oriented, pragmatic attitude to the future of food by taking her reporter’s notebook to the front lines of innovation. Her goal is to spell out a paradox: in order to conserve what is deeply valued about food in every culture, we must undertake changes that will in time drastically reshape the food system that now feeds the world. Her watchword: “We must innovate—with humility.”

Agriculture is a driving force of climate change, accounting for more than one-fifth of the world’s greenhouse gas emissions. The burning of the Amazon, which recently captured headlines around the world, is done to clear land for farming. This and other signals of profound environmental damage mean that moving swiftly toward a sustainable food system is an essential part of the global effort to cope with humans’ impact on the environment.

Over the past century and a half, the food system has industrialized, with vast fields devoted to single crops whose growth relies on mechanization, fertilizers, and pesticides. Food production now is knitted together by supply chains of planetary scope, bringing vegetables to dinner plates irrespective of season and stimulating diets that are cosmopolitan and eclectic in a way unimaginable not that long ago. That same industrial system has also dramatically diminished the



**The Fate of Food: What We'll Eat in a Bigger, Hotter, Smarter World**  
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problem of hunger, with food security rising over the decades—until this one.

For the garden harbors serpents. Many people are still hungry in poor countries, especially those suffering from droughts and poor governance—and many of the hungry are children, for whom malnutrition spells lifelong deficits of health and capability. Soils are eroding, water is polluted, fishing grounds are depleted, and everywhere ecosystems are transformed. Diets careen toward too much salt, sugar, and fat. The result is obesity in every country, together with ominous and costly increases in diabetes, heart disease, and other ailments of the overfed and badly nourished. A striking fact of the world today is that more people are overweight than are hungry.

In reaction, consumers, in rich nations especially, have turned toward “sustainable” food—organic produce, vegetarian diets, and “slow” food. Their culinary opinions are braised in suspicions of “Big Food” and the Green Revolution, and seasoned

with skepticism about food safety. Technological solutions are distasteful to sustainable food advocates, who would rather see food “deinvented” via a return to preindustrial practices.

Little suggests that there is a third way, between megaindustrial and preindustrial, that combines traditional goals with innovative means. This is, she suggests, already being nurtured in many parts of the world. Examples of this third way comprise the main course of her thought-provoking repast.

First is Jorge Heraud, a Peruvian-born Silicon Valley engineer who is developing precision agriculture. His tractors, which tow video cameras that use artificial intelligence to distinguish weeds from crops, apply herbicide or fertilizers accordingly, in the manner of an inkjet printer. Heraud’s firm was acquired by the agribusiness giant John Deere in 2017; the company’s backing, he argues, “gives us far bigger chances of having a worldwide impact.” Yet as Little points out, the intricacy of precision agriculture undermines farmers’ “right

to repair” their own equipment, leaving cultivators at the mercy of equipment dealers and manufacturers.

Little visits Ruth Oniang’o, a Kenyan biochemist educated in the United States. Her nonprofit, Rural Outreach Program of Africa, is introducing farmers to drought-tolerant, pest-resistant seed varieties created by the Monsanto division of the German multinational Bayer. Although Monsanto is often viewed by Western activists as the dark presence behind genetically modified organisms, an abundance of science, including reviews by the National Academies, demonstrates that these genetically engineered crops generate no adverse health effects.

The hazier question is whether such corporate initiatives can really benefit small farmers. Monsanto’s scientists are pursuing seeds that will benefit the poorest populations in the driest climates. Their work is funded in part by the Bill & Melinda Gates Foundation and the US Agency for International Development. Despite the powerful forces that are pushing for adoption of these crops, Little concludes, it is the farmers themselves who ought to decide: they are “discerning practitioners, not victims, of new farming technologies.... They also have far more to gain from technology than we do: resilience against the pressures of climate change.”

The food system is extraordinarily complicated, however, and new ideas need more than capital and determination to take hold. Little encounters Tony Zhang, who built a chain of spicy-food restaurants across urban China. He dreamed of creating a Chinese version of Whole Foods, a retailer that could reshape supply chains toward sustainably grown food. The idea was to create a national network of high-tech organic farms adjacent to big cities. This required expensive, temperamental technology that sought to overcome the difficulty of planting in some of the world’s most polluted

soils, where farmers apply fertilizer at levels far above those in developed countries in order to coax production to profitable levels. Zhang’s concept faltered and then toppled when the task of rapidly transforming the land and building a profitable supply chain could not be achieved. This was a business ahead of its time, Little says, one more instance of “start-ups that have tried to grow too big, too fast, while shouldering the enormous costs of technologies that haven’t yet matured.” This failed vision illustrates how daunting transforming the food system can be.

Little’s journalism is lucid and her style is disarming. The prose is breezy and easy to read, borrowing a good deal from business journalism—a *plucky entrepreneur*, a *nifty invention*, *someday this will change everything*. As the story of biotech seeds in Africa suggests, a changing climate means that someday everything *will* change. If the change is to be for the better, innovation and improved decision-making will have to play a central role. This is one reason to hope that Little’s book gains a wide readership beyond the United States. Her cheerful confidence in innovators invites a hard look at the European Union’s wholesale prohibition of genetically modified organisms, and leads to questions about how John Deere or Monsanto can play a constructive role in moving the world toward healthful diets produced in sustainable ways.

A large-scale trend of the past half-century has been the increasing demand for meat, a result of rising incomes in much of the world that has been poor. This is unsustainable in the long run, according to Little and many other experts. Animals require feed, and diets high in meat require far larger acreages of crops, along with water, fertilizer, and other inputs. The world does not have enough arable land to do this. Moreover, populations that consume large quantities of meat are plagued by obesity and costly

burdens to public health.

The impracticality of raising livestock for meat, combined with the durable desire of billions of people for meat in their diets, impels efforts to produce meat without animals—via vegetable-based substitutes and factory-scale culturing of animal muscle tissues. So far this is food for the rich, joining others such as organic produce and sustainably harvested fish. These developments are useful to explore, though they are still far from ready for the large-scale, low-price deployments that have characterized the global food system in recent decades. Moreover, the health implications of artificial meat are unclear, though one might imagine an Impossible Whopper could someday be better for a frail heart than a burger made from corn-fed beef.

And it isn’t only efforts such as the Chinese Whole Foods that find transformational change difficult or impossible. The food system is so complicated that attempts to dictate food production by central control have failed, often with famine inflicting misery on whole countries. The agility and responsiveness of a market economy turn out to be functionally essential. New entrants need—and often fail to find—luck and timing; even established firms and farms struggle with shifting tastes and tough competitors.

Often overlooked in food policy discussions are the countless people who till the soil and catch the fish. More than 1.5 billion of the world’s people are smallholders: family farmers, fishers, and aquaculturists who feed themselves as well as selling into markets. Many of them are poor. The countries they inhabit rely more than richer nations on agriculture for a larger portion of their economy and for the employment of their people.

Smallholders supply more than three-quarters of the food in Asia and sub-Saharan Africa. For them the vicissitudes of drought or market fluctuations are matters of survival, not just profitability. How to enable smallholders to make sensible choices in the face of the

uncertainties of globalization and climate change is central to the fate of food. Yet the complexities of the market and the challenge of making options practical for poor producers remain on the margins of Little's account.

At the opposite end of the economic spectrum, Little uses herself as a test subject, probing her willingness to give up meat ("the old sweetheart I can't quit") and to stomach, literally, Soylent, an engineered "omni-food" of notably utilitarian character: "It tastes like a cross between almond milk and pancake batter."

Little's rueful struggle to plant a garden ("I'm the gardening equivalent of tone-deaf") and her encounters with high-tech foods raise the question of how swiftly human practices and preferences will change as global warming and rising incomes alter the demand for food. That may be the biggest question of all, one that analysts, businesses, and governments will need to deal with in the short decades ahead.

*The Fate of Food* is a handsome piece of journalism that will enlighten and stimulate lay readers. Little concludes with the story of a couple trying to make a go of organic permaculture farming, and she invites her readers to share their hope that "the best way to produce food is 'by mimicking timeless patterns of nature'; and to use whatever advanced high-tech tools and techniques can help them do that." It is a hope on which much depends, for poor and rich alike.

*Kai N. Lee is a fellow at Stanford University's Center for Ocean Solutions and an emeritus professor of environmental studies at Williams College. He was vice-chair of the National Academies of Sciences, Engineering, and Medicine's Committee to Advise the US Global Change Research Program, 2012–17.*