

An Alternative Paradigm for Food Production, Distribution, and Consumption: A Noneconomist's Perspective

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Abstract

The Industrial Food and Agricultural (IFA) industry has become increasingly excoriated by proponents of the Naturalization Food and Agricultural (NFA) paradigm over the past decade. Thought leaders of this alternative movement have been calling for economic and policy overhauls of the food system—touching upon human health, labor rights, the environment, climate change, and animal welfare. Although the majority of these thought leaders are not economists or scientists, their arguments are structured to shape consumer choices and farmers' production decisions, influence food and agricultural policy, and ultimately affect the economics of the industry. In this article, we survey publications at the forefront of the NFA paradigm, touching upon the work of Pollan, Schlosser, Petrini, Bittman, Nestle, and Kremen, among others, as well as the earlier contributions of Carson, Sinclair, Steinbeck, Buck, and even Jefferson. Their solutions, although short on quantitative analysis and long on prescriptions, address the real concerns of the general public and lay the foundation for economists to advance public discourse through analytical research on the NFA paradigm.

INTRODUCTION

Over the last decade, the conventional or Industrial Food and Agricultural (IFA) paradigm has come under attacks in public discourse by intellectual leaders engaged in the formation of what we characterize as the Naturalization Food and Agricultural (NFA) paradigm. These attacks are sourced in part by ideology and facts that reflect the unanticipated consequences of the IFA sector actions. People care about what they eat and how it is being produced. The increase in obesity rates of American adults is estimated to be as high as 66% (Wang & Beydoun 2007), and the contamination of food with *Escherichia coli* and *Salmonella* (Zhao et al. 2001) and the proliferation of antibiotic-resistant bacteria (Zuraw 2013) are thought by many to be caused or at least spread by the IFA system. Agriculture also contributes to greenhouse-gas emissions through livestock, synthetic fertilizer application (Vermeulen et al. 2012), and agriculturally induced deforestation (Shukla et al. 1990); to the seasonal reoccurrence of the so-called dead zone in the Gulf of Mexico; and to compromised water quality in various areas scattered across the United States (Hamilton & Helsel 1995) (see Table 1).

Such consequences have contributed to the emergence of influential writing about the IFA by noneconomists, and the general consensus seems to be that food is too important to leave solely to politicians and economists. Michael Pollan has become a household name, and Eric Schlosser's *Fast Food Nation* (Schlosser 2001) was so popular that it was converted into a film. Celebrity chefs, such as Dan Barber, and media journalists, such as Mark Bittman and Tom Philpott, offer suggestions on how to prepare seasonal produce as well as how governmental food policy should be reformed. These criticisms of the IFA system, although arguably more public and widespread than ever before, are hardly new. They evoke critique of chemical use in agriculture raised by Rachel Carson in *Silent Spring* (Carson 1962), criticism of the food processing industry made by Upton Sinclair in *The Jungle* (Sinclair 1906), fury at the plight of migrant farmworkers raised by John Steinbeck in *The Grapes of Wrath* (Steinbeck 1939), and concern with the fate of the subsistence farmers displayed by Pearl Buck in *The Good Earth* (Buck 1931). The alternative naturalist paradigm in agriculture builds upon the Jeffersonian ideal of a small family farm; upon suspicion of large, multinational corporations; and upon concerns about pollution and environmental quality. It adds modern perspectives to expand ongoing concerns and prolonged criticisms of the agricultural and food systems in the United States and globally.

The NFA is diverse in perspectives and solutions. Its rallying point is not as much an affirmation of a common principle, but the rejection of the current status of the IFA sector. Some base this rejection on philosophical grounds, asserting that food is much more than sustenance. Others rally opposition around the depiction of a grotesque industrial food production or stand on platforms of social justice and environmental sustainability.

The extensive body of literature that this survey draws from establishes an alternative paradigm for naturalized food and agriculture in steadfast opposition to IFA principles. This alternative paradigm has political weight and has proved to influence the consumption habits of consumers; to alter the production inputs of farmers; and to affect the agenda of food and agricultural policy and, indirectly, the economics of the industry. Most authors of the assessed literature are not scientists and may not rely on rigorous scientific or economic analysis. Many of the publications present observations, draw conclusions, frequently advocate a certain point of view (e.g., local food is preferable), and suggest a policy (e.g., eat local, ban imports), which contribute to the social discourse.

Our synthesis is far from an exhaustive analysis of the entire body of literature, but it provides a survey of publications we find to be most pertinent. We emphasize presentation of the ideas, not critical evaluation of most studies. In our concluding remarks, we present overall evaluation of

Table 1 Dimensions of food and agriculture

Category	Facts
Obesity	<ul style="list-style-type: none"> ■ Two in three American adults are overweight.^a ■ One in three American adults is obese.^a ■ Between 1970 and 2002, childhood obesity rates in the United States increased by 200%.^b
Food safety	<ul style="list-style-type: none"> ■ Twenty two percent of the annual 2 million antibiotic-resistant infections in the United States are caused by foodborne illness.^c ■ The CDC estimates that one in six Americans (48 million people) get sick, 128,000 Americans are hospitalized, and 3,000 Americans die of foodborne diseases every year.^d ■ In 2003, <i>Escherichia coli</i> was found in fast food burgers, leading to more than 700 infected consumers.^d ■ In 2006, more than 205 people were infected by <i>E. coli</i>-contaminated spinach.^d ■ Approximately 42,000 cases of <i>Salmonella</i> are reported every year in the United States.^d
Contribution of agriculture to climate change	<ul style="list-style-type: none"> ■ The global food system contributes 19–29% of greenhouse-gas emissions.^e ■ Of that, livestock alone accounts for 14.5% of greenhouse-gas emissions, primarily through feed production, land-use change, and enteric fermentation.^f ■ Three out of every 4 acres of deforestation occur due to agriculture.^f
Agricultural production structure	<ul style="list-style-type: none"> ■ Since the 1930s, a significant portion of the revenues captured by program crop commodities is sourced from governmental support.^g ■ Real farmland real estate values have risen almost 100% since 1987.^h ■ A farmer has to wait 3 years without applying synthetic chemicals to his or her cropland before those crops can be certified organic in the United States.ⁱ ■ More than half of all US farms in 2007 were considered to be noncommercial farms (income <\$10,000).^j
Concentration of agribusiness	<ul style="list-style-type: none"> ■ In 2007, 8.5% of farms in the United States accounted for 63% of agricultural sales.^k ■ In 2009, four-firm concentration ratios topped 50% for crop seed/biotech, agrochemical, animal health, animal breeding, and farm machinery.^l ■ By 2007, four-firm concentration for beef/heifer slaughter measured 80%.^m ■ By 2003, four broiler firms accounted for 58% of production.ⁿ ■ The 2001 merger of Tyson Foods and IBP concentrated 30% of the beef market, 33% of the chicken market, and 18% of the hog market under one firm.ⁿ ■ Five firms controlled 45% of the global seed market in 2010.^o

Data from ^a<http://win.niddk.nih.gov/statistics/>, ^bAnderson & Butcher (2006), ^cZuraw (2013) and <http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/technical/?cid=stelprdb1041887>, ^dCDC (2006), ^eVermeulen et al. (2012), ^f<http://ccafs.cgiar.org/bigfacts2014/#theme=food-emissions>, ^gRausser (1992), ^h<http://www.ers.usda.gov/media/873616/farmrealestatevalues.pdf>, ⁱGreene (2014), ^jHoppe et al. (2010), ^k<http://www.epa.gov/oecaagct/ag101/demographics.html>, ^lFuglie et al. (2012), ^mWard (2010), ⁿConstance et al. (2013), and ^oBonny (2014).

these bodies of work, identify possible gaps, and assess the implication for the direction and communication of economic research on the future of food and agriculture.

FOOD IS MORE THAN SUSTENANCE

The works of Michael Pollan, a journalist-turned–bestselling author, emphasize the important role of food and its preparation in society and life. He writes prosaically on topics ranging from the pleasure of knowing your farmer to the value of taking the time to cook a full meal. His perspective seems to be influenced by Henry David Thoreau and other transcendentalists, as he highly values the natural world and has faith in its proclivity to operate righteously. His first book, the bestseller

The Botany of Desire (Pollan 2001), displays a neo-Darwinian perspective, emphasizing the modern notion of coevolution (Ehrlich & Raven 1964). Pollan argues that the strong ties between plant and human evolution are no coincidence but are rather a result of generations of selection for the best and most mutually beneficial genetic iterations to maximize the well-being of both plants and humans.

Pollan's second book, *The Omnivore's Dilemma* (Pollan 2006), is a critical assessment of the modern food system, assessing what we eat versus what we should eat. The omnivore American has multiple food choices, and Pollan considers four alternative menus. Industrial food (a McDonald's hamburger) relies on subsidized corn and antibiotics and, although inexpensive, is harmful to human health, the environment, and people who produce the food. He is also critical of Big Organic (sold at Whole Foods Market), which he finds energy intensive and wasteful. The model of desired farming he advocates for is a small organic, diversified farm (represented by Joel Salatin's Polyface Farm in rural Virginia), which relies on and produces for the local consuming population. *The Omnivore's Dilemma* makes the case for the type of diversified farming system that the NFA will advocate.

The Omnivore's Dilemma addresses the macro challenges of agriculture in food production, but consumers are more interested in knowing what to actually eat. Pollan attempts to answer this question in *In Defense of Food* (Pollan 2008b). In this book, Pollan criticizes the western diet created by food scientists and marketing whizzes and expresses doubt about the value of knowledge provided by the nutrition profession. Instead of pursuing nutritional objectives, consumers should concentrate on eating right. His main formula is, "Eat food. Not too much. Mostly plants" (Pollan 2008b, p. 1). This rule emphasizes the importance of moderation and the basic conservatism of Pollan, who is suspicious of food diets proposed by food scientists and nutritionists. Pollan's prescriptions are further developed in *Food Rules* (Pollan 2009), where he presents 64 rules for eating right. He advocates for growing your own food, buying from a farmer you know, and avoiding any labels with ingredients you can't pronounce. He is wary of the corporatization and industrialization of food and recommends buying at farmers' markets. He recommends spending more money on better ingredients and spending more time on cooking as opposed to eating processed foods.

Pollan's writings demonstrate extensive knowledge of the details of agricultural and food systems, but his comparative and normative analyses are not based on rigorous quantification of outcomes. Rather, he compares and analyzes, and he ignores the technological and economic feasibility of the wide-scale implementation of certain prescriptions. But his examination does provide the narrative that propelled the modern NFA.

Pollan's analysis of farm-to-table processes is echoed by other prominent journalists, including Bittman, a *New York Times* food columnist. Bittman, who initially gained a popular following for *The Minimalist* recipes column and cookbooks, has since turned his attention toward galvanizing the American public to eat better for both health and environmental reasons. Bittman's column regularly touches upon different aspects of the food system, ranging from his assessment of industrial farming contributions to land degradation and pollution (Bittman 2012) to criticizing the USDA's genetically modified organism (GMO) policies that promote the consolidation of power (Bittman 2013).

While Pollan's writings contributed to the emergence of the NFA movement mostly in the United States, a related countercultural food movement, often referred to as the slow food movement, has emerged in Europe. It originated in Rome and emphasizes the hedonic and cultural values of foods. In the book *Slow Food: The Case for Taste*, the father of the movement, Carlo Petrini, makes an argument for "rediscover[ing] the flavors and savors of regional cooking" and "developing taste rather than demeaning it" (Petrini 2003, p. xxiv). Slow food, although standing

in opposition to a homogenized food system (symbolized frequently by McDonald's), does not oppose modernity per se, as long as it does not compromise quality or diversity. Petrini's main focus is on the personal pleasure derived from cuisine and the importance of *culture* in *agriculture* and *viticulture*.

Pollan and Petrini's emphasis on the multiple benefits from food consumption can be analyzed using the household production functions of Lancaster (1966) and Becker (1965). The works of these food enthusiasts make the case that utility is derived not directly from food's caloric value but from the attributes and characteristics of the food. Such principles have been incorporated in many studies on food quality and hedonic prices of food, e.g., Heiman et al. (2001), Grunert (2005), MacInnis & Rausser (2005), Rausser & Thunström (2008), and Costanigro & McCluskey (2011).

Valuing food for its extrinsic qualities is a principle that resonates with animal welfare advocates, which, in turn, has shaped the NFA movement's approach toward treatment of livestock. Temple Grandin is an animal scientist and animal rights activist who has worked with corporate giants, such as Cargill and McDonald's, on the design of humane slaughterhouses. Grandin has argued that, although animals are legally considered property, it is important to treat them, even livestock raised for consumption, ethically because of their ability to feel emotions and pain (Grandin 2002). Furthermore, this literature argues that humane slaughter minimizes stress levels in animals, increasing the quantity of lactic acid in the meat, resulting in tender and more quality meat, and thus benefiting processors and consumers alike (Chambers & Grandin 2001).

There is much overlap between this literature and that by advocates for humanely and sustainably raised meat, who value similar characteristics in meat production, such as free range, 100% grass fed, and antibiotic free. Frances Moore Lappé's 1971 bestselling book *Diet for a Small Planet* brought the environmental impact of meat production into American consciousness. In the subsequent decades, American consumers have displayed a higher willingness to pay for sustainably raised meats. Abidoye et al.'s (2011) study found that consumers were willing to pay an average price premium of 34% for grass-fed beef. Another study by Wang et al. (2011) suggested that when consumers had full information about the different meat production methods, close to 40% chose natural, grass-fed meat.

Another strain of literature supporting the NFA can be traced back to Carson's wonderful book *Silent Spring*. This book raised concerns about the dependence of food production on synthetic pesticides, emphasizing their negative health effects on humans and flora and fauna species. Her work led to the banning of DDT and to stricter pesticide regulations. Perhaps more keenly, her analysis pinpointed the evolutionary consequences of the use of synthetic pesticides, in particular the natural selection of resistant strains, rendering the pesticide ineffective over time. Carson's work inspired criticism of the IFA, emphasizing that industrial agriculture subverts nature by attempting to conquer it, rather than mimic and work with it. Carson's research complemented the ideas promoted by J.I. Rodale, who popularized the terms "organic farming" and "sustainable agriculture" (Rodale 2010). Steve Gliessman built on Carson's and Rodale's work and made fundamental contributions to the establishment of another strand of the NFA, viz., agroecology. The intellectual foundation for the NFA by Gliessman was associated with the emergence of institutions like the Rodale Institute (<http://rodaleinstitute.org>) and the Leopold Center (<http://www.leopold.iastate.edu>). Both of these institutions are committed to research and extension activities in organic and sustainable agriculture.

Gliessman (1998) and his colleagues define agroecology by a set of ecological principles that encourage a transition toward sustainable agriculture. The main agroecological principles focus on recycling of biomass, balancing nutrient flow, managing organic matter, enhancing soil cover, fostering species and genetic diversification, and promoting beneficial biological interactions (Altieri 2000). Gliessman (2009) lists four steps for transitioning toward food system sustainability.

The first step is improvement of conventional practices toward higher levels of efficiency. The second step is the substitution of conventional inputs with more “environmentally benign” products and practices. The third step is the redesign of large-scale systems to replace IFA systems with ecological processes. The last step involves the cultural and economic shifts to support the long-run conversions to sustainable agricultural systems. An example of a cultural shift is a direct connection between “those who grow the food and those who consume it” (Gliessman 2009, pp. 1–2).

Many of the intellectually based NFA ideas stem, in part, from the work of Gliessman and his field of agroecology. His vision of transformation, which emphasizes sustainability, small farms, and direct farmer contact, influenced other strands that have emerged, such as diversified farming systems (DFSs), led by Claire Kremen, a conservation biologist.

Kremen et al. (2012) define a DFS as an agricultural system that “intentionally include[s] functional biodiversity at multiple spatial or temporal scales, through practices developed via traditional and/or agroecological scientific knowledge” (p. 1). The DFS was the core of agricultural practices before the twentieth century (Iles & Marsh 2012), and Kremen & Miles (2012) attempt to unravel the relative merits of the DFS versus IFA. They find that a DFS improves all ecosystem services at the cost of lower crop production. Such services include, *inter alia*, weed control, pest control, soil quality, and carbon sequestration.

Although the improvement in ecosystem services is important to the sustainability and resiliency of agricultural systems, the trade-off between (a) high input and high yields (IFA) and (b) low input and low yields is critical. In a meta-analysis of 66 studies, Seufert et al. (2012) compare yield production (ignoring other ecosystem functions) between industrial and natural farming techniques across 34 crops. They find that industrial techniques consistently produced higher yields but that the differential gap varied significantly. The difference in yields between industrial and natural cereal and vegetable crops was approximately 25%, whereas the difference was only 5% in rain-fed legumes and perennial crops (e.g., fruit trees). The level and type of nitrogen input were the biggest indicators of yields. Industrial farming uses 171 million metric tons of synthetic fertilizer each year, which allows for quicker uptake by plants compared with the slow release of nitrogen from composting or cover cropping.

The DFS strand also emphasizes linkages between social institutions and ecological diversification, including race relations in farming. This perspective has broad public appeal, particularly because the National Academy of Sciences (2010) finds that ethnic minority farmers would be more likely to adopt sustainable agriculture techniques if given proper support. Along similar lines, Bacon et al. (2012) present seven criteria with which to evaluate the social dimensions of a DFS. They conclude that expansion of a DFS requires establishing the appropriate institutional support system, emphasizing environmental sustainability. The DFS rejects the profit motive and, instead, argues for the maximization of environmental services. Kremen et al. (2012) criticize IFA for placing too little value on ecosystem management in the pursuit of profits. In particular, IFA creates a structure of farming heavily reliant on external inputs to compete in the market and avoid temporal crop loss (e.g., pests and diseases). Such a structure discourages “collaborative social learning” (Kremen et al. 2012, p. 6). Furthermore, the use of synthetic inputs in IFA has been linked to many environmental externalities, such as nitrogen runoff–induced dead zones in the Gulf of Mexico (NOAA 2013), colony collapse disorder of honeybees linked to synthetic pesticide usage (Philpott 2012), and reliance on natural gas for production of nitrogen-rich ammonia fertilizer (Philpott 2010). Market-based economic pressures may decimate ecosystem services, and the core of a DFS is to utilize biological systems to regulate agricultural production in order to achieve long-term sustainability.

Iles & Marsh (2012) argue that DFS tends to enhance innovation because it is more challenging intellectually. According to Morgan & Murdoch (2000), the more experientially and cognitively stimulating farmers find their work, the more motivated they are to innovate. Furthermore,

farmers who switch to DFS practices tend to enjoy their work more (Eckert & Bell 2006). This literature also argues that farmers who implement more naturalized systems rely more heavily on local knowledge, whereas, in industrial farming, a farmer's knowledge is "standardized knowledge emanating from upstream supply industries" (Morgan & Murdoch 2000, p. 171). Moreover, a frequent theme in this literature is that the more innovative and adaptive DFS system will lead to more resiliency. In other words, the NFA paradigm will achieve a greater degree of antifragility than will the IFA paradigm (Taleb 2012).

Pollan also highlights the deficiencies of the IFA paradigm. In *The Omnivore's Dilemma*, he contrasts the benefit of a solarized food chain with one fed primarily by fossil fuels. He refers to the processed foods in supermarkets as alien and unnatural. He also decries the recent change in the human diet (with overdependence on corn and few other dominant food crops), which does not correspond with coevolution as depicted in *The Botany of Desire*. Pollan is critical of governmental commodity programs, arguing that the subsidization of corn has led to specialization and to a movement away from diversified systems. Governmental intervention policies have also contributed to unprecedented levels of food processing, which counters Pollan's preference for natural and raw foods.

The idea that agriculture could use more nature is no longer a small-niche belief. The support for this assertion is evidenced by the growth of local farmers' markets, by the demand for organic food, and by potential public distrust of the health impacts of GMOs. The USDA calculates a 466% increase in local farmers' markets nationwide from 1994 to 2013 (<http://tinyurl.com/nyrpfv9>), with local food sales totaling an estimated \$6.1 billion in 2012 (Low et al. 2015). The organic food industry has experienced consistent growth for more than a decade, accounting for more than \$28 billion in retail sales in 2012. However, the growth of direct-to-consumer (DTC) farms has slowed from a 17% increase between 2002 and 2007 to a 6% increase between 2007 and 2012, while the growth in the value of DTC sales has leveled off as well (Low et al. 2015).

Many NFA proponents perceive sustainable produce as healthier and more pure than the industrial counterparts, including GMOs. Non-GMO-labeled foods have gained traction, both in the supermarkets as one of the fastest-growing food categories (Strom 2015) and in proposed state legislation for mandatory labeling of GMOs (Hibbert et al. 2014). Skeptics of GMOs have cited health problems as a major concern. These claims include the link between GMOs and organ damage; GMOs leaving traces of modified genetic material in human bodies; and the potential for GMOs to mix with unrelated species, thereby creating new toxins, allergens, and carcinogens. However, other scientific investigations have concluded that such claims are unfounded (Netherwood et al. 2004, Paarlberg 2009, Bennett et al. 2013, Van Eenennaam & Young 2014). Despite such scientific studies, it is likely that, as Greene (2013, 2014) argues, the demand for natural produce will continue to flourish.

A major benefit of the NFA is supposed to be its capacity to address risks, variability, and fragility. Kremen & Miles (2012) emphasize that growing evidence of climate change requires agricultural systems that are more resilient to dramatic changes. Improved soil management, better regulated microclimates, and more crop shade have positive effects in times of drought and extreme temperature (Tengö & Belfrage 2004), both expected consequences of global climate change (IPCC 2007). Consistent with this perspective, in *The Botany of Desire*, Pollan enumerates an argument for agricultural risk aversion. Pollan contrasts the Peruvian cultivation of many genetically distinct potatoes with the case of the Irish lumpers: the crop of great infamy during the potato famine. He cautions against monocropping and promotes crop diversification as a risk-reducing strategy. Risk considerations also drive Pollan's rejection of pesticide use. His conclusion is based not only on the potential health effects of pesticides on humans, but also on the fact that

intensive use of pesticides leads to buildup of genetic resistance, which he believes can be effectively countered by diverse crop selection.

Pollan (2008b, p. 6) addresses the risks of a large, globalized food system by using the same risk diversification argument:

Whatever may be lost in efficiency by localizing food production is gained in resilience: regional food systems can better withstand all kinds of shocks. When a single factory is grinding 20 million hamburger patties in a week or washing 25 million servings of salad, a single terrorist armed with a canister of toxins can, at a stroke, poison millions. Such a system is equally susceptible to accidental contamination: the bigger and more global the trade in food, the more vulnerable the system is to catastrophe. The best way to protect our food system against such threats is obvious: decentralize it.

Similarly, Schlosser's book *Fast Food Nation* emphasizes the food safety risks of a globalized food system. He presents a few cases of foodborne pathogens originating from contaminated fast food burgers, which were characterized by large meat recalls, lengthy litigation processes, and fatalities.

In addition to increasing the risk of food contamination, the practices of the intensive meat production industry have resulted in the proliferation of antibiotic-resistant bacteria. Antibiotics were first added to animal feed and water in the twentieth century to hasten animal growth. The American industrial livestock industry continues to use antibiotics in animals at a significant rate, outnumbering the usage in many other nations, and the amount of antibiotics administered continues to grow substantially (Tavernise 2014). Between 2009 and 2012, the amount of medically important antibiotics sold for livestock raised for meat consumption increased by 16% (FDA 2014a). This is a critical food safety concern because the abuse of antibiotics can lead to the development of antibiotic-resistant bacteria in animals. Such bacteria can then be transmitted to humans through food consumption, resulting in more severe illnesses in humans (CDC 2014). Communities surrounding farms that use antibiotics are particularly vulnerable, as antibiotic-resistant bacteria can be transmitted to farmworkers (Nadimpalli et al. 2015) and nearby environments (Philpott 2015a). Of the two million annual antibiotic-resistant infections in the United States, 22% are caused by foodborne illnesses (CDC 2013).

SMALL IS BEAUTIFUL

One of the alleged critical differences between the IFA and the NFA is the scale of farming enterprises. Small family farms have been a cornerstone of the Jeffersonian vision of American agriculture. The small farm was supported and encouraged by legislation, such as the 160-acre limitation to homesteading land (Hall & LeVeene 1978). The affinity for small farms is global. The slow food movement calls on its members to support their local farmers, suggesting that they go directly to the farm for their food purchases and subscribe to a community-supported agriculture program (<http://www.slowfoodusa.org/about-us>).

Proponents of small agriculture draw parallels between small family-owned businesses and small family farms. Chef Alice Waters's vision of the food system emphasizes both farmers' markets and "small mom-and-pop restaurants" (Waters 2014). Woodhouse (2010) identifies some differences between small farmers and restaurant owners. For example, a farmer bears more unforeseeable risk than does a restaurant owner. Also, if the farm is a small organic farm, it is characterized by lower energy costs, but also by lower labor productivity, which translates to lower labor returns and compensation. Much of the modern support for small farms is based on the

Goldschmidt thesis—named after the anthropologist Walter Goldschmidt (1947). Goldschmidt compared two California farm communities: Arvin, characterized by a few large farm operations, and Dinuba, characterized by many small ones. Goldschmidt concluded that there is a negative correlation between (a) farm size and (b) community vitality and average standards of living.

Goldschmidt's community comparison study has stirred an ongoing debate. Hayes & Olmstead (1984) argue that many other factors besides farm size influenced the slower rate at which Arvin developed compared with Dinuba. Their principal criticisms recognize that Dinuba was settled decades before Arvin and that the price of water in Arvin was much higher, which required economies of scale to make the farming profitable. Such facts, they believe, argue that the two communities were too different to offer any insight into the small farm versus large farm debate.

In the formation of the current NFA paradigm, there are lengthy criticisms of large-scale farming. Larger farms are considered part of the industrialized agribusiness sector. As noted above, Kremen et al. (2012) argue that industrialized systems cause farmers to forgo their autonomy and create an unnecessary reliance on banks, food buyers, agrochemical companies, and seed companies. Thus, such farmers become overly dependent on the upstream supply chain and the downstream marketing chain to reach the ultimate food consumers.

Wendell Berry, novelist, farmer, and environmental activist, has been a sage of the NFA movement. His statement "eating is an agricultural act" has served as a major inspiration for Michael Pollan's work and, in particular, *The Omnivore's Dilemma* (Fassler 2013). Berry's body of work emphasizes the importance of sustainability, appropriate technology, and strong rural communities. Some of the philosophical foundation of the NFA has been articulated in his 2012 Jefferson Lecture, in which he argues that "[t]here is in fact no distinction between the fate of the land and the fate of the people" (Berry 2012). Berry has written extensively and poetically in defense of the American small farmer and has disparaged industrial and corporate powers for waging an "economic genocide" against the family farm (Berry 2002).

Both liberals and conservatives alike share this sentiment that "small is beautiful." A substantial portion of organic farmers have right-leaning political views and see sustainable farming as an extension of their beliefs. Through this lens, the NFA is perceived as a return to the traditional, agrarian way of life, and the farmers and ranchers are seen as stewards of the land (Sayre 2011).

Schlosser's *Fast Food Nation* probably best represents the NFA criticism of large-scale operations that serve as a core component of the IFA system. The book is filled with judicial cases involving food companies and their questionable dealings. In 1999, top executives from Archer Daniels Midland were sent to federal prison for price fixing, specifically conspiring with foreign companies to control the price of certain feed additives. It was estimated that as a result of their illegal dealings, these companies overcharged farmers a total of \$180 million. ConAgra, one of the largest food suppliers in North America, was found guilty in 1995 of catfish price fixing and was fined \$13.6 million. Six years prior, ConAgra had also been found guilty of cheating chicken growers by tampering with scales and misrepresenting the weight of the chicken it was buying (resulting in \$17.2 million in fines). In 1997, two years after the catfish litigation, ConAgra was fined \$8.3 million when found guilty of wire fraud, misgrading crops, and waterlogging grain before selling it, gouging farmers and consumers alike.

On the retail end, Schlosser assesses McDonald's and its lawsuit in the United Kingdom against members of London Greenpeace, who passed out pamphlets with allegedly libelous claims about the corporation. As the case unfolded, it turned out many of the statements were in fact true. The UK courts ruled that McDonald's did exploit children through advertising and paid their employees unjustly low wages. Moreover, it came to light that McDonald's had hired spies to infiltrate London Greenpeace to collect intelligence about the defendants. A verdict was returned in 1997 after 7 years of court proceedings, but the defendants appealed to the European Court of

Human Rights, which left open “McLibel”-related litigation until 2005, 15 years after the original lawsuit. Schlosser’s anecdote, although biased in its depiction, describes well the distrust people have with corporations that seem driven by shareholder value and short-run profits.

Schlosser uses the meatpacking industry to illustrate the growing power of downstream intermediaries relative to that of farmers. Until the Reagan administration, ranchers sold cattle in a market with many buyers, and the top four firms slaughtered only 21% of the nation’s cattle. By 2001, that number had grown fourfold, and 81% of cattle were slaughtered by one of four meatpacking companies. As Schlosser cites the Nebraska Center for Rural Affairs: “A free market requires many buyers as well as many sellers, all with equal access to accurate information, all entitled to trade on the same terms and none with a big enough share of the market to influence price. Nothing close to these conditions now exists in the cattle market” (Schlosser 2001, p. 138). As an alternative, meatpacking firms have shown that oversupply of beef, not corporate behavior, explains low beef prices. Beef consumption is lower, cows are larger, fewer get sold, and they can’t be exported to the large European Union market because of a ban on imports of meat produced from animals that are subjected to growth hormones.

According to Schlosser, meat processors do not adequately provide for the safety and well-being of their workers, many of whom are from Latin America. He supports his claim by describing grotesque working conditions, worker deaths, and reporting on unsound corporate policies. Congressional hearings uncovered multiple injury logs kept by Iowa Beef Processing and found that the company not only misrepresented the number and severity of the injuries that occurred at its facilities but willfully refused to report more than 1,000 work-related injuries (Shabecoff 1987).

Philpott, a columnist for *Mother Jones* magazine, has exposed abusive practices of food corporations, such as the mistreatment of migrant agricultural laborers (Philpott 2014) and the poultry industry’s use of the term cage free as a means to greenwash its products (Philpott 2015b). Lawyer David R. Simon takes this investigative approach even further in his book *Meatonomics*, an exposé on how the US government and meat industry use misleading marketing, legislation, and artificially low prices to increase American meat consumption (Simon 2013). Surprisingly, Simon calculates that the externalities that are generated by the meat industry and that harm human and environmental health total \$414 billion annually, exceeding the industry’s \$250 billion annual revenue. Many critics of IFA claim that conditions in the swine and poultry sectors are worse than those in beef production. Companies such as Tyson Foods process a huge proportion of the nation’s chicken, vertically integrating the breeding, slaughtering, and processing and thus essentially doing everything but actually raising the birds. For the last, least lucrative step in the process, Schlosser says, “[Tyson] leaves the capital expenditures and the financial risks of [this] task to thousands of ‘independent contractors’” (Schlosser 2001, p. 140).

In a more recent piece titled *The Meat Racket*, Leonard (2014) hones in on Tyson to expose the nature of the economic mechanisms that generate much of the consumption of US meat, specifically poultry. Leonard speaks with an air of admiration for Don Tyson, the man who transformed the company into the juggernaut it is today. The son of a farmer who was forced out of the profession as a result of the Great Depression, Don Tyson had a knack for capitalizing and economizing. Despite his admiration for Tyson, Leonard takes serious issue with the vertical integration and contract culture in the industry Tyson created. Leonard argues that the vertical integration in the meat industry disadvantages farmers and consumers while allowing the meat conglomerates to reap large profits. Additionally, the contract culture extracts value from farmers and has eliminated the viability of spot markets in the United States. Leonard advocates for a return of free markets to meat production and for more state regulations to protect the interest of growers.

Leonard’s work has not gone uncriticized. It is debated whether the return of the free market would bring the slew of benefits to farmers that Leonard asserts would occur. More specifically,

Schaefer (2014) protests against Leonard's claims regarding Tyson's profitability, citing a modest 6.25% average return on equity over the last 10 years. This review argues that Tyson survives due to an obsession with efficiency and the motivation of farmers to avoid broiler cycles (Rausser & Cargill 1970). Schaefer also posits that the contract system actually supports the rural economy by assuring at least the opportunity cost of the farmers' business while "buffer[ing] the variability of farmer income through the use of contracts" and encouraging farmers to adopt new and efficient technologies in their operations (Schaefer 2014, p. 1508). Market realities also suggest that Leonard and other critics are driven largely by ideology (Rausser 2010).

However, the nature of the contracts between integrators and poultry growers complicates matters. Integrators are the sole determinant of the details of the contract, and growers are allowed to "take it or leave it," with little room for negotiation. The contracts generally last for the duration of one flock cycle, with no guarantee of a certain number of cycles in a year (Vukina & Leegomonchai 2006). Because there is an asymmetrical number of integrators to growers, with a few thousand growers in the states with the greatest concentration of poultry growers but only five to ten integrators, Vukina & Leegomonchai (2006) suggest that integrators can pressure growers into accepting these inefficient short-term contracts because it would be difficult for growers to switch companies. Along similar lines, Jenner (2014) suggests that most poultry growers do not want to risk upsetting the integrators for fear of retaliation, who have the contractual right to terminate growers' contracts at will with 90 days' notice. Although the integrators may terminate contracts, the grower's underlying commitment is long term. This is because growers make an initial costly investment to build poultry houses to the integrator's exacting standards, which can cost upwards of \$200,000–\$400,000, leaving many with debts and mortgages on their farm. The NFA paradigm seems to hold the view that this sector creates an inequitable market outcome, given the large scale, and potential monopsonistic nature, of contract poultry farming.¹

Although organic brands often have names and labels that encourage the idea of the small family farm, the profitability of the market has encouraged the creation of Big Organic, which is characterized by large operations that appear more similar to the public's idea of corporate agriculture than to their grandfather's homestead. Although the term organic was initially an adjective to generate an image of a certain type of small-scale farming, since the Organic Foods Production Act of 1990 (Gold 2007), the term has become a branding theme in agricultural marketing as organic regulatory standards have grown increasingly lax (Kindy & Layton 2009). The organic food sector has evolved, and corporate strategies that are strikingly similar to those of the IFA have emerged.

In part two of *The Omnivore's Dilemma*, Pollan addresses what he terms Big Organic: industrial food companies that hide behind a facade of an organic certification but are less than natural or sustainable in operation. He debunks some claims that organic is necessarily sustainable and sheds light on how free "free-range" chickens actually are. He discredits parts of the Big Organic industry, which superficially appears to be aligned with many of his ideals. He rejects this alignment with the same rhetoric he uses to scrutinize the large, monocropping conventional farms discussed in the first part of the book. In essence, he condemns a large portion of organic food as too industrial and even poor tasting. After his description of a meal bought entirely at Whole Foods, Pollan (2006) ponders whether it is worth the extra cost. He asserts that, when compared with the conventional food available for purchase at a large grocery chain, Big Organic is generally healthier, citing many recent papers on nutritional science (which he does regard elsewhere as a "young science"). However, he later seems to conclude that, on the basis of environmentalism

¹For an alternative perspective, see Rausser (2010).

and taste, there is not a significant difference between Big Organic and food produced from the IFA paradigm (Pollan 2009, p. xi).

Chassy et al. (2014) critically analyze the conduct and marketing of the organic food sector. The starting point for their analysis is a quote given in a keynote speech at a 1999 Organic Food Conference: “If the threats posed by cheaper conventionally produced products are removed, then the potential to develop organic foods will be limited.” They argue that the “perceived safety concerns tied to pesticides, hormones, antibiotics and genetically modified organisms (GMOs) are the critical component driving sales” for organics and that there is direct evidence linking “collaborative and pervasive industry marketing” and false consumer health and safety perceptions regarding conventionally produced food (Chassy et al. 2014, p. 1). The organic food sector has benefited from this perspective. Eco-friendly labels have flooded the markets, but many are used as a greenwashing marketing device by companies eager to profit off of the NFA movement. Certain labels, such as USDA Organic, Rainforest Alliance, and Certified Humane Raised and Handled, are grounded in reputable third-party certification. Others, such as “natural,” “cruelty free,” and “environmentally friendly,” can be liberally applied by companies without any objective and standardized verification (Schueller 2011). With organic foods projected to generate \$35 billion in 2014 (Greene 2014), it should come as no surprise that the sector is also motivated by profitability and political-economic realities.

AGRICULTURE IN A GLOBAL CONTEXT

Many criticisms of the IFA paradigm are presented from the vantage point of the developed world. Although there are similar negative assessments in the rest of the world, there is a sharp distinction between the agricultural realities of the developed world and those of the developing world. Throughout the twentieth century, food surpluses were a major part of the landscape of the developed world, whereas the developing world struggled with scarcity (Anderson et al. 2013). Working in a global context, geographer Jonathan Foley has become renowned for his papers that elucidate the connection between the global food problem and climate change. In “Solutions for a Cultivated Planet,” Foley et al. (2011) present the challenges to world agriculture, taking into account population growth, economic growth in developing countries, and land degradation. The authors conclude that with changes in agricultural practices and building on current technologies, the world could double food production to meet growing demand while drastically decreasing the environmental footprint of agriculture.

In “A Five-Step Plan to Feed the World,” Foley (2014) states that agriculture has “become polarized, pitting conventional agriculture and global commerce against local food systems and organic farms.” He acknowledges that IFA advocates are correct when they assert that “modern mechanization, irrigation, fertilizers, and improved genetics can increase yields to help meet demand,” but he also gives organic proponents credit in that “small farmers could increase yields plenty and help themselves out of poverty by adopting techniques that improve fertility without synthetic fertilizers and pesticides.” He proposes a five-step plan to improve agricultural practices. The steps include completely halting deforestation and new agricultural cultivation, improving yields on currently cultivated lands, improving input use efficiency, shifting the global diet away from grain-fed meat, and reducing food waste. Foley et al. (2005) argue that most of the best lands have been cultivated for centuries but that there are spatial differences in productivity. The transfer of know-how can lead to closing the yield gaps, increasing productivity of existing farmlands while freeing less productive lands to provide valuable ecological services.

A major challenge to the food system, especially in a developing country context, is control of land. This issue is emphasized in the writing of Olivier De Schutter, the UN Special Rapporteur on

the *Right to Food* (De Schutter 2008). De Schutter & Vanloqueren (2011) assess the consequences of land grabbing by larger entities (specifically in sub-Saharan Africa), finding that although developing countries have attracted vast amounts of foreign investment focused on acquiring land rights, these schemes have failed to yield inclusive development. These countries have yet to achieve poverty-reduction and food-security development goals. De Schutter & Vanloqueren argue that land is often the only productive asset that poor rural households have and that it would be mistaken to treat land ownership like other commodities. De Schutter & Vanloqueren also advocate pursuing sustainable agriculture-enhancing strategies and point to the promotion of agroecology and welfare improvement of smallholder farmers as critical components of such strategies. Focusing on smallholder farmers is critically important because more than half of the hungry people in the world live in small-scale farming households with less than two hectares of land (Sanchez & Swaminathan 2005). In the same spirit, Altieri et al. (2012) dissect a few selected case studies that they argue and show that, when farmers and institutions [governments, non-governmental organizations (NGOs), and academic institutions] combine modern agricultural science and local knowledge, such parties can increase food security and avoid depleting natural capital in the form of soil quality, biodiversity, and water quality.

Vandana Shiva, a major contributor to the global food debate, is an environmental activist and biotech critic. Shiva (1998) asserts that progress made in the name of science and technology has started to destroy life, and she has taken strong antiglobalization and anticorporate positions. She identifies the NFA as “a trend of diversity, democracy, freedom, joy, culture—people celebrating their lives. . . . And the [IFA]: Monocultures, deadness. Everyone depressed. Everyone on Prozac. More and more young people unemployed” (Specter 2014). Specter (2014) also cites a 2011 speech in which Shiva states that “fertilizer should never have been allowed in agriculture” and proposes to ban its use.

Climate change activist Bill McKibben, who founded 350.org, predicts that climate change has induced an “endless chain of disasters that will turn civilization into a never-ending emergency response drill” (McKibben 2013, p. 42). He integrates climate change activism and the NFA paradigm. He argues that IFA is contributing to greenhouse-gas emissions at such a high level because it is essentially an “extension of the fossil fuel industry,” and he makes a case for smaller farms by referring to evidence suggesting that smaller farms, often with low inputs, are harvesting the largest yields (McKibben 2014, 01:34). His argument is echoed by sustainable-food advocate Anna Lappé, who, in her book *Diet for a Hot Planet: The Climate Crisis at the End of Your Fork and What You Can Do About It*, links the food system contributions to climate change, including emissions from globalized food supply chain and increased meat consumption. She devotes a section to actions that the quotidian citizen can undertake to reduce her food-related environmental footprint. McKibben’s and Lappé’s messages come at a very crucial time when the current global food system contributes 19–29% of all anthropogenically induced greenhouse-gas emissions (Vermeulen et al. 2012). The largest emitters in the agricultural sector are from synthetic fertilizer application (nitrous oxide), enteric fermentation and manure management from livestock (methane), rice production (methane), and deforestation (carbon dioxide).

FOOD AND THE CONSUMER

The two major global nutritional and health problems, malnourishment and obesity, seem contradictory. According to Nobel Laureate Amartya Sen, “widespread hunger in the world is primarily related to poverty. It is not principally connected with food production at all” (Sen 2002). As a result, the importance of understanding food distribution as opposed to food supply must be stressed. Although Sen emphasizes the developing world, his analysis also applies to developed

countries, particularly the United States and European Union. Recent studies (Weinberg 1995, p. 3, and Rose & Richards 2004) recently identified “food deserts,” which are rural or urban areas “without ready access to healthy or affordable food” (<https://apps.ams.usda.gov/fooddeserts/foodDeserts.aspx>), and conclude that low-income neighborhoods have 30% fewer supermarkets than do high-income neighborhoods. This disparity is compounded by differences in access to transportation, by lack of time to prepare meals, and by unsafe neighborhoods. These kinds of differences are thought to discourage proper diets. Such diets can result in malnourishment or undernourishment. Moreover, residents of food deserts in the United States rely heavily on fast food restaurants, and as a result, poverty has been correlated with the obesity epidemic (Nestle 2007).

The inadequate nutrient intake of the poor has led to the emergence of a food justice movement akin to the social justice movement (Wekerle 2004). Food justice advocates challenge the larger global food system, recommending the pursuit of urban sustainability projects like urban gardens, farmers’ markets, and composting (Starr 2000). Such projects encourage economic development that offers sharp distinctions from IFA, which Starr (2000) believes is also very important to the developed world. The food justice movement agenda is championed by a diverse body of organizations ranging from NGOs and think tanks to the USDA’s “Know Your Farmer, Know Your Food” initiative (<http://www.usda.gov/wps/portal/usda/knownyourfarmer?navid=KNOWYOURFARMER>) and First Lady Michelle Obama’s “Let’s Move” campaign (<http://www.letsmove.gov/>).

Marion Nestle, a leading academic nutritionist, argues that food policies and the food industry significantly affect food choices. Nestle (2007) presents examples of agribusiness subversively influencing policy and advertising to capture its narrow self-interest. In particular, in establishing the 2000 nutritional guidelines of the USDA and the Department of Health and Human Services, the seemingly uncontroversial “Aim for a Healthy Weight” guideline was opposed by firms like Frito-Lay because it could lead to reduced consumption of their products. Nestle identifies paths of action to improve the political climate of food and nutrition, inspired largely by antismoking campaigns. She calls for consumers to use their food choices as political statements by selecting healthy food sources and recommends direct alliances between farms and consumers. New York City vegan restaurant Angelica Kitchen, which procures its produce from local farms, is offered as a model of food production and distribution. Unfortunately, the median price of an entrée at Angelica Kitchen is \$15 (<http://www.angelicakitchen.com/#menus>), more than twice the amount of the hourly federal minimum wage of \$7.25.

Nestle also argues that a large part of the increasing levels of obesity in the United States is caused by the increase in portion sizes, particularly for processed foods and fast food servings, spurred by the overproduction of food in many industrialized countries (Nestle 2003). Every item in a sample of foods she considered was found to contain a larger portion size than the USDA or the FDA lists as a serving size, often by more than 100% (Young & Nestle 2002). The USDA is currently reviewing proposed changes to the Nutrition Facts label, one of which is to label packaged foods and drinks meant to be eaten in a single sitting as one serving (FDA 2014b).

Stuckler & Nestle (2012) argue that, because one billion people begin each day hungry and two billion people are overweight (Patel 2008, p. 448), the underlying causal factor must be that “food systems are not driven to deliver optimal human diets, but to maximize profits.” They go on to posit that reconciling consumer needs with corporate motives is highly unlikely because healthy food is inherently not profitable. As such, they advocate for public health regulation, putting the onus on Big Food to prove that it satisfies standards and provides foods worthy of human consumption.

In the book *Revolution at the Table: The Transformation of the American Diet*, the historian Harvey Levenstein (1988) provides an historical prism on the evolution of the American diet and attitudes that are the basis for a dramatically different lens compared with the framework advanced by Nestle. He explains that, until the end of the nineteenth century, the American diet was not diverse and strongly emphasized the consumption of meats. There was a bifurcation between the

conspicuous consumption of the rich and the subsistence diets of the poor. The American diet evolved between 1880 and 1930 due to the emergence of new scientific knowledge (discovery of vitamins), urbanization, constraints on food time preparation (the “servant” problem of the middle class and the emergence of professional women), and immigration. These developments resulted in the rise of agribusiness and labor-saving simple foods with less emphasis on meats. The changes in diets were induced both by education and by marketing and promotion that were sometimes misleading. There is currently a new bifurcation between the diets motivated by a nutrition- and health-conscientious middle class and the diets of the time- and budget-constrained poor. The transition to the new science-based diet was plagued with unrealistic expectations, fads, and unsubstantiated claims about foods. Levenstein’s analysis suggests that many current alternative food perspectives that we have today are a continuation of a long historical process.

Levenstein (1988) also suggests that, despite the immense increase in nutritional knowledge, much is still unknown, and nutritional theories have even been proven wrong on more than one occasion. This view is shared by Taubes (2011b), who argues that analysis of the impacts of diets based on material-balance rules is overly simplistic and that the biochemical processes governing food digestion and metabolism should instead be emphasized. In particular, Taubes argues that a major flaw of the current US diet is its emphasis on consumption of carbohydrates, which has the unfortunate consequence of increased obesity. He also demonizes sugar in an article for *The New York Times Magazine* titled “Is Sugar Toxic?” (Taubes 2011a). He recommends, in lieu of the USDA’s food groups pyramid, an emphasis on meats, eggs, and vegetables and argues that their adoption can help counter the obesity crisis.

Conflicting nutritional theories have abetted the growth of misleading food marketing by companies, which use popular health fads to their advantage. Both class action lawsuits and media personalities have challenged the food industry’s false advertising. More than 100 lawsuits in the past few years have challenged food companies that label their food products as natural. One obstacle stems from the fact that the FDA has not officially defined natural and instead defers to its statement that natural means “nothing artificial or synthetic has been included” (Esterl 2013). Among the few recent high-profile cases that have been settled include those involving PepsiCo, which paid \$9 million in 2013 to settle a lawsuit over Naked Juice for using GMOs and chemically processed vitamins, and Barbara’s—manufacturer of Puffins Cereal—which paid \$4 million over a claim that it was using nonnatural ingredients (Esterl 2013).

Social media have also given rise to activist blog personalities who take on corporate giants. Among the better known is Vani Hari, the founder of the blog “Food Babe” (<http://foodbabe.com/>). Hari rallies readers to pressure companies into changing their production practices. She takes credit for modifying the practices of corporations such as Starbucks, General Mills, and Subway. However, many scientists have been critical of Hari’s blog, denouncing her for peddling pseudoscience, for alarmist viewpoints, and for the lack of rigorous scientific data used to support her claims. Furthermore, food policy critics suggest that, by lauding food corporations for making small-but-easy changes, Hari makes it difficult for advocates to press for substantive change (Purvis 2014).

GOVERNMENT POLICY REFORMS

Struggles to reach consensus on agricultural policy have long characterized American history. Many significant historical events, such as the American Revolution and the Civil War, originated over access to agricultural land, availability of farm labor, and effects of monetary policy on farmers (Sumner 1999). Modern-day farm programs developed in the 1930s as a response to the plummeting agricultural commodity prices. The government worked to implement a price floor above the market clearing price for feed grains, wheat, rice, and cotton, which resulted in surpluses.

To address this problem of surplus, the Farm Bill established supply controls, such as output quotas and subsidized idling land, as well as the creation of export subsidies, international food aid, and domestic food subsidies (Rausser 1992, Sumner 1999).

In contemporary public discourse, there has been a widely growing public interest in reforming food and agricultural policy. Participants in this discussion are no longer limited to the economics or policy spheres but also come from the fields of law, medicine, and business (Linnekin 2013). These critics of the Farm Bill see governmental programs as outdated and indirectly harmful to the American public. In particular, NFA proponents critique the government's continued subsidization, through crop subsidies and crop insurance, of maize and soy, but not of fruits and vegetables. The logic is that farmers will gravitate toward growing grain and oil seed because the production risk is greatly reduced (Haspel 2014). Mark Bittman, Michael Pollan, Ricardo Salvador, and Olivier De Schutter (Bittman et al. 2014) argue that—given how food, from its production to its consumption, impacts public health, the environment, climate change, economic inequality, and the federal budget—the government needs to create a unified, national food policy that focuses on the public's welfare. Bittman et al. view as hypocritical a government that simultaneously subsidizes production of high-fructose corn syrup through corn subsidies and pays for the American public's health care costs for diet-related chronic diseases.

Given the association or correlation between rising levels of US obesity largely due to dietary changes, and the continued subsidization of commodity crop farmers, some critics suggest that eliminating those subsidies would improve American health (Nestle 2007). Imhoff's (2007) book on the Farm Bill suggests that junk food is subsidized because the Farm Bill favors "mega production" of corn (Imhoff 2007). In a speech at Williams College in 2007, Michael Pollan asserted that organic foods will never compete with their conventional counterparts as long as the price of conventional agriculture is artificially low (Pollan 2007). However, Pollan has not shied away from proposing policy reforms that encourage or subsidize organic farming. In *Farmer in Chief* (Pollan 2008a), he suggests that producers of fresh produce, such as sellers in farmers' markets and organic producers, should receive preferential treatment by US government support programs.

Iles & Marsh (2012) call for policy reforms that rely on economic incentives. If the DFS is to thrive again (as in the nineteenth century), policies must reward farmers who provide environmental services while simultaneously increasing regulation of IFA practices to "shift progressively from degradation to diversification." These authors suggest that public research funding be redirected from industrial technologies to the development of a knowledge base for more sustainable practices and that the access to information alone will have a positive effect on DFS adoption. Along similar lines, Iles & Marsh also suggest an increase in performance-based Conservation Reserve Program and Environmental Quality Incentives Program incentives and other payments for environmental services programs. Iles & Marsh call for a governmental emphasis on more localized agricultural marketing, e.g., government subsidy support for the use of Supplemental Nutrition Assistance Program (SNAP) benefits at local farmers' markets and for fresh food. In recent years, the number of farmers' markets that accept SNAP has risen to nearly 3,000 locations nationwide (<http://www.fns.usda.gov/cbt/learn-about-snap-benefits-farmers-markets>).

ALTERNATIVE ASSESSMENTS OF NFA

The NFA movement, with its heavy criticism of the IFA paradigm, has critics of its own. Much of the debate between the two paradigms frequently boils down to GMOs versus ecological agriculture. Böschen et al. (2006) argue that the conflict between these two forms of agriculture reflects the differences between the organismal versus molecular approaches to biology. Yet, E.O. Wilson (Wilson & Salazar 2011), a leading organismal biologist, argues that we "need all the biology and all

the advances we can find in agriculture.” He accepts the need for GMOs and admits that “some people don’t like the idea. But that’s one of those necessities brought about by the human condition.”

A plant geneticist at the University of California, Davis, Pam Ronald, made the fateful decision to marry an organic farmer, Raoul Adamchak. Their recent book, *Tomorrow’s Table* (Ronald & Adamchak 2008), argues that organic farming and GMOs are complements, not substitutes, and that the cooperation of genetic modification and ecological practices is key to feeding a growing population. They recognize that organic production is generally less energy intensive and more supportive of environmental services but, typically, less productive (in terms of yields per land acre) than IFA. Thus, dually focusing on fostering soil fertility and improving crop varieties will lead to the production of healthier, safer, and more abundant food.

The French philosopher Pascal Bruckner’s perspective on the NFA originates from his criticism of the environmental movement. In his book *The Fanaticism of the Apocalypse*, Bruckner argues that, although climate change is a very real phenomenon, the manner in which we view its emergence is fatalist (Bruckner 2014). He draws parallels between the climatically fatalistic perspective and the Catholic Church’s “admonishment to give up joy.” He describes the carbon footprint as our generation’s original sin. He is concerned about the environmental movement perspective on “the despised industrial civilization, the frightening science, the endless crisis, the globalization that exceeds our grasp” and suggests that only an increase in research, an explosion of creativity, or an unprecedented technological advance will save us. He emphasizes the necessity of encouraging a new renaissance era for everything from architecture to agriculture and claims that the way in which we are discussing our futures, due to the environmental narrative, encourages us to sit on our hands. Although his view of environmentalists for being nothing more than critics is quite simplistic, his book provides a valuable lens on the policy debate related to agriculture, development, and the environment.

CONCLUSION

Noneconomists have produced an expansive body of public discourse on food and agriculture consisting of multiple strands and diverse perspectives that are sometimes contradictory. The NFA paradigm portrays itself as a decentralized industry that hedges against large risk, resulting in localized gains. In contrast, the IFA paradigm is a centralized industry, inherently exposed to large, uncontrollable risk (agroterrorism, widespread contamination, or antibiotic resistance). A reoccurring theme is the rejection of the IFA and support for the NFA, emphasizing local, small-scale, diversified, low-input agriculture. The NFA paradigm follows a long tradition of critical expositions of agricultural and food systems, sourced from original thought leaders such as Carson, Sinclair, Steinbeck, and Buck.

Much of the literature presenting the NFA paradigm takes a strong advocacy position, and it tends to be long on prescription and short on analysis. Its thought leaders tend to shape much of the public discourse around the externalities emanating from the IFA system. Forwarded by noneconomists, the NFA paradigm is mostly unaware of the large and rich literature in agricultural and environmental economics that has been frequently critical of major features of modern agriculture, existing agricultural policies, and the environmental external costs of agriculture. Economists have been using both welfare and political-economic arguments to offer significant reforms of agricultural policies (Rausser 1992, Rausser et al. 2011) and to address environmental and resource policies in agriculture (Kling et al. 2010, Lichtenberg et al. 2010), industrial concentration (Sexton & Lavoie 2001), and food safety (Unnevehr et al. 2010). The NFA literature that addresses similar topics is much more visible to the public, but as a literature written by noneconomists, it underemphasizes human behavior, resource constraints, preferences, and trade-offs

and downplays the role of incentives and institutions, especially the role of markets. The NFA paradigm also tends to overlook the heterogeneity of socioeconomic and biophysical conditions and the diversity of solutions that such conditions imply. For example, although organic farming is a valuable niche market, its viability as a global solution for the food safety and security issues facing humanity is still to be determined. Thus, the policies advocated by the NFA paradigm may face difficult implementation barriers or fail to meet incentive compatibility criteria.

Although the policy prescriptions that the NFA paradigm presents may be naive, this paradigm captures real concerns of the general public. People are conscious of the price and quality of foods that they consume, are generally intimidated by giant agribusinesses, are sympathetic to farmworkers, and are concerned about the impact of food systems on environmental quality. The NFA paradigm is an outlet for these concerns, and it raises interest in agricultural and food systems, particularly public policy issues, providing a fertile ground for agricultural and natural resource economic research. Such a research agenda should aim to identify and quantify the implications of the major proposals of the alternative paradigms, e.g., the impact of locavorism, organic agriculture, and heavy restrictions on GMOs, as well as the costs and benefits of globalization and commercial farming systems. This agenda should identify major flaws of the commercial agricultural systems and propose solutions to address noncompetitive excesses and to improve environmental and safety outcomes of IFA. At the same time, this research should investigate the value of various agroecology strategies and the fragility limits of monoculture.

To advance the public discourse, economists need to address and educate individuals with limited economic literacy, including both proponents of the NFA paradigm and the public at large. Simply advancing the right answer after taking into account all the relevant trade-offs is not sufficient; the profession's implementation requires developing the capacity to communicate complex economic ideas simply and clearly to an actively engaged public. Such conduct can enhance the effectiveness of economic argumentation in the food and agricultural system debate.

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LITERATURE CITED

- Abidoye BO, Bulut H, Lawrence JD, Mennecke B, Townsend AM. 2011. US consumers' valuation of quality attributes in beef products. *J. Agric. Appl. Econ.* 43(1):1–12
- Altieri MA. 2000. Agroecology: principles and strategies for designing sustainable farming systems. http://nature.berkeley.edu/~miguel-alt/principles_and_strategies.html
- Altieri MA, Funes-Monzote FR, Petersen P. 2012. Agroecologically efficient agricultural systems for small-holder farmers: contributions to food sovereignty. *Agron. Sustain. Dev.* 32(1):1–13
- Anderson K, Rausser G, Swinnen J. 2013. Political economy of public policies: insights from distortions to agricultural and food markets. *J. Econ. Lit.* 51(2):423–77
- Anderson PM, Butcher KE. 2006. Childhood obesity: trends and potential causes. *Future Child.* 16(1):19–45
- Bacon CM, Getz C, Kraus S, Montenegro M, Holland K. 2012. The social dimensions of sustainability and change in diversified farming systems. *Ecol. Soc.* 17(4):41

- Becker GS. 1965. A theory of the allocation of time. *Econ. J.* 75:493–517
- Bennett AB, Chi-Ham C, Barrows G, Sexton S, Zilberman D. 2013. Agricultural biotechnology: economics, environment, ethics, and the future. *Annu. Rev. Environ. Resour.* 38:249–79
- Berry W. 2002. Death of the American family farm. *Progressive*, April
- Berry W. 2012. *It All Turns on Affection: The Jefferson Lecture and Other Essays*. Berkeley: Counterpoint
- Bittman M. 2012. Everyone eats there. *N. Y. Times Mag.*, Oct. 10
- Bittman M. 2013. Why do G.M.O.'s need protection? *N. Y. Times*, April 13
- Bittman M, Pollan M, Salvador R, De Schutter O. 2014. How a national food policy could save millions of American lives. *Wash. Post*, Nov. 7
- Bonny S. 2014. Taking stock of the genetically modified seed sector worldwide: market, stakeholders, and prices. *Food Secur.* 6(4):525–40
- Böschchen S, Kastenhofer K, Marschall L, Rust I, Soentgen J, Wehling P. 2006. Scientific cultures of non-knowledge in the controversy over genetically modified organisms (GMO): the cases of molecular biology and ecology. *GAIA* 15(4):294–301
- Bruckner P. 2014. *The Fanaticism of the Apocalypse: Save the Earth, Punish Human Beings*. Cambridge, UK: Polity
- Buck P. 1931. *The Good Earth*. New York: John Day
- Carson R. 1962. *Silent Spring*. Boston: Houghton Mifflin
- CDC (Cent. Dis. Control Prev.). 2006. *Multistate outbreak of E. coli O157:H7 infections linked to fresh spinach (final update)*. <http://www.cdc.gov/ecoli/2006/september/updates/100606.htm>
- CDC. 2013. *Antibiotic resistance threats in the United States, 2013*. Rep., CDC
- CDC. 2014. *Antibiotic use in food-producing animals: tracking and reducing the public health impact*. <http://www.cdc.gov/narms/animals.html>
- Chambers PG, Grandin T. 2001. *Guidelines for humane handling, transport and slaughter of livestock*. Rep., FAO, U. N.
- Chassy B, Tribe D, Brookes G, Kershen D. 2014. *Organic marketing report*. Rep., Acad. Rev.
- Constance DH, Martinez-Gomez F, Aboites-Manrique G, Bonanno A. 2013. The problems with poultry production and processing. In *The Ethics and Economics of Agrifood Competition*, ed. J Harvey, pp. 155–75. Dordrecht, Neth.: Springer
- Costanigro M, McCluskey J. 2011. Hedonic price analysis in food markets. In *The Oxford Handbook of the Economics of Food Consumption and Policy*, ed. J.L. Lusk, J. Roosen, J.F. Shogren, pp. 153–61. Oxford, UK: Oxford Univ. Press
- De Schutter O. 2008. *Promotion and protection of all human rights, civil, political, economic, social and cultural rights, including the right to development: report of the special rapporteur on the right to food, Olivier De Schutter. Building resilience: a human rights framework for world food and nutrition security*. Rep., U. N. Gen. Assem.
- De Schutter O, Vanloqueren G. 2011. The new green revolution: how twenty-first-century science can feed the world. *Solutions* 2(4):33–44
- Eckert E, Bell A. 2006. Continuity and change: themes of mental model development among small-scale farmers. *J. Extens.* 44(1):1FEA2
- Ehrlich PR, Raven PH. 1964. Butterflies and plants: a study in coevolution. *Evolution* 18(4):586–608
- Esterl M. 2013. Some food companies ditch 'natural' label. *Wall Str. J.*, Nov. 6
- Fassler J. 2013. The Wendell Berry sentence that inspired Michael Pollan's food obsession. *Atl. Mon.*, April 23. <http://www.theatlantic.com/entertainment/archive/2013/04/the-wendell-berry-sentence-that-inspired-michael-pollans-food-obsession/275209/>
- FDA (Food Drug Admin.). 2014a. *2012 summary report on antimicrobials sold or distributed for use in food-producing animals*. Rep., FDA
- FDA. 2014b. *Proposed changes to the nutrition facts label*. <http://www.fda.gov/Food/GuidanceRegulation/GuidanceDocumentsRegulatoryInformation/LabelingNutrition/ucm385663.htm>
- Foley J. 2014. A five-step plan to feed the world. *Natl. Geogr. Online*, May. <http://www.nationalgeographic.com/foodfeatures/feeding-9-billion/>

- Foley JA, Defries R, Asner GP, Barford C, Bonan G, et al. 2005. Global consequences of land use. *Science* 309(5734):570–74
- Foley JA, Ramankutty N, Brauman KA, Cassidy ES, Gerber JS, et al. 2011. Solutions for a cultivated planet. *Nature* 478(7369):337–42
- Fuglie K, Heisey P, King J, Schimmelpfennig D. 2012. Rising concentration in agricultural input industries influences new farm technologies. *Amber Waves*, Dec. 3
- Gliessman S. 2009. A framework for the conversion to food system sustainability. *J. Sustain. Agric.* 33(1):1–2
- Gliessman SR. 1998. *Agroecology: Ecological Processes in Sustainable Agriculture*. Boca Raton, FL: CRC
- Gold MV. 2007. *What is organic production?* Natl. Agric. Libr. <http://www.nal.usda.gov/afsic/pubs/ofp/ofp.shtml>
- Goldschmidt WR. 1947. *As You Sow*. New York: Harcourt Brace
- Grandin T. 2002. *Animals are not things: a view on animal welfare based on neurological complexity. Paper presented at a discussion on whether or not animals should be property, with Marc Hauser, Dept. of Psychology, Harvard University, 2002.* <http://www.grandin.com/welfare/animals.are.not.things.html>
- Greene C. 2013. Growth patterns in the US organic industry. *Amber Waves*, Oct. 24
- Greene C. 2014. *Organic market overview*. Econ. Res. Serv., USDA. <http://www.ers.usda.gov/topics/natural-resources-environment/organic-agriculture/organic-market-overview.aspx>
- Grunert KG. 2005. Food quality and safety: consumer perception and demand. *Eur. Rev. Agric. Econ.* 32(3):369–91
- Hall BF, LeVeen PE. 1978. Farm size and economic efficiency: the case of California. *Am. J. Agric. Econ.* 60(4):589–600
- Hamilton PA, Helsel DR. 1995. Effects of agriculture on ground-water quality in five regions of the United States. *Ground Water* 33(2):217–26
- Haspel T. 2014. Farm bill: Why don't taxpayers subsidize the foods that are better for us? *Wash. Post*, Feb. 18
- Hayes MN, Olmstead AL. 1984. Farm size and community quality: Arvin and Dinuba revisited. *Am. J. Agric. Econ.* 66(4):430–36
- Heiman A, Just DR, McWilliams B, Zilberman D. 2001. Incorporating family interactions and socioeconomic variables into family production functions: the case of demand for meats. *Agribusiness* 17(4):455–68
- Hibbert RG, Pavel A, Forgues Schlenker C. 2014. Mandatory GMO labeling: perhaps some skepticism on the Hill. *Natl. Law Rev.*, Dec. 26
- Hoppe R, MacDonald J, Korb P. 2010. *Small farms in the United States: persistence under pressure*. Bull. EIB-63, USDA. <http://www.ers.usda.gov/publications/eib-economic-information-bulletin/eib63.aspx>
- Iles A, Marsh R. 2012. Nurturing diversified farming systems in industrialized countries: how public policy can contribute. *Ecol. Soc.* 17(4):42
- Imhoff D. 2007. *Food Fight: The Citizen's Guide to a Food and Farm Bill*. Healdsburg, CA: Watershed Media
- IPCC. 2007. *Climate change 2007 synthesis report: summary for policymakers*. Rep., IPCC
- Jenner A. 2014. Chicken farming and its discontents. *Mod. Farmer*, Feb. 24
- Kindy K, Layton L. 2009. USDA organic label comes under fire. *Los Angel. Times*, July 3
- Kling CL, Segerson K, Shogren JF. 2010. Environmental economics: how agricultural economists helped advance the field. *Am. J. Agric. Econ.* 92(2):487–505
- Kremen C, Iles A, Bacon C. 2012. Diversified farming systems: an agroecological, systems-based alternative to modern industrial agriculture. *Ecol. Soc.* 17(4):44
- Kremen C, Miles A. 2012. Ecosystem services in biologically diversified versus conventional farming systems: benefits, externalities, and trade-offs. *Ecol. Soc.* 17(4):40
- Lancaster KJ. 1966. A new approach to consumer theory. *J. Polit. Econ.* 74(2):132–57
- Lappé A. 2010. *Diet for a Hot Planet: The Climate Crisis at the End of Your Fork and What You Can Do About It*. New York: Bloomsbury
- Leonard C. 2014. *The Meat Racket: The Secret Takeover of America's Food Business*. New York: Simon and Schuster
- Levenstein HA. 1988. *Revolution at the Table: The Transformation of the American Diet*. Berkeley: Univ. Calif. Press

- Lichtenberg E, Shortle J, Wilen J, Zilberman D. 2010. Natural resource economics and conservation: contributions of agricultural economics and agricultural economists. *Am. J. Agric. Econ.* 92(2):469–86
- Linnekin B. 2013. *Food policy moves to the fore*. <http://reason.com/archives/2013/04/13/food-policy-moves-to-the-fore/singlepage>
- Low SA, Adalja A, Beaulieu E, Key N, Martinez, S, et al. 2015. *Trends in local and regional food systems: a report to Congress*. Admin. Publ. AP-068, USDA
- MacInnis B, Rausser G. 2005. Does food processing contribute to childhood obesity disparities? *Am. J. Agric. Econ.* 87(5):1154–58
- McKibben B. 2013. *Oil and Honey: The Education of an Unlikely Activist*. New York: Macmillan
- McKibben B. 2014. Bill McKibben: Is agriculture destroying our planet? *Nation*, Interview, Feb. 27
- Moore Lappé F. 1971. *Diet for a Small Planet*. New York: Ballantine
- Morgan K, Murdoch J. 2000. Organic vs. conventional agriculture: knowledge, power and innovation in the food chain. *Geoforum* 31(2):159–73
- Nadimpalli M, Rinsky JL, Wing S, Hall D, Stewart J, et al. 2015. Persistence of livestock-associated antibiotic-resistant *Staphylococcus aureus* among industrial hog operation workers in North Carolina over 14 days. *Occup. Environ. Med.* 72(2):90–99
- National Academy of Sciences. 2010. Drivers and constraints affecting the transition to sustainable farming practices. In *Toward Sustainable Agricultural Systems in the 21st Century*, Committee on Twenty-First Century Systems Agriculture, National Research Council, pp. 271–350. Washington, DC: National Academies Press
- Nestle M. 2003. The ironic politics of obesity. *Science* 299(5608):781
- Nestle M. 2007. *Food Politics: How the Food Industry Influences Nutrition and Health*. Berkeley: Univ. Calif. Press
- Netherwood T, Martín-Orúe SM, O'Donnell AG, Gockling S, Graham J, et al. 2004. Assessing the survival of transgenic plant DNA in the human gastrointestinal tract. *Nat. Biotechnol.* 22(2):204–9
- NOAA (Natl. Ocean. Atmos. Admin.). 2013. NOAA, partners predict possible record-setting dead zone for Gulf of Mexico. http://www.noaanews.noaa.gov/stories2013/20130618_deadzone.html
- Paarlberg R. 2009. *Starved for Science: How Biotechnology Is Being Kept Out of Africa*. Cambridge, MA: Harvard Univ. Press
- Patel R. 2008. *Stuffed and Starved: The Hidden Battle for the World Food System*. Brooklyn, NY: Melville House
- Petrini C. 2003. *Slow Food: The Case for Taste*. New York: Columbia Univ. Press
- Philpott T. 2010. Our other addiction: the tricky geopolitics of nitrogen fertilizer. *Grist*, Feb. 12
- Philpott T. 2012. 3 new studies link bee decline to Bayer pesticide. *Mother Jones*, March 29
- Philpott T. 2014. The horrifying reason why your fruit is unblemished. *Mother Jones*, Dec. 10
- Philpott T. 2015a. Dust from factory farms carries drugs, pop bacteria, and antibiotic-resistant genes far and wide. *Mother Jones*, Jan. 27
- Philpott T. 2015b. What does “cage-free” even mean? *Mother Jones*, Jan. 14
- Pollan M. 2001. *The Botany of Desire: A Plant's Eye View of the World*. New York: Random House
- Pollan M. 2006. *The Omnivore's Dilemma: A Natural History of Four Meals*. New York: Penguin
- Pollan M. 2007. *The omnivore's dilemma*. Speech, Williams Coll., Oct. 11. <https://www.youtube.com/watch?v=AEUxk12U9ZQ>
- Pollan M. 2008a. Farmer in chief. *N. Y. Times Mag.*, Oct. 12. <http://www.nytimes.com/2008/10/12/magazine/12policy-t.html>
- Pollan M. 2008b. *In Defense of Food*. New York: Penguin
- Pollan M. 2009. *Food Rules: An Eater's Manual*. New York: Penguin
- Purvis K. 2014. Charlotte's Food Babe has lots of fans—and some critics. *The Charlotte Observer*, Sept. 8
- Rausser GC. 1992. Predatory versus productive government: the case of US agricultural policy. *J. Econ. Perspect.* 6(3):133–57
- Rausser GC. 2010. *Declaration of Gordon C. Rausser, Ph.D.* Submitted in Opposition to RIN 0580-AB07 (Implementation of Regulations Required Under Title XI of the Food, Conservation and Energy Act of 2008; Conduct in Violation of Act), Grain Inspection, Packers and Stockyards Administration, USDA

- Rausser GC, Cargill TF. 1970. The existence of broiler cycles: an application of spectral analysis. *Am. J. Agric. Econ.* 52(1):109–21
- Rausser GC, Swinnen J, Zusman P. 2011. *Political Power and Economic Policy: Theory, Analysis, and Empirical Applications*. Cambridge, UK: Cambridge Univ. Press
- Rausser GC, Thunström L. 2008. The marginal willingness-to-pay for health related food characteristics. *Food Econ.* 5(3):194–206
- Rodale M. 2010. *Organic Manifesto: How Organic Farming Can Heal Our Planet, Feed the World, and Keep Us Safe*. Emmaus, PA: Rodale
- Ronald PC, Adamchak RW. 2008. *Tomorrow's Table: Organic Farming, Genetics, and the Future of Food*. Oxford, UK: Oxford Univ. Press
- Rose R, Richards R. 2004. Food store access and household fruit and vegetable use among participants in the US food stamp program. *Public Health Nutr.* 7(8):1081–88
- Sanchez PA, Swaminathan MS. 2005. Cutting world hunger in half. *Science* 307(5708):357–59
- Sayre L. 2011. The politics of organic farming: populists, evangelicals, and the agriculture of the middle. *Gastronomica* 11:38–47
- Schaefer KA. 2014. The meat racket: the secret takeover of America's food business. *Am. J. Agric. Econ.* 96(5):1507–8
- Schlosser E. 2001. *Fast Food Nation: The Dark Side of the All-American Meal*. Boston: Houghton Mifflin
- Schueller G. 2011. The truth behind food labels. *Audubon*, March–April
- Sen A. 2002. Why half the planet is hungry. *Observer*, June 16. <http://pqasb.pqarchiver.com/guardian/doc/478334906.html?FMT=CITE&FMTS=CITE:AI&type=historic&date=Jun+16%2C+2002&author=&pub=The+Observer+%281901-2003%29&edition=&startpage=&desc=Why+half+the+planet+is+hungry>
- Seufert V, Ramankutty N, Foley JA. 2012. Comparing the yields of organic and conventional agriculture. *Nature* 485(7397):229–32
- Sexton RJ, Lavoie N. 2001. Food processing and distribution: an industrial organization approach. In *Handbook of Agricultural Economics*, Vol. 1, ed. BL Gardner, GC Rausser, pp. 863–932. Amsterdam: Elsevier
- Shabecoff P. 1987. OSHA seeks \$2.59 million fine for meatpacker's injury reports. *N. Y. Times*, July 21
- Shiva V. 1998. *Biopiracy: The Plunder of Nature and Knowledge*. Boston: South End
- Shukla J, Nobre C, Sellers P. 1990. Amazon deforestation and climate change. *Science* 247(4948):1322–25
- Simon DR. 2013. *Meatonomics: How the Rigged Economics of Meat and Dairy Make You Consume Too Much and How to Eat Better, Live Longer, and Spend Smarter*. San Francisco, CA: Red Wheel/Weiser
- Sinclair U. 1906. *The Jungle*. New York: Doubleday
- Specter M. 2014. Vandana Shiva's crusade against genetically modified crops. *New Yorker*, Aug. 25
- Starr A. 2000. *Naming the Enemy: Anti-Corporate Movements Confront Globalization*. London: Zed
- Steinbeck J. 1939. *The Grapes of Wrath*. New York: Viking
- Strom S. 2015. Many G.M.O.-free labels, little clarity over rules. *N. Y. Times*, Jan. 30
- Stuckler D, Nestle M. 2012. Big food, food systems, and global health. *PLOS Med.* 9.6:e1001242
- Sumner DA. 1999. Agricultural commodity policy in an historical context. *ARE Update* 2(3):5–7
- Taleb NN. 2012. *Antifragile: Things that Gain from Disorder*. New York: Random House
- Taubes G. 2011a. Is sugar toxic? *N. Y. Times Mag.*, April 17
- Taubes G. 2011b. *Why We Get Fat: And What to Do About It*. New York: Anchor
- Tavernise S. 2014. Antibiotics in livestock: F.D.A. finds use is rising. *N. Y. Times*, Oct. 2
- Tengö M, Belfrage K. 2004. Local management practices for dealing with change and uncertainty: a cross-scale comparison of cases in Sweden and Tanzania. *Ecol. Soc.* 9(3):4
- Unnevehr L, Eales J, Jensen H, Lusk J, McCluskey J, Kinsey J. 2010. Food and consumer economics. *Am. J. Agric. Econ.* 92(2):506–21
- Van Eenennaam AL, Young AE. 2014. Prevalence and impacts of genetically engineered feedstuffs on livestock populations. *J. Anim. Sci.* 92(10):4255–78
- Vermeulen SJ, Campbell BM, Ingram JSI. 2012. Climate change and food systems. *Annu. Rev. Environ. Resour.* 37:195–222

- Vukina T, Leegomonchai P. 2006. Political economy of regulation of broiler contracts. *Am. J. Agric. Econ.* 88(5):1258–65
- Wang X, Curtis KR, Moeltner K. 2011. *Modeling the impact of new information on consumer preferences for specialty meat products*. Presented at 55th Conf. Aust. Agric. Resour. Econ. Soc., Pap. 100540, Melbourne, Aust., Feb. 8–11
- Wang Y, Beydoun MA. 2007. The obesity epidemic in the United States—gender, age, socioeconomic, racial/ethnic, and geographic characteristics: a systematic review and meta-regression analysis. *Epidemiol. Rev.* 29(1):6–28
- Ward CE. 2010. Assessing competition in the U.S. beef packing industry. *Choices*, Spring. <http://www.choicesmagazine.org/magazine/article.php?article=121>
- Waters A. 2014. Alice Waters says the future of food is sustainable and locally sourced. *Wall Str. J.*, July 7
- Weinberg Z. 1995. *No Place to Shop: The Lack of Supermarkets in Low-Income Neighborhoods*. Washington, DC: Public Voice for Food and Health Policy
- Wekerle GR. 2004. Food justice movements: policy, planning, and networks. *J. Plann. Educ. Res.* 23(4):378–86
- Wilson EO, Salazar J. 2011. *E.O. Wilson on the future of biology*. Interview, EarthSky. <http://earthsky.org/human-world/e-o-wilson-on-the-future-of-biology>
- Woodhouse P. 2010. Beyond industrial agriculture? Some questions about farm size, productivity and sustainability. *J. Agrar. Change* 10(3):437–53
- Young LR, Nestle M. 2002. The contribution of expanding portion sizes to the US obesity epidemic. *Am. J. Public Health* 92(2):246–49
- Zhao C, Ge B, De Villena J, Sudler R, Yeh E, et al. 2001. Prevalence of *Campylobacter* spp., *Escherichia coli*, and *Salmonella* serovars in retail chicken, turkey, pork, and beef from the Greater Washington, D.C., area. *Appl. Environ. Microbiol.* 67(12):5431–36
- Zuraw L. 2013. CDC acknowledges role of farms in antibiotic resistance. *Food Saf. News*, Sept. 17. <http://www.foodsafetynews.com/2013/09/drug-resistant-infections/>

