Annals of the American Association of Geographers

ISSN: 2469-4452 (Print) 2469-4460 (Online) Journal homepage: http://www.tandfonline.com/loi/raag21

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To cite this article: Susanne Freidberg (2017): Big Food and Little Data: The Slow Harvest of Corporate Food Supply Chain Sustainability Initiatives, Annals of the American Association of Geographers, DOI: 10.1080/24694452.2017.1309967

To link to this article: http://dx.doi.org/10.1080/24694452.2017.1309967

Published online: 31 May 2017.

Big Food and Little Data: The Slow Harvest of Corporate Food Supply Chain Sustainability Initiatives

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Over the past several years, many of the companies collectively known as Big Food have launched ambitious programs to assess and improve the sustainability of their raw material supply chains. Fueled partly by concerns about the risks posed by climate change and other environmental problems, these efforts differ from earlier corporate food supply chain governance in that they rely more on metrics of continuous improvement than compliance with standards. They also extend beyond high-value, high-profile products to include staple ingredients such as corn and soy. These commodities are sourced through long, complex, and traditionally nontransparent supply chains, where even the biggest food companies exercise surprisingly little clout over producers. This article examines how companies contend with this problem both within their own supply chains and as members of multistakeholder initiatives. The assemblage concept not only describes the many actors, technologies, and practices now working to get certain kinds of data flowing off farms; it also highlights the relational nature of this work and the uncertainty of its outcomes. More broadly, the article points to the limits of both corporate food power and the very notion of Big Food as an explanation for how that power is wielded. *Key Words: agriculture, corporations, metrics, supply chains, sustainability.*

过去数年来, 共同以 “大型食品” 而广为人知的若干公司, 发展了评估并改善其原物料供应链的可持续性之宏大计画。部分受到气候变迁与其他环境问题的风险考量所驱动, 这些努力更加仰赖持续改善的指标而非仅追求符合标准, 因而与较早期的企业粮食供应链的治理有所不同。它们同时延伸至高价值、倍受瞩目的产品之外, 纳入诸如玉米和大豆等主食原料。这些商品透过长程、复杂、且传统上不透明的供应链进行供给, 其中出乎意料的是, 即便最大的粮食公司, 对生产者亦鲜少拥有影响力。本文检视这些公司如何同时在其自身的供应链中, 以及身为多方利益协作机制的一员来应对上述问题。凑组之概念, 不仅描绘目前正在进行取得流于农场之外的若干信息种类的诸多行动者、技术与实践; 它同时强调此一工作的关系性本质, 及其成果的不确定性。更广泛而言, 本文指出企业粮食权力以及 “大型食品” 此一概念作为解释该权力如何行使的限制。 *关键词: 农业, 企业, 指标, 供应链, 可持续性。*

Durante los pasados años, muchas de las compañías conocidas colectivamente como las “Big Food” (las Grandes de los Alimentos) han lanzado programas ambiciosos para evaluar y mejorar la sostenibilidad de sus cadenas ofertantes de materia prima. Parcialmente alimentados por las preocupaciones acerca de los riesgos planteados por el cambio climático y otros problemas ambientales, estos esfuerzos difieren de la anterior gobernanza corporativa en la cadena de suministros alimentarios en que ellos descansas más en las métricas de mejoramiento continuo que en la conformidad con los estándares. Se extienden también más allá de los productos de alto valor y perfil más alto para incluir ingredientes esenciales por el estilo del maíz y la soya. Estas mercaderías se obtienen a través de largas y complejas cadenas de suministros tradicionalmente carentes de transparencia, donde incluso las más grandes compañías de alimentos sorprendentemente ejercen poca influencia sobre los productores. Este artículo examina el modo como las compañías lidian con este problema tanto dentro de sus propias cadenas de suministro como en la condición de miembros de iniciativas de multidepositarios. El concepto del ensamblaje no solo describe los numerosos actores, tecnologías y prácticas empeñadas ahora en obtener cierto tipo de datos que fluyen desde las granjas; destaca también la naturaleza relacional de este trabajo, y la incertidumbre de sus resultados. Con mayor amplitud, el artículo apunta hacia los límites del poder de los alimentos bajo control corporativo y la propia noción del Big Food como explicación de cómo ese poder es ejercido. *Palabras clave: agricultura, corporaciones, métrica, cadenas de suministro, sustentabilidad.*

Two months before the twenty-first annual climate talks (COP21) opened in Paris in December 2015, ten major food companies released a joint letter calling on world leaders “to join us in meeting the climate challenges that face the world.” Published in the *Washington Post* and *Financial Times* and

Annals of the American Association of Geographers, 0(0) 2017, pp. 1–18 © 2017 by American Association of Geographers
Initial submission, December 2016; revised submission, February 2017; final acceptance, February 2017
Published by Taylor & Francis, LLC.

later amended to include four more signatories—Coca-Cola, Hain, Hershey's, and PepsiCo joined the likes of Unilever, General Mills, and Mars—the letter emphasized that the companies would also work "to ensure that our supply chains become more sustainable, based on our own specific targets" (Ceres 2015). Elsewhere they detailed targets that ranged from fully traceable, deforestation-free palm oil by the end of 2016 to a 28 percent reduction in farm-through-landfill greenhouse gas emissions by 2025 (Hershey's n.d.; General Mills 2016).

Quantitative, time-bound, and "science-based," these sustainability targets point to a set of important changes in how the companies popularly known as Big Food (Pollan 2016) attempt to govern their supply chains. In part, these changes reflect growing challenges to companies' own sustainability, ecological as well as commercial. In part, they signal shifts in companies' strategic and technological approaches to such challenges. Altogether, these changes in food supply chain governance underscore the need to look beneath the "big" of Big Food and to examine the practices, social relationships, and forms of expertise through which corporations frame and pursue certain supply chain goals.

Taking up that call, this article examines how major food companies seek to define, assess, and enhance sustainability, especially at the farm level. Much research over the past quarter-century has shown how supermarkets in particular have sought to assure that their products comply with a widening range of safety, quality, and ethical standards. As new concerns have emerged in recent years, however—some of them related to climate change and other environmental risks—food companies have adopted new technologies for addressing them, centered less on compliance than on driving measurable, ongoing improvement. Their interest in managing supply chain risks also now extends beyond high-value, high-profile products to staple commodities such as corn and soy. Within these traditionally long, complex, and nontransparent supply chains, however, even the biggest of Big Food companies exercise surprisingly little clout over farmers and other primary producers. In short, they face increasing pressure to show progress toward agricultural sustainability, yet possess neither the knowledge nor leverage needed to demand it.

To show how major food companies contend with this basic problem—the article's first, most basic purpose—I draw from ongoing research on the multistakeholder initiatives (MSIs) where corporate knowledge about agricultural sustainability is produced (Konefal, Hatanaka, and Constance 2014), the various tools these MSIs have developed, and the views of the corporate sustainability managers (CS managers) who try to put these tools to work. Similar to many commodity chain studies, this one takes a qualitative and multisited approach (Bestor 2001; Freidberg 2001; Macdonald 2007; Goger 2013). Unlike many, however, my own study centers not on a specific commodity, company, or sector but rather on a global assemblage of actors, technologies, and practices (Collier and Ong 2005; Murray Li 2007; Havice and Iles 2015).

Besides describing the study's empirical scope, the assemblage framework serves my two other purposes. One is to highlight the tenuous nature of Big Food sustainability initiatives. Conventional political economy notions of corporate food power, understood in terms of market share and de facto regulatory clout (Howard 2016), assume more concentrated knowledge, efficacy, and confidence than individual companies (or even entire sectors, such as manufacturing) demonstrate in this realm. As many CS managers will readily admit, they are working in uncharted terrain, often with limited expertise, authority, and resources. Their companies' progress toward sustainability targets also hinges on many other actors cooperating, despite minimal and uncertain incentives. Power in this context is not just plural, heterogeneous, and dispersed (Allen 2011; B. Anderson and McFarlane 2011); it can also fail. "Assemblage thinking" recognizes that possibility, as well as the different kinds of work needed to avoid and (if necessary) reframe failure (Murray Li 2007). This leads to the article's third purpose, which is to highlight the work needed to build the relationships, capabilities, and commitments that hold the corporate food supply chain sustainability assemblage together, however tenuously. This attention to individuals' practices, strategies, and subjectivities does not discount the broader political economy in which Big Food companies define agricultural sustainability. Rather, it aims to show that their bigness, and the political and economic power it implies (Murphy 2008; Howard 2016), cannot by itself explain how they pursue this goal (Friedmann 2016).

Although many of the empirical developments examined in this article are quite recent, the analysis builds off two well-established bodies of scholarship, both briefly reviewed in the next two sections: one on standards as tools of food supply chain governance and the other on the ongoing work of making corporations

knowledgeable, responsible, and sustainable. A third section describes a set of MSIs that have formed to undertake such work, the tools they have created, and the events where their members regularly assemble. The rest of the article then draws on observations from these events, as well as from CS managers' own accounts of the challenges they face in getting data off the farm.

These accounts in turn draw from more than thirty semistructured interviews as well as informal conversations with CS managers at major food companies (mostly manufacturers but also retailers and commodity traders and processors), conducted between mid-2015 and early 2017. All of these companies belong to one or more MSIs; other interviewees include staff members at these organizations and at the nongovernmental organizations (NGOs) that work most closely with the companies. The research has also entailed attendance at several MSI summits and participation (albeit primarily as an observer) in two MSIs' working groups, as described later in the article.[1]

Governing Food at a Distance: Standards versus Metrics

Most research on food supply chain governance centers on standards and related audit and certification systems (Henson and Reardon 2005; Fulponi 2006). A sizable literature chronicles how, over the past quarter-century, agrifood standards have spread, multiplied, and become the altogether standard—as in expected—means to address a wide range of risks, demands, and logistical problems (Higgins and Hallstrom 2007; Busch 2011; Ponte, Gibbon, and Vestergaard 2011). Although often voluntary and created by nonstate entities, they effectively regulate access to markets, while imposing costs on producers and sometimes premium prices on consumers (Mutersbaugh 2005; Guthman 2007).

From the perspective of food retailers and manufacturers, meanwhile, standards help to identify and manage supply chain risks, improve brand images, and thereby compete on nonprice factors (Konefal, Mascarenhas, and Hatanaka 2005; Freidberg 2007; Busch 2011). For the biggest brands, standards function as quasi-diplomatic instruments, negotiated to improve relations with states and international NGOs (Fuchs, Kalfagianni, and Havinga 2011; Dauvergne and Lister 2012). This is especially true of some of the newer sustainability standards for commodities implicated in large-scale deforestation, such as soy and palm oil (Daviron and Vagneron 2011).

The multistakeholder stewardship councils and roundtables that oversee these sustainability standards (Havice and Iles 2015; Vandergeest, Ponte, and Bush 2015) bear some resemblance to the MSIs investigated in this study and share many of their members. Viewed by some as examples of the precompetitive collaboration needed to address the "wicked problems" of food sustainability (B. G. Smith 2008; Dentoni, Hospes, and Ross 2012), more critical scholarship on roundtables and other MSIs questions their transformative potential and claims of broad representation (Brassett, Richardson, and Smith 2010; Fuchs, Kalfagianni, and Havinga 2011; Hatanaka and Konefal 2013; Pesqueira and Glasbergen 2013; Ponte and Cheyns 2013; Nelson and Tallontire 2014; Ponte 2014).

Once created, standards' authority relies on both the scientific expertise tapped to create them and the rule-based techniques used to audit and certify compliance (Campbell and Le Heron 2007; Bain, Ransom, and Worosz 2011; Konefal and Hatanaka 2011). In theory, the scientism of the entire process both legitimates and depoliticizes standards-based governance (Hatanaka 2010). It helps to "render technical" problems and their solutions (Murray Li 2007). In practice, standards and certifications have often catalyzed controversy (Barry 2012; Havice and Iles 2015). One problem lies in verification. Certifiers might follow the rules of audit, but farmers and other suppliers might not follow the rules of accurate documentation, especially if they resent the questions asked of them. As an ostensibly organic Indonesian shrimp farmer quoted by Hatanaka (2010) put it, "Every system has a hole" (153). Often these holes are gaping, as food scares and adulteration scandals regularly demonstrate (Mason 2013).

Yet it does not take a scandal to make supply chain standards contestable. Within science and technology studies (STS), scholarship on standards shows how much work goes into making them applicable and enactable across space and social worlds (Star and Griesemer 1989; Lampland and Star 2009; Lien and Law 2011). Agrifood standards in particular contend with the immense diversity of both agro-ecologies and the foodways they support (Klintman and Boström 2004; Dunn 2005).

Altogether, the agrifood standards literature helps illuminate where and how the assemblage devoted to governing corporate food supply chains has taken

shape and why it is far from stable. It also draws attention to the sociotechnical work needed to produce tools of supply chain governance and make them effective in diverse supply chain settings. For the purposes of understanding the specific work underway within MSIs, however (Konefal, Hatanaka, and Constance 2014), and the companies that participate in them, existing scholarship on agrifood standards runs up against at least three limits.

First and perhaps most obvious, metrics and standards are not the same (Freidberg 2013). They are related and indeed interdependent, in that standards include metrical elements (e.g., seafood standards' target stock numbers and feed conversion ratios; Lien and Law 2011; Ponte 2012) and metrics must be standardized to travel any distance (Barry 1993). Standards and metrics also both derive from normative goals. Yet they govern differently: Standards typically demand compliance with specific best practices, such as the organic requirement to maintain soil fertility without chemical fertilizers. By contrast, the metrics in question here—key performance indicators (KPIs)—quantify outcomes, such as crop yields per unit of fertilizer applied, or nitrogen runoff per acre. Put simply, they focus less on means than ends; that is, less on how farmers achieve a particular goal than on how much progress they make. Yet the MSIs that created these indicators emphasize that the sustainability "journey" will never end (Milne, Kearins, and Walton 2006) and thus KPIs aim to not only measure but also drive continuous improvement. How effectively they do so is an empirical question. It is worth noting, however, that unlike organic, fair trade, or other well-known certifications, reporting on metrics typically does not earn producers a premium or their products a label. Rather, metrics-based governance assumes that incentives will come in the form of discovered efficiencies and improved relations with supply chain customers. Again, whether those assumptions are valid is an empirical question.

Second, most of the literature on agrifood standards, like most standards themselves, covers supply chains where the "tiers" are relatively few and traceable. This is the case for fresh fruits, vegetables, and seafood, as well as for certified organic and fair trade products. It is not the case for the basic commodities that account for the bulk of calories in the industrial food supply, as well as for much of its environmental footprint (West et al. 2014). Relatively new certifications for zero-deforestation palm oil and genetically modified organism (GMO)-free corn and soy demonstrate that establishing traceability for such commodities is technically feasible (Potts et al. 2014), although by some accounts "extremely challenging" (Waldman and Kerr 2014). The point remains that major manufacturers have traditionally not known with any precision where their soy, corn, or other staple ingredients come from, because their suppliers of these commodities are trader-processor companies such as Cargill or Archer Daniels Midlands (ADM). Although the standards literature has largely not addressed the challenges of identifying much less governing subsuppliers in complex food supply chains (Grimm, Hofstetter, and Sarkis 2014), manufacturers seeking farm-level information and outcomes must now do so. As discussed later, this imperative is driving much of the activity within certain MSIs, while also changing relationships between manufacturers and their suppliers.

Finally, despite rich scholarship on how agrifood standards affect farmers' livelihoods and communities (Mutersbaugh 2005; Blowfield and Dolan 2010; Arora et al. 2013; Jaffee 2014), we have little idea about how they are enacted inside and between companies further down the supply chain. At most, studies of the "backstage" channels by which uncertified products reach supermarket shelves hint at the negotiation that supply chain governance entails (Ouma 2010). The fact that metrics-based governance expects suppliers to both report on and somehow improve their performances—often without promise of monetary gain—raises the obvious question of how that is supposed to happen. How (and how effectively) do CS managers convince producers and other supply chain actors to help them assess and improve on-farm sustainability, and what tools, expertise, and sensibilities do they bring to this task? Here research on broader corporate improvement projects offers useful guidance.

Corporate Knowledge Work: From Social Responsibility to Sustainability

Two overlapping bodies of literature merit mention: one focused more on corporate knowledge work of different kinds and the other on corporate social responsibility (CSR). Within the former, STS scholars and geographers share an interest in the privatization of scientific knowledge production, especially as it affects what is known (and by whom) about environments, human bodies, and their ecological relationships (Randalls 2010; Guthman 2011; Lave 2012, 2015). Although acknowledging this broad historical trend,

this study focuses more on how "corporate science" itself has changed in response to new societal and environmental challenges (Penders et al. 2009; Schleifer and Penders 2011). In particular, I consider how Big Food companies' efforts to assure their own sustainability have required input from fields of knowledge that once seemed peripheral to the tasks of industrial food production and distribution.

At one level, companies' "science-based" targets draw on research published by organizations such as the International Panel on Climate Change (Grady 2015). At another, the pursuit of those targets within corporate supply chains relies on many fields of expertise. Some resemble the fields described by Thrift (2005) in *Knowing Capitalism*, in that they analyze and intervene in different types of corporate conduct—behavioral, logistical, and material—to help companies manage the increased complexity, uncertainty, and rising stakeholder demands associated with globalization (Hughes 2006). In addition to the management "gurus" and megaconsultancies discussed by Thrift (i.e., Deloitte and PricewaterhouseCoopers; see also Bryson 2000), food companies look to environmental NGOs, green consultancies, and experts in life cycle assessment (a form of cradle-to-grave modeling) to provide them with information and assurances about the sustainability of upstream operations (Hughes 2007; Freidberg 2014).

Inside corporations, the expertise and everyday work of CS managers and other midlevel managers has received little attention (although see L. M. Anderson and Bateman 2000; Tang, Robinson, and Harvey 2011). My own research on U.S. and European food companies indicates that relatively few CS managers bring much formal sustainability training to their jobs, especially if they previously held other positions within their own companies. Although unsurprising, their references to a "steep learning curve" raise the question of how and where they actually learn the work of managing supply chain sustainability (Hughes 2006; Hall 2008). On a day-to-day level, this work is deeply relational. One common task is to collect, analyze, and respond to requests for information, as when a retailer asks a manufacturer questions about its own or its suppliers' emissions or water use. This information is unlikely to be forthcoming, however, unless CS managers first win the support and cooperation of others, ranging from farmers to buyers to chief executives. Here actor network theory offers perhaps a better "empirical toolbox" than assemblage thinking (Müller and Schurr 2016), in that it draws attention to the wide variety of technologies and tactics that CS managers rely on to "enroll" others, often across considerable distances, in the project of supply chain sustainability (Callon 1990; Galt 2011; Robbins 2012).

Although actor network theory offers a useful "set of sensibilities" (Mol 2010, 253), even more direct methodological guidance for this project has come from ethnographies of CSR. Within this literature, studies of communities and workers impacted by CSR programs (J. Smith and Helfgott 2010; Gilberthorpe and Banks 2012; Ololade and Annegarn 2013; Kirsch 2014) far outnumber those focused on the corporate actors who, with the help of NGOs and technical experts, develop and implement them (Li 2011). Corporate secrecy has often precluded the latter approach; researchers' concerns about cooptation have sometimes discouraged it (Benson and Kirsch 2010; Urban and Koh 2013). A growing body of ethnographic research inside corporations, however—enabled in at least some cases by companies' interest in social scientists' feedback (Schleifer and Penders 2011)—reveals a landscape of "corporate ethicizing" more complex than companies' glossy annual reports might suggest (Dolan and Rajak 2011).

On one level, CSR knowledge and discourses circulate globally through conferences, MSIs, and other "theatres of virtue" (Rajak 2011, 32). Participants extol transparency, collaboration, and stakeholder engagement but in venues that few can afford to access. On another level, CSR managers work for companies with distinctive cultures of "doing good" but that might grant them limited autonomy and resources to do much good (Duarte 2010; Rajak 2011). On yet another level, the managers themselves bring diverse professional backgrounds and aspirations to their work, which in its daily practice shapes (and perhaps frustrates) their own ethical subjectivities (Cross 2011; Hardin 2011). Frustration adds to the appeal of conferences and other CSR arenas, where managers can expect empathy and hope for renewed inspiration (Welker 2014).

My research indicates that many of these observations about CSR also describe the assemblage devoted to sustainable food supply chains. Indeed, the two overlap in their aims, practices, and participants (on the business community's own distinctions between social responsibility and sustainability, see Olson 2016). Whereas much on-the-ground CSR activity centers on specific workplaces and surrounding communities, however (Cross 2014; Welker 2014), the

work of managing food supply chain sustainability spans a wide range of desired improvements and spans diverse supplier operations and sites, many of which food companies can neither identify nor control.

The Assemblage

Although the corporate governance of food safety and quality dates back to at least the 1990s (Dolan and Humphrey 2000), the assemblage devoted to food supply chain sustainability has taken shape more recently. This section first examines why companies have assembled around this cause and then describes where and how (in terms of organizations, tools, and events) they have done so. The first important point is that although brand image remains a perennial concern—especially given widely reported consumer distrust of Big Food (Wahba 2015) and high-profile NGOs' scoring of "big brand" food company performance (Greenpeace 2016; Oxfam 2016)—the assemblage's emergence also reflects newer pressures and the need for new tools of governance (namely, metrics) to address them. Some of these pressures are neither directly consumer-driven nor unique to the food industry. Organizations such as the United Nations Global Compact and the Global Reporting Initiative, for instance, have called on multinational businesses more generally to demonstrate transparency through annual disclosures of environmental and social performance, as measured by multiple indicators (Dingwerth and Eichinger 2010; Lydenberg, Rogers, and Wood 2010; Kaenzig et al. 2011). In their campaigns to encourage banks and other investors to consider their exposure to "environmental risk," NGOs such as CDP (formerly the Carbon Disclosure Project) and Ceres also ask companies to report their greenhouse gas (GHG) emissions, water footprints, and forest product use (see www.cdp.net, www.ceres.org).

Another important pressure comes from increasingly globalized competition in food retailing and branded manufacturing. Although this competition is not in itself new, sustainability metrics offer new levers for promoting supply chain efficiency and innovation. By assessing suppliers on their abilities to produce more with less, such metrics can potentially help Big Food companies drive down costs and thus capture larger shares of price-sensitive emerging markets. Unilever claims that its commitments to sustainable sourcing have already paid off with cost savings and bigger markets (Dauvergne and Lister 2012), and Walmart emphasizes that more sustainable products will "save our customers money" (Walmart n.d.).

I return shortly to Walmart's role in assembling multistakeholder support for its own sustainability goals. Although these goals have compelled all kinds of consumer goods manufacturers to start seeking information about where and how their products are made, the food companies most active on this front are driven by more than the need to stay on good terms with their biggest customer. For at least some of them, climate change is already proving costly, as droughts and floods exacerbate price volatility and supply shortfalls (Neate 2013). Unilever estimates that it loses 300 to 400 million euros annually to extreme weather (Harrabin 2015). Crops affected range from the Midwest's corn to Madagascar's vanilla (Ceres 2014). Companies expect even worse: Walmart's own British subsidiary Asda forecasts that 95 percent of its fresh produce supply is "at risk" due to global warming (Idle 2014). Companies dealing in cocoa, coffee, and spices face the prospect that certain high-value varieties could disappear altogether, as suitable growing conditions diminish and farmers switch to less risky crops (Goerlich 2016). Beyond climate change, environmental problems such as soil erosion, water pollution, and biodiversity loss could also threaten future harvests, either directly or by eventually driving up the costs of and regulatory restrictions on production. Although the food industry does not dwell on its own role in causing these problems (namely, by driving farmers to maximize yields in environmentally destructive ways), companies' sustainability commitments effectively recognize that those problems can no longer be ignored.

In short, although food companies face considerable pressure to show that they are addressing climate change and other forms of environmental degradation, their agricultural sustainability initiatives amount to more than performances; they also reflect concerns to maximize efficiency and manage risks to raw material supplies. Both the relative newness and the very geography of these concerns—that is, distant from companies' own operations and much broader in scale—have supported the growth of several MSIs over the past several years, as well as increasingly close relationships between them. Varied in size and scope, these MSIs share commitments to precompetitive and cross-sector collaboration and to outcome-based metrics as means to assess and incentivize farmers and other supply chain actors.

Examined together, these MSIs offer insights into the pressures driving Big Food companies to assemble around the goal of agricultural sustainability. Neither external pressures nor sheer bigness by themselves, though, explain how participating companies are actually pursuing this goal—or how effectively. Indeed, Murray Li (2007) observed that managing failure counts among the key "practices of assemblage." The very willingness of individual companies to devote time and money to multistakeholder activities reflects the failure of their traditional levers of corporate power, namely, market share and lobbying clout (Howard 2016), to deliver the farm-level information and influence they need. Joining MSIs offers one way to manage this failure, if not necessarily overcome it. Working through the relationships forged by sustainability managers offers another. Both constitute practices of assemblage.

One MSI to attract some of the biggest food brands is the Sustainability Consortium (henceforth, the Consortium). Founded in 2009 by Walmart, a handful of its major suppliers, and a few large NGOs (Environmental Defense Fund, Natural Resources Defense Council), the Consortium is officially a nonprofit research initiative, jointly administered by the University of Arkansas and Arizona State University and financed by membership fees of up to $100,000 annually. Its original mission was to help Walmart create a "sustainability index" that would quantify and then disclose to consumers the cradle-to-grave environmental and social impacts of every product it sold (Rosenbloom 2009). It was a necessarily multi-stakeholder effort because Walmart had neither the scientific expertise nor the basic information about product origins needed to create the index.

Dozens of companies joined the Consortium over the next two years, mainly to secure a seat at the table where their biggest customer would be deciding how to measure product sustainability. Yet the index made little progress. Technical disagreements about the modeling of products' cradle-to-grave impacts slowed things down, as did many member companies' reluctance to share what they had considered proprietary information about their products and manufacturing processes. The more fundamental problem, however, was an utter lack of information: Even the relatively few companies that had already assessed emissions, resource use, and perhaps social conditions in their supply chains did not have nearly enough reliable data to allow for the type of "green nutrition labels" originally envisioned (Rosenbloom 2009, B1). Especially scarce was information about the farthest upstream activities—farming, mining, forestry—already known to account for the largest part of many products' "footprints" (Weber and Matthews 2008; Mogensen et al. 2011).

Once it became apparent that Walmart's original plan was not remotely realistic, the Consortium changed course. Instead of attempting to rate individual products' overall sustainability (say, Cheerios vs. Special K), it began developing KPIs for broad product categories, such as bread or laundry detergent. Framed as multiple-choice questions, these KPIs would help "focus buyer and supplier conversations around doing things that matter about things that matter" (Sustainability Consortium 2012). Consumers, in other words, were no longer the ultimate audience for the Consortium's work. Its KPIs would instead serve as a form of business-to-business disclosure aimed at encouraging manufacturers to both learn more about and find ways to improve the sustainability of their supply chains.

In the years since, the Consortium has created surveys of fifteen KPIs each for nearly 150 product categories. Walmart now asks suppliers to complete these surveys every year. All of the KPIs are reviewed and approved by sector-specific working groups, the largest of which is the Food, Beverage, and Agriculture group. Its members include major manufacturers and retailers (General Mills, PepsiCo, Organic Valley, Walmart, Kroger), agribusiness firms (Monsanto and Syngenta), NGOs and industry associations (Environmental Defense Fund, Global Aquaculture Alliance), and a few consultancies (in mid-2014, I joined this working group as an academic observer).

During online meetings to review new KPIs, the group's members paid close attention to wording. Some had obvious interests to defend: The agrichemical companies wanted KPIs related to their products to encourage not less but rather optimal use, whereas NGOs wanted language that promoted their own ideas about, say, biodiversity or animal welfare. Among food manufacturers, however, a top priority was "answerability." Although sometimes a matter of wording, the more common problem was the same one as before: The KPIs ask about hot spots far up the supply chain—typically on farms, ranches, or other primary production sites—about which companies have little or no information.

To get around this problem, many food manufacturers have joined MSIs with more direct links to producers. Field to Market, for example aims "to define,

measure and advance the sustainability" of U.S. commodity crop agriculture (https://fieldtomarket.org/). Founded in 2007, its membership doubled between 2014 and 2016 alone. Its hundred-plus members now include some of the same companies and NGOs that belong to the Consortium (including Walmart) but also many more agribusiness and producer associations, several land-grant universities, and commodity traders such as ADM, Bunge, and Cargill. In late 2016, my institution joined as a nonvoting member.

Much of Field to Market's work centers on its Fieldprint Calculator, an online tool that allows commodity crop farmers to input, analyze, report, and compare their "sustainability performance" according to several eco-efficiency metrics. Although the tool promises farmers confidentiality, Field to Market aggregates their anonymized data to both benchmark and track change at different geographic scales. It will also eventually allow corporate members to use these data for their own reporting purposes—including responding to Walmart's surveys—provided that they sponsor Fieldprint Projects. These projects typically focus on a particular crop, region, and environmental concern, such as water quality or soil erosion. Food manufacturers usually sponsor projects in regions where they know they are major, if indirect buyers—General Mills, for example, sponsors a corn project in eastern Wisconsin, and Coca-Cola sponsors another in western Michigan. In each project, anywhere from twenty to fifty growers agree to "enroll" their farms in the Fieldprint Calculator, generating data about how specific management practices affect costs, yields, and environmental indicators. Although corporate sponsors cannot yet officially take credit for any of their projects' outcomes (these must be measured for at least five years), at least some report that raw materials from project counties are "sustainably sourced" (Gelles 2015; General Mills 2016).

In late November 2016, Field to Market reported that it was collecting data from more than 2,000 farmers on an estimated 2.35 million acres. Although these numbers had leapt from the year before, they were still far from the organization's goal of 20 million acres by 2020, hinting at the hard work involved in enrolling farmers. Meanwhile, it was cooperating closely with two other MSIs engaged in similar activities: the Innovation Center for US Dairy, which has its own dairy-specific online FarmSmart calculator (not yet in wide use), and the California-based Stewardship Index for Specialty Crops, which has developed sustainability metrics specific to fruit, vegetable, and nut production (see farmsmartbeta.usdairy.com, www.stewardshipindex.org).

All of these MSIs communicate and share members with the Consortium and other more global MSIs. The oldest of these is the Brussels-based Sustainable Agriculture Initiative Platform (SAI-Platform), founded by Unilever, Nestle, and Danone in 2002. Its more than eighty members are all food and drink companies but, like the other MSIs, it stresses its "partnerships" with NGOs, scientific institutions, and farmer organizations. SAI-Platform's online Farm Sustainability Assessment asks farmers nearly 140 questions in three categories: Profit, Planet, and People. Unlike the online calculators, this survey-style assessment does not measure outcomes such as reduced GHG emissions. Rather, its questions "focus on practices that should lead to those impacts (and that can be measured)" (SAI-Platform n.d.). Its breadth is also supposed to make it a "one-stop shop," sparing farmers and companies the burden of multiple surveys. SAI-Platform says that its member companies now use its assessment in eighteen languages, twenty-four countries, and for multiple crops, from Spanish rice to Indian mangoes (see saiplatform.org).

The last MSI followed in this study is the Sustainable Food Lab, which operates out of rural Vermont but claims a membership of global brands and NGOs (Mars, Starbucks, Heineken, Oxfam, and the Rainforest Alliance, to name a few). Among its projects is the Cool Farm Tool, which it cosponsored along with Unilever, one of its founding members. Like the other online farm calculators, this one promises benefits to "both ends of the supply chain," providing companies with on-farm information and a means to "motivate, track and reward continuous improvement" and farmers with insights into how best to reduce those impacts, as well as, ideally, their costs (https://coolfarmtool.org/coolfarmtool/). Less comprehensive than the other tools—it calculates only GHG emissions and, in its most recent version, water use and biodiversity—the Cool Farm Tool is supposed to be "intuitive" and easy to use. Both large-scale and smallholder farmers in several countries have already used it, providing companies such as Heinz, Costco, Tesco, and PepsiCo with data about the impacts associated with farm products ranging from tomatoes to organic eggs to tea (see coolfarmtool.org).

Like the other MSIs described here, the Sustainable Food Lab's work extends well beyond tool development

into research, consulting, and the convening of companies and farmers around specific goals. Although many multistakeholder activities transpire virtually or in dispersed sites, all of the MSIs also hold annual summits that combine work meetings, breakout sessions, keynotes, social events, and in some cases educational field trips ("learning journeys") to local farms and food enterprises. In several ways, these events have helped the broader corporate food supply chain sustainability assemblage both cohere and expand.

First and most broadly, MSI summits have helped provide their member companies with a common understanding of what agricultural sustainability means, why it matters to them, and how to talk about it. This is a significant achievement, given that sustainability is not only a notoriously contested idea but also one that companies approach from different parts of the industry and with different levels of experience and knowledge. Relatively few companies and NGOs have effectively shaped this common vision and discourse, and their representatives invariably appear on the speakers' list at MSI summits. The language they use, though—referring to sustainability as a *journey* (Milne, Kearins, and Walton 2006), aimed at *continuous improvement* and increasingly *just good business*—plays down the gap between recognized industry leaders and relative newcomers. Summit presentations also frequently invoke the food industry imperative to feed the world, generally avoiding debates about how best to do so. If they bring up publicly controversial technologies—GMOs or antibiotics, for example—it is usually not in support or opposition but rather in reference to consumers' concerns.

MSI summits have also helped stabilize the assemblage by fostering camaraderie among participants. Many companies participate in more than one initiative, so their CS managers see each other as well as other regular attendees at a few such events each year. They catch up at meals, coffee breaks, last-night galas, and hotel bars. It is not uncommon to see competing companies' CS managers chatting. Especially for those who describe their jobs as underresourced and sometimes overwhelming, summits provide opportunities not only for reinspiration but also commiseration with peers, or what one food manufacturer's CS manager described as her "support group." These conversations can in turn lead to joint actions, whether in the form of proclamations (as seen in the cosponsored climate policy letter mentioned at the beginning of this article) or partnering on Fieldprint or other supply chain sustainability projects.

MSI summits further encourage such collaborations through procedural rules requiring that formal discussions remain both precompetitive and to some degree confidential. Typically participants must agree not to talk about prices or business plans and to comply with the Chatham House Rule of nonattribution.[2] Although these restrictions serve partly as legal protections, they also aim to foster conversations and relationships that might not otherwise happen. The Sustainable Food Lab especially emphasizes this latter point, describing itself as "a safe container" for building trust, especially between companies and NGOs.

Procedural rules aside, the exclusivity of MSIs and their summits has made them relatively "safe" places for Big Food to assemble around the cause of agricultural sustainability. As Rajak (2011) observed of CSR events, an obvious tension exists between the rhetoric of "consensus and inclusion" and the reality of exclusive membership requirements and registration fees (typically running upwards of several hundred dollars, not including accommodations or travel). NGOs that regularly attend such events tend to have budgets dedicated to and dependent on corporate partnerships and are therefore unlikely to publicly challenge a company's sustainability claims. Where consensus publicly breaks down in these settings is usually not over the goals of sustainable agriculture but rather over how different supply chain actors will profit from its pursuit.

Neither Carrot nor Stick

Having described the different actors, technologies, and practices assembled around the cause of corporate food supply chain sustainability, I now want to examine more closely the challenges facing the assemblage and especially the CS managers who work within and through it. An appropriate starting point is the 2016 release of the Consortium's first-ever impact report at its annual spring summit, titled *Greening Global Supply Chains: From Blind Spots to Hotspots to Action* (Sustainability Consortium 2016). The Consortium's then-CEO Sheila Bonini described the fifty-page report as "the beginning of a journey." Now that Walmart and a handful of other retailers were asking their suppliers to respond to its KPIs, Bonini said, the Consortium could "begin to start to drive impact."

A closer look at the report clarifies this oddly tentative pronouncement. On one hand, a summary of research findings emphasized that many products'

environmental and social "hot spots" occur upstream from manufacturing and retailing. On the other hand, the report noted, more than 2,500 surveys of 1,700 Walmart suppliers indicated that they had "limited visibility" upstream from their own operations. Indeed, Bonini said that the most common response to all KPIs, accounting for more than half the total, was, "We don't know." For KPIs related to on-farm production—the hot spot for most food supply chains—respondents ticked the "We don't know" box 80 percent of the time. Visibility was especially poor in commodity crop supply chains, as opposed to those for fresh produce and other specialty crops.

With so little information, the Consortium's impact report could hardly claim that the surveying of consumer goods manufacturers had, in fact, made any impact on how those goods were produced. As the report acknowledged, "If you can't manage what you don't measure, you definitely can't manage what you can't even see" (Sustainability Consortium 2016). At most, the creation of KPIs had allowed Walmart and potentially other retailers to "send a market signal" to manufacturers (Sustainability Consortium 2016, 7), encouraging them to find ways to see better and farther up their supply chains.

For food companies in the Consortium, this goal was one reason to send their sustainability managers to the summit a day early, when the Consortium sponsored an all-day workshop titled, "How to Get Sustainability Data Flowing in Agriculture Supply Chains." The roughly 100 attendees included CS managers from food manufacturing and agribusiness, NGO representatives, consultants, and staff from both the Consortium and other MSIs (Field to Market, SAI-Platform, and Sustainable Food Lab). Title notwithstanding, the workshop did not show participants how to get data flowing from farms to companies, although it did feature presentations on the many tools developed for this purpose. Besides the MSIs' online calculators and surveys, a number of consultancies and NGOs introduced their own "ag data" initiatives, which ranged from bespoke farmer questionnaires to a United Nations–sponsored global registry described as a "LinkedIn for farmers."[3]

The day's schedule included a session on the value of harmonizing different tools' data to streamline its "flow" while sparing farmers repeated surveys. Most attendees, however, seemed more concerned about getting data off the farm in the first place. As one MSI staff member put it, "We're operating in a world without a carrot or a stick." Food manufacturers, in other words, were generally unwilling to pay premiums for farmers' data—partly because Walmart was not paying for the information it collected from them via its surveys—but neither could they demand it, given their lack of contractual or otherwise direct relationships with farmers.

A breakout session devoted to the question of how to "incentivize producers" attracted a crowd. Provided with a flip chart and tasked with diagramming an action plan, the group instead scribbled notes about needs and frustrations. The word *trust* came up often throughout the session and indeed the entire summit. The most immediate problem was farmers' distrust of companies' requests for information about their management practices. Summit attendees also spoke about the need for "more intimate supply chains" in a broader sense, however. In these, trust between suppliers and buyers would enable the sharing of not only aggregated farm data but also "stories" of individual farmers' progress toward sustainability. These stories would in turn earn the trust and loyalty of consumers as well as the procurement teams at Walmart and its Big Food suppliers.

This vision of a more intimate supply chain is not necessarily either realistic or even widely shared by participants in real supply chains. In fact, it emerged out of a breakout session that no farmers or retailers attended. What makes this vision noteworthy is rather what it says about the aspirations and workaday practices of at least some of the supply chain actors who did attend this session, namely food manufacturers' CS managers and their NGO partners (on NGOs as supply chain members, see Hyatt and Johnson 2016). For CS managers, especially, it describes the type of relationships that they spend much of their time trying to build and maintain and that they see as necessary to both their own professional success and that of their companies' sustainability programs. These relationships are also what hold the broader assemblage together, however tenuously.

The Social Relations of Supply Chain Sustainability Work

Different types of relationships matter to CS managers for somewhat different reasons, but all underscore how much work goes into simply establishing the basic channels of communication and information exchange on which the assemblage depends. First, CS

managers rely on relationships in and beyond their companies to compensate for their own limited experience and knowledge. Most of my interviewees had worked in their current sustainability jobs for less than five years. Whether new or internal hires, most had taken new positions, often with broadly defined responsibilities relative to their own backgrounds. One CS manager, having studied engineering and then worked in his company's finance department, got his current director-level job after a hallway encounter with a senior colleague five years prior:

> She told me about this emerging area of sustainability and how the organization was trying to grapple with it because no one was really sure what it was, what it meant, where it was going to go. . . . I said, "That sounds like a dream, where do I sign up?" . . . I never studied environmental science or anything like that. . . . It was an enormously steep learning curve and actually it still is.

The CS manager for the North America unit of another global company had worked in sustainability in her previous job but in a different industry; she had no background in food or agriculture. "They took a chance on me," she admitted. On her job for less than a year, she said she regularly sought out colleagues to teach her about the supply chains she oversees. "Really once I find somebody—these poor people!—once I find somebody that shows even just like a little bit of interest, they will get a meeting request the next day: 'Sit down and talk with me.' That is how I have had to learn."

CS managers also rely on advice from NGOs. Although much research on corporate–NGO partnerships emphasizes the latter's role as a source of moral legitimacy (Baur and Palazzo 2011), individual CS managers stress the value of NGO contacts who can alert them to what one called "the next big issue"; that is, an environmental or social problem that CS managers need to address before it threatens their companies' brands and bottom lines. "We try to work with them," said this CS manager, "to say, 'What do you see? What do you think needs attention?'" Although his company scanned the traditional and social media for clues about emergent public concerns, he said that was "probably less effective than just talking directly with people."

Whereas talking with NGO people helps CS managers anticipate risks, talking with their peers at other companies (including direct competitors) helps them determine what to do about them. This is especially important when they are entering regions where the risks are unfamiliar. As the CS manager for one U.S.-based manufacturer said in reference to her company's expanding smallholder-based supply chains in the Global South, "Unilever has been sourcing from Africa forever and for us it is brand new. We are just building plants in India . . . so we have a lot of learning to do."

Whatever their level of expertise, much of CS managers' work requires the cooperation of fellow employees, in part because they themselves have limited resources and autonomy. This is true even in companies known as "sustainability leaders." At one such company (a dairy brand), a top-level CS manager explained, "I have very little budget. I cannot just go out and do projects. I have to convince others that there are projects worth doing." Another dairy brand CS manager said, "A huge part of my role is education and relationship building," even just within her own company:

> You really have to do what we call "enroll." People really need to get what we do before you are doing anything. . . . I basically run a mini-business in the business. Things are going well if my business is busy. It means people know that I exist, they know what I do, and they know how it can create value. . . . Because you have got a big boulder to push up a hill no matter what, and you really hope that you have got a lot of people helping you push. Otherwise it is going to be kind of a long day.

If the "big boulder" represents the ultimate goal of a measurably more sustainable industry, at least some CS managers admit that demonstrating the bottom line value of their work can itself be a formidable task. The engineer-turned-CS manager mentioned earlier, after describing his participation in different MSI efforts to collect on-farm information, said that one of the hardest parts of his job was convincing his company's executives to devote resources to these efforts:

> In a lot of these spaces there is not necessarily a financial gain or at least not an immediate one that is easily recognizable . . . you are really trying to influence the business, influence the company, without a hard number—almost out of the goodness of your heart, you know what I mean? That can be very, very challenging because ultimately the senior executives . . . are hard-nosed business people. That is how they got to where they are.

CS managers need senior leadership's support in part to leverage the day-to-day help of coworkers with "operational" responsibilities, especially the procuring of raw materials. These individuals have the direct

contacts to suppliers that CS managers themselves lack, and they might also have significant on-the-ground knowledge. Their main aim, however, is to buy the needed quantity and quality of commodity at the lowest possible price, and assure its on-time delivery. Many companies' procurement teams are now also accustomed to buying third-party certified commodities (e.g., organic, fair trade), which might cost more but end up in premium-priced products and do not require much extra effort to obtain. CS managers' need for ongoing and ever-improving farm-level data, however, asks much more of procurement teams. It asks them not only to consider other kinds of information besides price (information that their own direct superiors might not necessarily care about) but also to lean on suppliers to provide that information—which they probably do not have on hand and might not be well equipped to acquire. In other words, CS managers need the procurement teams to help them enroll suppliers in the broader project, or assemblage, to assess and improve on-farm sustainability.

Exactly how this plays out varies, of course, across industries, regions, and individual supply chain relationships. Industries that faced reputational risks even before they worried about environmental risks—such as cocoa, with its long-standing child labor problem—are considered more "mature," in that supply chain actors are accustomed to asking and getting asked questions about on-farm activities (even if they still cannot necessarily get reliable answers). This is less true of the Global North's commodity supply chains, such as those dealing in U.S. corn and soy. Although the producers of these crops might be technically better equipped to provide information to inquiring companies than, say, West Africa's smallholder cocoa farmers, they are not necessarily more amenable to doing so.

A closing example from the U.S. corn supply chain illustrates some of the challenges facing CS managers responsible for getting this information. Corn features among the ingredients of Big Food products from breakfast cereal through soft drinks, whether in the form of grits, meal, sweeteners, oil, or minor additives such as citric acid and emulsifiers. Although the bulk of U.S. corn production goes into animal feed and biofuels, many of the food and beverage manufacturers that source corn in significant quantities (e.g., Kellogg's, General Mills, PepsiCo, and Coca-Cola) have committed to doing so more sustainably. In particular, they hope to see reduced GHG emissions and energy use per unit of yield and improved nutrient efficiency and biodiversity. Walmart's supplier scorecards for corn-based products also include questions about these environmental concerns. None of the manufacturers buy directly from farmers, though; rather, their corn-based ingredients come from one or more of the handful of commodity trader and producer firms that operate grain elevators and mills across the U.S. Midwest. ADM, Bunge, Cargill, and Tate & Lyle are the major players. These firms do transact directly with farmers, in some cases both as sellers of farm inputs (i.e., fertilizer) as well as buyers of their crops, but these relationships are neither contractual nor necessarily enduring. The CS manager for one company's corn wet-milling operations emphasized that U.S. corn farmers use "very sophisticated hedging and pricing tools" to determine where they are likely to get the best deal, which meant that his supply base varied from year to year.[4]

Both to assess progress toward their own sustainability commitments and to fill out Walmart's scorecards, manufacturers rely on the commodity traders and processors to collect the necessary on-farm data, tapping their own relations with farmers. Securing this cooperation (in any supply chain, not just corn) can take a while. One CS manager said she and the relevant procurement teams might need several months:

> We say there is a three-meeting process, but it is three formal meetings and months of discussion. We socialize it and resocialize it, and the more that procurement can articulate to the supplier that this is a real ask, that it is not just from the sustainability team over in the corner, I think that helps.

In the case of U.S. corn, it also helps to belong to Field to Market, where manufacturers' CS managers can socialize in more than one sense. In other words, they can take advantage of multistakeholder social settings to impress on their suppliers' own CS managers the value of collecting and sharing farm-level sustainability information. At the summits I have attended, these conversations are common and expected. They might start at coffee breaks or happy hour receptions and then continue on into dinner. They are friendly and seemingly casual, yet also essential. A CS manager for one the major commodity trader and processor firms said that attending summits inevitably entailed "a lot of Coke," drunk at mealtime meetings with one of his biggest corn syrup customers.

Like his counterparts at other trader ad processor firms, this CS manager said that responding to customers' (i.e., manufacturers') requests for farm-level data

has become a major part of his job. "They think we know all our farmers," he said, implying that this was impossible, given that a top corn milling company might receive corn from 10,000 farmers in the United States alone. Even though they confine their data collection to a few supply sheds, CS managers for the commodity and trader firms emphasize that it is slow going, partly due to limited resources, especially personnel. This might seem improbable given, again, the scale of such companies (Murphy, Burch, and Clapp 2012). The sustainability teams are not necessarily well-endowed relative to what is expected of them, however, nor can they send just anybody to collect the needed data from farmers.

Although most commercial-scale Midwestern corn farmers routinely collect and analyze at least some data about their own operations (via combines equipped with Global Positioning System and sensors, among other technologies), these data do not flow automatically to either the Fieldprint Calculator or any of the other sustainability assessment tools mentioned earlier. In early 2017, Field to Market announced a new software interface for its calculator that would make such flow technically possible (Vogt 2017); whether farmers agree to it remains to be seen. To collect the needed data, therefore, commodity trader and processor firms have had to rely heavily on the only employees who interact regularly and in person with farmers, namely, the "ag retailers" who sell them inputs and perhaps equipment. These individuals' official job responsibilities do not include data collection, much less sustainability; as one CS manager put it, "This is definitely an add-on." Ag retailers do at least know farmers on a first-name basis, though, and know something about the fields, crops, and technologies with which they work. With this familiarity and knowledge, they are generally better positioned than others in their companies to collect sustainability data from farmers.

This does not make it an easy job. One ag retailer said that despite good relations with her customers, getting farmers to sit down and complete a survey, online or otherwise, "is still almost like pulling teeth sometimes." This is perhaps unsurprising; she estimated that it could take "half a day" to answer all of the Fieldprint Calculator's more than eighty questions for the first time (subsequently it would go much more quickly). Even that might not cover specific manufacturers' queries.

Besides the time required, she said that farmers knew that their data were valuable and resented that they were expected, with few exceptions, to give it away for free (in a small number of Fieldprint Projects, the sponsoring companies have agreed to pay farmers premiums on crops from "enrolled" acreage; see, e.g., Gelles 2015). Like her CS manager colleague, the ag retailer said that farmers also resented the very assumption that they were not already sustainable, as many had been farming for several generations and hoped to continue doing so. Not least, despite guarantees of data confidentiality, farmers distrusted the motives of those who wanted the data. Conceivably, a company could use county- or state-level data about water use per acre of corn to set a benchmark that individual farmers, working more arid land, would find unattainable. Conceivably, in other words, their data could somehow be used against them.

Although farmers in the United States might be more concerned about privacy and perceived regulatory measures (even those by private actors) than their counterparts elsewhere, their resentment toward those who might question their environmental stewardship is hardly unique. Whatever the basis for such attitudes, they pose a major obstacle to companies' data collection efforts and indeed to the entire assemblage that has cohered around the idea that Big Food companies can use farmers' data to not only assess but also improve the overall sustainability of their raw material supplies.

Some of the tools developed toward this end do generate information that is potentially useful to farmers as well as their downstream customers. The Fieldprint Calculator and Cool Farm Tool, for instance, both allow farmers to generate field-level scenarios showing how different management practices might affect not just GHG emissions but also input costs and soil fertility. If a farmer is becoming more eco-efficient over time, the tools provide hard (or at least easily communicated) evidence.

In addition to sending their ag retailers to farms with the Fieldprint Calculator, some of the commodity processor and trader firms hold workshops for participating farmers. One CS manager described how his company used these occasions partly to show farmers how their results, still anonymized, compared to those of others in the room. The effect of bar charts showing that some could produce the same yields with much less energy use was, as he put it, "really powerful." It helped convince them that the calculator might, in fact, be useful.

> They will leave then and say, "There is something to this." It is one way we can try to give some value back to

> growers, and we can get insight into how our supply chain is doing. Then over time if we can get all of those bars on a relative basis to go a little bit down and a little bit down, the Cokes and the Pepsis are happy that we are having improvement in our supply chains. That is at least the theory (laughter). We will see how that goes.

In the meantime, he relied on workshops and a handful of ag retailers to bridge the gap between customers' expectations of free data and farmers' reluctance to provide it. "We are in the middle refereeing," he said. "We try to come up with feasible solutions at no premium to really pay, which is a challenge. A huge challenge."

Conclusion

The latter part of this article moved from the scene of a Walmart-backed MSI summit to the upper reaches of a corn supply chain, where individual farmers and their ag retailers sit at kitchen tables and input data that Walmart, among others, has requested. This account did not address some obviously important if not readily answerable questions. How and how much, for instance, will these data affect how companies govern their food supply chains? How much can its collection actually drive improvements in the sustainability of food production, especially in the absence of monetary incentives? Not least, are the industry's metrics of improved sustainability—most of which emphasize producing "more with less"—meaningful, sufficient, and desirable? The list could go on, but this narrative climb up the supply chain has, I hope, put to rest a question I commonly hear, namely, about whether the food industry's sustainability initiatives are "for real."

Certainly these initiatives are responding to what companies have identified to be real risks, both environmental and reputational (although different companies might weigh these risks differently). Certainly they have already had all kinds of real consequences, manifest in the assemblage of MSIs, tools, and practices that has taken shape over the past few years. Indeed, the very existence of CS managers' jobs, like the relationships those jobs require, testifies to larger and very real changes in how companies relate to one as buyers, suppliers, and competitors and how they relate to other actors such as NGOs (and perhaps even academics).

The fact that the actual collection of on-farm data has gone slowly—at least relative to the expansion of the assemblage for which this is a primary goal—does not necessarily prove false intentions; that is, greenwash. It does, though, demonstrate the limits of both corporate food power itself and depictions of that power that take the corporation and perhaps the entire category of enterprises known as Big Food, as their only unit of analysis (Wallace and Kock 2012; McMichael 2013; Pollan 2016). To take the inquiry inside corporations and supply chains does not close the door on critical political economy. If anything, it offers valuable insights into the bigger picture (i.e., the assemblage) of corporate food supply chain sustainability initiatives, provided in part by the individuals who work in it everyday. These insights in turn hint at how even the most ostensibly powerful corporations, faced with limited visibility and influence inside their supply chains, might be pushed to change, as Schleifer and Penders (2011) put it, "in unexpected ways" (432; see also Friedmann 2016). This is a possibility worth taking seriously and exploring further.

Acknowledgments

I owe thanks to James McCarthy and three anonymous reviewers and to the interviewees whose time, knowledge, and insights made the article possible. All errors are my own.

Funding

Research for this article was supported by funding from the National Science Foundation, Award #1456910.

Notes

1. Fieldwork inside corporate settings poses a number of practical and ethical challenges, which space precludes me from addressing at any length in this article. I do plan a future article focused more on methodological considerations in corporate supply chain research.
2. "When a meeting, or part thereof, is held under the Chatham House Rule, participants are free to use the information received, but neither the identity nor the affiliation of the speaker(s), nor that of any other participant, may be revealed" (https://www.chathamhouse.org/about/chatham-house-rule#sthash.3YZPLtSI.dpuf).
3. The global registry is known as the Blue Number Initiative. See http://www.intracen.org/article/Blue-Number-Initiative-links-development-to-sustainability/.
4. Transport time and costs also figure into farmers' decisions. I was unable to find publicly available information

about different companies' elevators, but this would obviously be useful.

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