

9 Conclusions about the Global Meat Industry: Consequences and Solutions

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As noted in the introduction to part III, this book has set about providing a broader understanding of the operation of the global meat industry in different geographical spaces and at different scales. By providing empirical evidence through case studies and statistical data, we have a clearer understanding of the growth of meat global production, which encourages our questioning the central role of meat in our food system in the twenty-first century and the types of policies and practices that will need to be established to create a different type of food system. Specifically, this work has drawn attention to three themes that are present within the operation of the food system today: (1) the role of state and corporate entities in contributing to the growth of global meat; (2) the ways global meat production contributes to reduced food security; and (3) the social and environmental consequences of the global meat industry. This chapter will first revisit these three themes, focusing on the ways the chapters in this book speak to these themes. We then turn our attention to possible solutions to tackling some of the complex problems associated with the global meat industry, first focusing on consumer movements, then shifting to broader movements that do not originate from consumers. Finally, we conclude by discussing the role that climate change may play in inducing change to our global food system.

State and Corporate Involvement the Global Meat Industry

Several chapter authors engage with the role of the state and corporations, one of three major themes in the book. The authors reveal the ways in which state policies and capitalist markets have encouraged overproduction and,

in some spaces, overconsumption of aquatic and terrestrial meat. Howard's chapter on "Corporate Concentration in Global Meat Processing" powerfully demonstrates not only the growing concentration of corporate ownership in the meat sector, but also the important role that direct and indirect government support has played in supporting corporate concentration. In doing so, Howard argues that governments increasingly are faced with a legitimation crisis, as continued subsidy support for industrial meat production is coming under scrutiny by citizens due to the biophysical and social limits that global meat firms are rubbing up against.

Moving from corporate ownership of terrestrial species, Bailey and Tran turn our attention to the role of corporations in the future of aquaculture in their chapter "Aquatic CAFOs." The authors reveal how an increase in international trade in aquaculture has led to an increase in corporate investment, both in the CAFOs and in ownership of the genetic material. For example, they note, a German corporation has recently acquired a Norwegian firm that controls 35 percent of the global salmon market. At present, aquaculture is not as concentrated as other meat industries, but Bailey and Tran argue that the conditions are ripe for aquaculture to follow a very similar path towards concentration that you see in poultry production, which Howard details in his chapter.

Schneider's "China's Global Meat Industry" (chapter 4) continues the theme of the role of the state and corporations, with a detailed accounting of how the Chinese state works to support CAFO pork production. As Schneider (79) explains, "While governments always play a role in corporate power ... in China these relationships are not hidden. ... State-corporate relations are central to the political economy of China's reform-era pork boom."

Food Security

The second dominant theme in this book is the declining role of food security in the midst of increasing meat production. While it may seem counterintuitive to argue that increasing production decreases food security, several authors in this work reveal the ways in which this counterintuitive process may work. Schneider's chapter 4 reveals that transformation of the Chinese countryside is due to the growth of CAFOs. While pigs have always played an important role in Chinese culture, only recently has pork meat

become a mainstay of local diets through the growth of state-supported CAFOs. However, this industrialization of pork production has profound consequences for smallholder agriculture in rural China, with the consequence being a decline of smallholder production, thereby making smallholders' livelihoods' precarious. Clearly, industrial meat production is not alone in contributing to the decline of smallholder production, as this is true of most industrialized agricultural systems that depend on commodity-focused agriculture (Carolan 2012; McMichael 2009a). However, chapters 3, 4, 5, and 8 (by Bailey and Tran; Schneider; Rudel; Chiles and Christy, respectively) in this volume identify the unique and important role that livestock and aquatic species have played in indigenous and smallholder communities. Unlike cotton or soybean fields, smallholders around the world have relied upon livestock and aquatic animals to maintain their existence. Livestock are important sources of energy, fertilizer, food, and income for smallholders. In the case of aquaculture, the small fish used for feed in intensive production reduce the small fish that are available for consumption by poorer communities who have historically relied on these species for food. In terms of fertilizers, livestock are integral to the natural ecosystem of agriculture for smallholders, who generally do not and cannot rely on chemical fertilizers.

Two other dimensions to declining food security include the labor strategies most slaughterhouses around the world deploy in order to ensure a profit: one is low-wage positions; the other is the increase in highly processed meats at cheaper prices. As Freshour explains in "Cheap Meat and Cheap Work in the U.S. Poultry Industry" (chapter 6), worker pay has declined over time, which ironically contributes to household food insecurity due to insufficient money among the households of the slaughterhouse workers. Therefore, slaughterhouse workers (and other low-wage workers) around the world are often dependent upon purchasing cheaper foodstuffs. These cheaper foods include highly processed meats, which may fill a person's stomach, but do not offer the appropriate nutrition. This has led to the rise of the so-called obesity-poverty paradox, mentioned in the introduction to part II, whereby poorer people in industrialized countries, and increasingly in many countries in the global south (e.g. Brazil, South Africa, and India) are more likely to be overweight and suffer from chronic diseases—such as Type II diabetes—than other income groups.

Social and Environmental Consequences

Finally, several chapters speak to the third theme of the book, the social and environmental consequences of industrial meat production as it relates to people, land/territory, and animals. Industrial meat production contributes to a silencing of the tragedy that unfolds daily for humans, animals, and the ecosystems that sustain industrial meat production (Pachirat 2013; Simon 2017). To continue to produce inexpensive meat, the system relies on silencing the voices and suffering of human laborers, externalizing the costs to the environment and the communities within which these production chains are situated, and hiding the toll the system demands of sentient animals' lives (Schlosser 2001; Simon 2017). Unlike the smallholders who rely on animal waste for fertilizer in their agricultural ecosystem, industrial meat production produces animal waste on such a scale that it must be collected into massive holding ponds, threatening to contaminate waterways, agricultural crops (e.g., contamination of vegetables with *Escherichia coli* [E. coli]), and communities (i.e., excessive odor).

Rudel's chapter 5 and Freshour's chapter 6 reveal the ways in which social inequalities can be exacerbated by the operation of the global meat industry. Rudel's chapter "Amerindians, Mestizos, and Cows in the Ecuadorian Amazon" brings racial-ethnic differences in beef production in Ecuador into view. His research documents the ways that globalization of the meat trade and racial-ethnic land tenure differences shape land-use practices among smallholder cattle owners in the Ecuadorian Amazon. While both Amerindians and mestizos have seen a decline in the size of their landholdings, more Amerindians have found themselves in a position of needing to rent their lands in order to generate an income as cattle prices have gone through extreme fluctuations over the past two decades of global trade. For the lands that are rented, there are much higher rates of land degradation. Through Rudel's case study, we see how indigenous people's vulnerabilities to market fluctuations contribute to environmental degradation. With decreasing productivity of degraded lands, rearing cattle on these lands will be more difficult, thereby further exacerbating income inequality for Amerindians. Moving from production to processing, Freshour demonstrates how racial inequalities are used to the benefit of maintaining low wages by slaughterhouse managers.

Denny's chapter 7 and Chiles and Christy's chapter 8 highlight the complexity of thinking about the environment and smallholders in the context of a globalized food system. Denny's chapter "Contributions to Global Climate Change" focuses specifically on the greenhouse gas (GHG) emissions that come from animals' bodies and from their manure on the farm. She concludes that many places that are least efficient in GHG emissions are those most likely to be affected by climate change, yet least likely to be able to effectively respond to climate change impacts. While Denny's chapter focuses on a very specific type of GHG emission, she opens the door to thinking about what can be learned from diverse production settings that are more efficient and how policies and research might support lowering GHG emissions in animal agriculture.

Finally, Chiles and Christy's chapter "Livestock Intensification Strategies in Rwanda" offers an important intervention as it relates to thinking about humans' ethical obligations toward animals. Specifically, the authors focus on the development efforts that are currently underway to increase meat production in Rwanda, and more generally the global south, without any significant focus on animal suffering within intensive meat production systems and the ethical obligations humans have toward animals. Christy and Chiles seek to disrupt a development paradigm that views the growth of meat consumption as inevitable.

Confronting the Global Meat Industry—Possible Solutions

In the face of so many challenges confronting global meat production and consumption, it seems important to recognize that there is not total silence surrounding the costs of industrial meat production. There are spaces of resistance and opportunities for change. Table 9.1 provides examples of activities that individuals, organizations, and government policies have undertaken in an effort to curb or challenge the dominant system. In concluding, let us examine some of these proposals and evaluate how they may contribute to a better, more sustainable and just food system.

Consumers

Several initiatives for creating change in the global meat system fall within individual consumer activities, with occasional support from government initiatives. The decision to go vegetarian or vegan, opting to reduce meat

Table 9.1

Examples of attempts to create change in the global meat industry

Consumers	Organizational
Vegetarian/vegan diets	Animal welfare policies
Meatless Mondays	Cultured meat products/Clean meat
Purchasing local meat/eggs	Sustainability initiatives/Multi-stakeholder initiatives
Organic animal/products	Food sovereignty movement

consumption (e.g., Meatless Mondays), or choosing to purchase only meat or meat products sourced locally or grown organically are all examples of individual consumers trying to make a difference through their purchasing habits.

First, let us discuss vegetarian and vegan consumers. There are an estimated 1.5 billion vegetarians, or about 22 percent of the world's population (Leahy, Lyons, and Tol 2010, 4). Many of these people are not strict vegetarians, meaning that they occasionally eat meat; and some of them are vegetarian out of necessity because they lack the ability to purchase meat. Furthermore, vegetarianism is more common in some places than others. Most notably, more than 442 million people in India are vegetarian—that is more than one-third of the country's population, which is predominantly Hindu.¹ In other countries, there are far fewer vegetarians. In the United States, for example, only 5–6 percent of the population claims to be vegetarian (and 2 percent vegan), with those actually following a vegetarian diet estimated to be slightly less, anywhere from 1–3 percent of the population (Edelstein 2013; Maurer 2002; Newport 2012). Variation exists in Europe, where vegetarians make up about 3 percent of Portugal's population, while Italy and Germany have the highest number at approximately 9–10 percent of the population who identify as vegetarian (Micheletti and Stolle 2012). Most countries, then, have only a small share of the world's 1.5 billion vegetarians, and Asia—especially India—accounts for the majority of the world's vegetarians.

The reasons people give for becoming vegetarian vary. Most of the world's vegetarians adopted their diet because of religious beliefs (e.g., Hindu, Buddhist, and Seventh Day Adventist). Others identify health concerns or moral/ethical reasons, including environmental and animal

welfare concerns, as their reasons for adopting a vegetarian diet. Vegans, those who opt out of using/consuming animal products completely, are overwhelmingly vegan for moral and ethical reasons (Maurer 2002; Micheletti and Stolle 2012). The motivation behind these choices is relevant in terms of thinking about how consumers' purchasing decisions, or what some call lifestyle politics, can create change in the global meat system. In the global north, there has been an increasing availability of vegetarian, plant-based options that are meant to serve as meat replacements. In this sense, consumers purchasing more vegetarian options have clearly encouraged companies to develop more of these product lines. In fact, even global meat corporations see this as a growth market: in 2016, Tyson became a minority investor in Beyond Meat, which produces plant-based alternatives to animal meat, and Tyson increased its ownership share in 2017 (Rowland 2017; Strom 2016). The role for lifestyle politics will be discussed further on, but let us first discuss a few other lifestyle choices, including individuals who opt to reduce their meat consumption.

Short of adopting a vegetarian and vegan diet, much of the global north has seen a trend of reduced meat consumption. For example, U.S. per capita meat consumption has decreased from 124.5 kg in 2004 to 113.9 kg in 2013 (FAO 2019), leading to a new category of consumers, named "flexitarians" (Flail 2011). Flexitarianism recognizes that people may not follow a strictly vegetarian diet, but they still consciously choose to reduce the amount of meat in their diets. Similarly, a movement that started in the United States in 2003 and has since gained a global presence is Meatless Mondays, a campaign to encourage people to go meatless for at least one day of the week (Monday Campaign 2017). Ghent, Belgium, made headlines in 2009 for declaring every Thursday in the city to be vegetarian, including all school cafeterias only serving vegetarian food for lunch (Bittman 2009; Harrell 2009). Despite the trend of increasing flexitarians and meatless days, it is important to note that most consumers opting to eat less meat are doing so in the context of living in countries with some of the highest rates of meat consumption in the world.

Local food initiatives have grown dramatically over the past decade in the United States, but also in other countries, including Japan (Kimura and Nishiyama 2007; Schupp 2016). "Food with a face," a phrase often associated with the local food movement, provides a double entendre when it comes to purchasing local meat. As a consumer participating in a local food

movement, the ideal is not only that a consumer will know the farmer from which meat or meat products are purchased, but also that the farmer knows the animal, perhaps so much so that the animal has a name, from which a customer's steak or eggs originate.

Local meat consumption is seen as a mechanism to reduce some of the distance that global meat production imposes, thereby reducing some of the "bad" aspects of a long food chain. For example, for some consumers they gain a sense of trust by knowing the person who sells them their meat, thereby trying to guard against fears of meat harboring food-borne illnesses (see Gouveia and Juska 2002). For those concerned about animal welfare, there is also a feeling that locally produced animals lived better lives than industrially produced animals (see Weiss 2012). Furthermore, there are environmental ethics associated with locally sourced meats, including restaurant chefs who offer snout-to-tail delicacies as a means to promote less food waste and the idea that eating diverse breeds of animals not found in industrial settings encourages genetic diversity (Weiss 2012). Of course, what is conceived of as "local" is highly variable among consumers, and there is no guarantee to consumers that local production is inherently safer or more animal welfare-friendly, and like so many other consumer movements, there tend to be inequalities embedded in who participates and who does not or cannot participate (Allen 2004). Nonetheless, focusing on local sources is unique in that people not only "willingly inconvenience themselves but also they do so with deepening joy and increasingly significant effects" (Starr 2010, 487).

Organic meats and, more generally, all organic foodstuffs is a final area that has seen dramatic growth in terms of consumer purchasing in the last decade. Europe and North America lead the way in terms of purchasing of organic food and drink, which by 2014 had grown to \$80 billion dollars annually, up from \$15 billion in 1999 (Sahota 2016). The reasons consumers give for increased purchasing of organic products is similar to motivations for pursuing more local food production: that they lack trust in the safety and integrity of the food system; they believe there are health benefits to consuming organic products; and they are concerned about the environmental consequences of industrial agriculture. Meat remains a smaller part of the total organic market share in Europe than fruits and vegetables, with the exception of eggs and milk, which have made the greatest inroads in organic sales (Willer and Schaack 2016). In the United States, eggs, milk,

and broiler chickens are among the top earners of organic meat products (Haumann 2017).

Small-p Politics

The four approaches already discussed—vegetarianism, meat-reduced diets, purchasing local meat products, and purchasing organic meats—fall under what many see as small-p politics (Kennedy, Johnston, and Parkins 2017), or what we call *smallitics* for short, which signifies consumers demonstrating their beliefs and values through their purchasing choices. Under debate with regard to consumer purchasing is whether or not these shopping decisions assist in creating an alternative food system, or simply serve to reinforce a food system that places the burden of change on individuals, with very little transformation of the dominant structures (e.g., corporate concentration; a subsidy system that favors corn and soybeans).

In the case of vegetarianism, scholars have noted that individuals who adopt a vegetarian lifestyle because of perceived health benefits often fail to engage an agenda of transformation of the food system, as these individuals may pay very little attention to broader political concerns related to the environment or animal welfare (Maurer 2002). In addition, despite a long history of vegetarians throughout the world, it remains unclear if vegetarian/vegan advocacy can diminish the growth of meat consumption globally (Neo and Emel 2017), in part because of the power and reach of the global meat industry.

In the case of Meatless Mondays, the movement has been accused of blunting vegetarianism's social change potential by adapting to a dominant culture that protects meat-eating culture against its long-perceived threats, including feminism,² animal rights and environmentalism (Singer 2017). Moreover, Meatless Mondays as a movement omits reference to nonhuman animals and the suffering they endure within industrial agricultural systems (Singer 2017). More broadly, Singer (2017) argues that small, incremental movements for change, like meat reduction movements, ignore important issues. These include the ways in which these campaigns frame why people should join (generally offering individualistic, nonradical logics); the fact that these movements do not move people toward total vegetarianism; and furthermore, how these movements rarely acknowledge that while some people choose to "do something" to improve society, their choice may do nothing for others in that society.

In the case of organics, the area that has seen the largest growth in consumer spending in terms of alternatives to the industrial agriculture, the reality is that organic production has increasingly conformed to or become a part of the industrial agricultural system (Guthman 2004; Neo and Emel 2017). While qualifying as “organic” production by meeting USDA organic regulations, the degree to which organic production varies from industrial production is questionable, given the sheer size of many of the organic farms and news reports that occasionally make headlines related to animal or worker cruelty on organic farms and slaughterhouses (e.g., Associated Press 2009). For these reasons, animal rights groups have pushed for stricter government regulation of animal welfare standards on organic farms (Associated Press 2017).

Despite all of these concerns, many scholars have argued it would be shortsighted to not recognize the potential for change in smallitics (Kennedy, Johnston, and Parkins 2017). Already, smallitics has made a difference in terms of increasing demand for plant-based meat replacements and organics, thereby incentivizing meat companies to invest in plant-based manufacturing companies and producers to switch to organic production. Similarly, small-scale producers all over the world, but especially in North America and Europe, have seen the revival of the appreciation for artisan production methods and products. Such smallitics have clearly made a difference in the lives of some humans and animals. However, the global meat industry seems persistent in its growth despite these changes. Consequently, we need to move beyond the level of consumer choice and smallitics to find more adequate solutions.

Consider again for a moment the case of India. With increases in meat production (from 1 MMT to 4 MMT) and per capita income (from US\$4,200 to US\$10,700) over the past twenty-five years, we might expect that meat consumption would have likewise increased. But meat consumption has not increased. Why not? At least part of the answer has to do with the reason why there are so many vegetarians in India, specifically religious beliefs and government policies that limit meat consumption. In other words, factors beyond the level of individual choice shape the diets of people in India in ways that counter the expanding meat industry. Thus, any search for responses to the global meat industry should consider the broader context of governmental policies and corporate or NGO activities.

Organizational Responses

Another effort to reform meat production has occurred in the form of animal welfare policies. While official government policies date back to the 1960s and 1970s (e.g., U.S. Humane Methods of Slaughter Act of 1978; the United Kingdom's Farm Animal Welfare Council of 1979), there has been a significant increase in animal welfare policies enacted by government and private organizations beginning in the 1990s and continuing to the present (Ransom 2007). For many, a turning point was the Treaty of Amsterdam that the EU signed in 1997, which recognized animals as sentient and required that EU member states consider animal welfare policies related to agriculture, transport, and research (Hirsch 2003).

Major corporations, including not only production and processing companies, such as Tyson Foods and Cargill, but also fast food companies, like McDonald's and KFC (as part of Yum! Brands) have adopted animal welfare standards in the past two decades. The shift in private organizations focusing on animal welfare policies can be considered in light of two factors. First, there has been an increase in government policies—not only national and regional (e.g., EU) level policies, but also international policies, such as the World Organization for Animal Health's (OIE) adoption of agricultural animal welfare guidelines in 2005. As a reference body to the World Trade Organization, the OIE is the first global governance organization that has provided guidance on animal welfare policies. Second, corporations are responding to the growing evidence of an increase in consumer demand for animal welfare policies across many Western, industrialized countries (Cornish, Raubenheimer, and McGreevy 2016). Of course, it is noteworthy that animal welfare standards do not address the labor conditions that can be found in CAFOs and processing facilities all around the globe.

In terms of actors contributing to change in the global meat system, a slightly different direction appears in the rise of cultured meat companies, that is, companies that culture meat in a lab using cellular science and *in vitro* cultivation (Chiles 2013). The stuff of science fiction in the not too distant past, cultured meats increasingly are gaining mainstream appeal. Some consider cultured meat, also referred to as “clean meat” products, to be a potential solution to many of the concerns associated with global meat production. Not to be confused with plant-based meat substitutes, clean meats focus on growing meat in a lab environment using cellular tissue from animals. While scientific activity related to cultured meat has

been underway since the 1970s, only in the 2000s has there been a major uptick in interest shown by major meat companies and prominent investors; the latter include Bill and Melinda Gates, who recently invested in cultured meat start-up companies (see Kowitt 2017). Then there are plant-based meat substitutes, like vegetarian burgers. Recently picked up by major news outlets was the recent U.S. Food and Drug Administration's approval of a vegetarian burger that bleeds (see Troitino 2018a).

Because cultured meat is one of the least-developed alternatives for creating change to our global meat system, it is difficult to assess the extent to which it would reduce or resolve some of the concerns raised in this volume. The reasons for the lack of certainty include technical concerns, in that cultured meat is in its infancy. It isn't clear yet whether these meats will be similar in taste, texture, safety, and nutrition to conventional meats, or if scaling up cultured meat production is economically feasible (Bonny et al. 2015; Kadim et al. 2015). Then there are the social, political, and environmental issues raised. Many see cultured meat as a mechanism to reduce animal suffering and resolve animal welfare concerns (Bonny et al. 2015), as well as environmental concerns, especially GHG emissions (Tuomisto and Mattos 2011). However, it remains to be seen if consumers are willing to accept cultured meat (Chiles 2013; Verbeke et al. 2015), and one area that is not addressed by alternative meats is corporate control of the food supply. Unless alternative ownership structures are explored, such as public-private partnerships, the amount of capital investment needed for the creation of cultured meat does not allow for a large number of laboratories involved in its production, thereby ensuring concentration of ownership.

The prospect of lab-created meat has many proponents and opponents, not least of which are animal farmers and farming-related interest groups in industrialized countries (Troitino 2018b). In part the criticism is a concern that the label "clean meat" disparages traditional sources of meat and can be misleading for consumers (AgFunder 2018; Troitino 2018b). Moreover, the rise of lab-grown meat furthers the argument made by the La Via Campesina landworkers alliance about the larger global agrifood system, which is that we are approaching an era of farmer-less agriculture that will only increase hunger and poverty (La Via Campesina 2009). As mentioned in the introduction to part III, we have seen a decline in the number of farmers in industrialized countries, as medium-sized farms are consolidated into larger farms.

La Via Campesina as a movement originates out of the global south and calls for peasants (smallholders) throughout the world to unite and fight for food sovereignty. Food sovereignty is defined as “the right of peoples to healthy and culturally appropriate food produced through ecologically sound and sustainable methods, and their right to define their own food and agriculture systems. It puts the aspirations and needs of those who produce, distribute and consume food at the heart of food systems and policies rather than the demands of markets and corporations” (Nyéléni International Steering Committee 2007).

To be clear: food sovereignty as a movement (first presented by La Via Campesina in 1996 at a World Food Summit) and an organizing concept (the term “food sovereignty” was adopted by the Food and Agriculture Organization of the United Nations in 2012), makes no specific claims about meat production or consumption. Rather, in reviewing the definition of “food sovereignty” and the six pillars of food sovereignty, it is clear that the dominant, global meat system runs counter to achieving food sovereignty (Nyéléni International Steering Committee 2007). Furthermore, food sovereignty is one of the few efforts for creating change in the food system that incorporates smallholders across the globe. The previous examples of other efforts to create change in the global meat industry are largely enacted by people and organizations in Western, industrialized food landscapes, with very little real attention given to smallholder producers.

Finally, another means of reform is through sustainability initiatives that involve participants from all over the globe, although these initiatives generally represent corporate entities. Much of the effort to define and operationalize agricultural sustainability is now taking place in private settings, most notably multi-stakeholder initiatives (MSIs) (Loconto and Fouilleux 2014). MSI sustainability initiatives form to establish standards and certification that others must follow if they want their product to be deemed sustainable. However, these MSIs have to work to gain governance legitimacy, which means they must fend off possible criticism and competitors (Ponte 2014).

One of the earliest examples of an MSI for meat is the Marine Stewardship Council (MSC), established in 1999. A more recent example is the Aquaculture Stewardship Council (ASC), established in 2010. MSC focused on capture fisheries and sustainable fish, while ASC was created to focus on farm-raised fish. Ponte (2014, 264) in his astute analysis of sustainability

MSIs notes that *less* successful MSIs tend to be “more participatory, transparent and adopt more democratic and complex procedures,” whereas MSC is an example of a successful MSI because it was more top-down in organizing, with more buy-in from major corporate entities involved in the industry. However, MSC was less successful at predicting and therefore incorporating governance of capture fisheries in the global south.

In the context of terrestrial animals, industry and nongovernmental organizations in the private sector are jointly organizing a new global sustainable beef initiative that seeks to reduce the environmental harms caused by beef production. The initiative, Global Roundtable on Sustainable Beef (GRSB), focuses on multiple regions of the world. The GRSB mission is “to advance continuous improvement in sustainability of the global beef value chain through leadership, science and multi-stakeholder engagement and collaboration” (GRSB n.d.).

The founding members of GRSB include Walmart, Solidaridad, the World Wildlife Fund, Cargill, Elanco, JBS, McDonald’s, and Merck Animal Health. GRSB founders represent a reasonable degree of market embeddedness. Based on analysis of previous sustainability MSIs, the academic literature suggests several things about the future development and outcomes of GRSB (Ponte 2014; Schouten, Leroy, and Glasbergen 2012). First, GRSB is likely to have a market impact, given its members include some of the biggest purchasers of beef. Yet, the final indicators, metrics, or practices are not likely to represent a wide range of producers’ interests, especially those of smallholders. A similar critique has also been leveled against ASC, in that smallholder aquaculture producers are not likely to benefit from its sustainability initiatives. In the case of GRSB, while the MSI’s membership is more global than previous roundtables, its geographical representation remains fairly lopsided, with only a few members having any ties to Africa, and no membership affiliation for Asia. Finally, GRSB is likely to be similar to other roundtables in forgoing radical approaches, opting instead for pragmatic solutions to environmental problems (Schouten, Leroy, and Glasbergen 2012).

Climate Change and the Consequences of Business as Usual

While there are many alternative food movements underway to change or counter the global meat industry, it is also possible that the biggest change agent for the global meat industry moving forward will be extreme

weather-related events due to climate change. The scientific data is stacking up that we are on the cusp of an ecological tipping point, with hotter temperatures and more extreme weather events becoming the new normal (see Cribb 2010; Kolbert 2014; Rosenzweig et al. 2001; Samenow 2018). These events not only affect producers and consumers of meat products, they also impact the animals themselves. For countries in the global south, the FAO estimates an upward trend in the occurrence of natural disasters from 1980 to 2016, with flooding, drought, and other climatological disasters (extreme temperatures) accounting for the majority of agriculture losses (FAO 2017a). When focused on more industrialized production, the list is long of the environmental and human and animal welfare concerns associated with the operation of CAFOs. Less discussed are the ways in which CAFOs lack resiliency in the face of extreme weather events. The many issues include the problem of manure lagoons contaminating water supplies when flood waters breach their banks; a lack of adequate feed or water in the midst of drought; animals burned alive when the structures holding them catch fire; and animal deaths from drowning during flooding. In the United States, flooding from hurricanes have contributed to an inconceivable number of agricultural animal deaths. For example, 3.4 million chickens and 5,500 hogs were reported drowned during Hurricane Florence in 2018 in the North Carolina and in 2017 Hurricane Harvey was estimated to have killed thousands of cattle in the state of Texas, with total head counts not known, but loss estimates of around \$93 million, including structures that housed the animals (Associated Press 2018; Fannin 2017). Finally, animal diseases, which have always plagued industrial animal production, are expected to become more of a threat as temperatures rise (Rosenzweig et al. 2001).

By now, it should be clear that there are a lot of different initiatives underway to create change—some small, some large—in our global meat system. What should also be evident is that each initiative has its limitations. There is no one-size-fits-all approach to redefining the global meat system. Yet, with overproduction and overconsumption situated alongside the impacts of climate change and the projected population growth reaching nine billion humans on the planet by 2040, very real concerns exist about our capacity to identify more efficient, humane, and ecologically sustainable food systems.

Notes

1. Depending in part on how a vegetarian diet is defined, estimates of the number of vegetarians vary widely, even in India where vegetarianism is relatively common. Leahy, Lyons, and Tol (2010, 4) offer a conservative estimate that 34 percent of Indians are vegetarian. Given a total population of 1.3 billion people, that would be about 442 million vegetarians. Edelstein (2013, 281), by contrast, states that about 80 percent of India's population "is believed to eat mostly a plant-based or vegetarian diet." This would place the number of vegetarians in India at about 1 billion, more than the rest of the world combined.

2. Feminists, particularly eco-feminists, have argued that consumption of meat is associated with the dominant form of masculinity and signifies a need to dominate not only animals and nature, but also other more marginalized humans (i.e., women, particularly racial-ethnic minority women).

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