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Serving Magically Perfect Fruit Globally: Local nesting in translating multiple standards

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Abstract

Globally, standards govern and organise the production and exchange of food. This article uses insights from science and technology studies to study the translation of multiple standards in the Ghanaian pineapple industry. The data demonstrate a translation process that is best described as *nesting*. Nesting is the process through which producers translate multiple standards into a locally contingent network of human and non-human actors, which is represented materially by the perfect fruit. For nesting to take place, producers develop intra-organisational collective practices that we call: prioritising standards, enrolling additives, and creating residues. The concept of nesting explains how food producers translate multiple standards, while simultaneously regaining agency. While nesting enables us to speak about what it means to implement the multiple standards that materially embody the consumers' vision of perfection, it also contributes to the sociology of standards, the literature on standards adoption, and organisation studies.

Keywords

food, Ghana, private regulation, science and technology studies (STS), standards

Introduction

> Lovely shape, no wrinkles, perfect skin. Fruit like this doesn't just grow on trees, you know.
>
> (Andrew Purvis, *The Observer*, 13 July 2003)

Even though the perfect fruit, noted in the above newspaper headline, does not grow on trees, it seems to 'magically' appear in supermarkets. This article is about the process through which producer organisations create this perfect fruit.[1] Central to this process are standards, which are both formalised rules and material measures (Busch, 2011). Standards have long ensured that good, safe and

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appealing food is available (Lasztity, 2009) and their ubiquity in the contemporary world is a topic of interest for social scientists (Brunsson & Jacobsson, 2000a; Busch, 2011; Djelic & den Hond, 2013; Foley, 2017; Lampland & Star, 2009; Timmermans & Epstein, 2010). The food industry currently faces pressures from two different sets of standards. The first concerns measurable food properties, like the OECD standards for fruits and vegetables that regulate the appearance of foods, such as the size, maturity, colour, moisture or peel appearance (OECD, 2020). These standards became the norm for governing the global supply networks in the 1980s. A second wave of standards dealing with safety and distinct quality features (e.g. Organic, Fairtrade, GMO-free, GlobalGAP) appeared on global markets in the 1990s (Bain, Ransom, & Higgins, 2013). We label these standards as ethical, because they aim to stimulate 'conditions that are socially and/or environmentally as well as financially responsible' (Blowfield, 1999, p. 754). The two waves caused increasing multiplicity in the standards that together orchestrate today's production and trade of food around the globe.

In contrast to the simplistic assumption that standardisation leads to homogeneity, uniformity or convergence, scholars have documented an increase in the multiplicity of standards when actors try to standardise processes and products (Djelic & den Hond, 2013). The global governance literature has examined the strategies (Abbott & Snidal, 2001; Djelic & den Hond, 2013; Henson & Humphrey, 2010) and competitive dynamics (Fouilleux & Loconto, 2017; Reinecke, Manning, & von Hagen, 2012; van der Grijp, Marsden, & Cavalcanti, 2005) between multiple standard-setters who have the authority to set the rules that producers must follow. Despite the emergence of meta-standards that attempt to harmonise (Fransen, 2015; Loconto & Fouilleux, 2014), producers continue to face multiple standards (Mutersbaugh, 2005). We examined the multiplicity of standards from the rule-takers' perspective, which requires a conceptual shift from the space of 'standards in the making' to 'standards in action' (Loconto & Demortain, 2017). In doing so, we further advance the movement away from standard-setters towards producers (Riisgaard, 2009; Tampe, 2018).

Producers implement the multiple standards required by the buying firms, especially large retailers, who use them to achieve economies of scale within specific product categories, to differentiate their product range or to legitimately inform their customers about appreciable food qualities (Ponte & Gibbon, 2005). The political economy literature characterises producers as powerless actors at the mercy of standards and powerful buyers (Coslovsky, 2014; Freidberg, 2004; Ponte & Gibbon, 2005), but others have observed that producers often must reorganise their everyday practices to accommodate these external, standardised requirements (Bingen & Busch, 2006; Henson & Humphrey, 2010; Loconto, 2014a; Mutersbaugh, 2005). These demonstrations of producer agency (Brunsson, Rasche, & Seidl, 2012; Haufler, 2018; Tempel & Walgenbach, 2007) have been described as local deviances, or superficial compliance, in the adoption of standards (Boiral, 2007; Giuliani, Ciravegna, Vezzulli, & Kilian, 2017; Tampe, 2018; Wijen, 2014). Yet the obligation to align private standards with local, legal requirements also gives producers agency in how they decide to apply the private standards (Bartley, 2014; Distelhorst, Locke, Pal, & Samel, 2015; Locke, Rissing, & Pal, 2013; van der Grijp et al., 2005). Recent studies have argued that producers gain further agency by creating their own local standards (Foley, 2017; Schouten & Bitzer, 2015) – often with the support of local governments – to fight the intrusions of foreign, private standards (Bartley, 2014; Wijaya & Glasbergen, 2016). However, the variety of the relationships and interactions of standards requires a more nuanced understanding, as they could replace, complement or simply remain indifferent to other standards (Bartley, 2011; Djelic & den Hond, 2013; Locke et al., 2013). Thus, while the multiplicity of standards requires producers to decide how to apply them, there is little research that explores how and why this occurs. We thus address a gap in knowledge as to how producers translate multiple standards.

Building on the knowledge that the implementation of an individual standard requires collective work by producers (Coslovsky, 2014; Perez-Aleman, 2010), we follow Bowker and Star (1999, p. 9) and 'look at what goes into making things work like magic' when dealing with multiple standards.

Our overarching goal is to understand how this magic perfection is achieved in the pineapple industry. To do this, we answer the following research question: *How do producers translate multiple, potentially competing standards*? We use insights from science and technology studies (STS) to examine how multiple standards are translated by the Ghanaian pineapple producers.

We use empirical data to demonstrate a translation process that is best described with the metaphor of *nesting*. In STS, translation refers to the formation and stabilisation of networks (composed of human and non-human actors) and nesting is the process by which producers translate multiple standards into a locally contingent network. The working products of this network that are composed of human actors (workers, managers, certification officers, etc.) and non-human actors (standards, plants, chemicals, etc.), are represented materially as perfect fruit. For the nesting process to take place, producers develop intra-organisational collective practices, which we call prioritising standards, enrolling additives and creating residues. The metaphor of nesting explains how food producers translate multiple standards, while simultaneously regaining agency, in a situation that is typically considered as one of rule-taking. Nesting enables us to understand what it means to implement multiple standards that materially embody the consumers' vision of perfection. First, however, we clarify our conceptual approach and methods, introduce the case of Ghana, and then report the empirical findings. We conclude with a discussion of the nesting process and its wider implications for studying standards in food systems.

Multiple Food Standards in Action

To understand how producers translate multiple standards, we use theoretical insights from the field of STS, as it underpins the sociology of standards (Busch, 2011; Timmermans & Epstein, 2010). This approach to studying the emergence, implementation and resistance of standards follows Latour's (2005) interactionist approach. It accords symmetrical importance to humans and non-humans, emphasising their interrelationships in the making of social relations. In this vein, the sociology of standards highlights how order is produced when the non-human (standards) and human actors interact in specific spaces. It directs attention to the work of human actors that brings non-human actors (standards, plants, chemicals, etc.) into the networks, enabling the production of new forms of order. This is in line with STS-inspired approaches in organisation studies, that allow for the agency of non-human actors (e.g. Corvellec, 2018; Nicolini, Mengis, & Swan, 2011).

STS scholars stress that standards (i.e. rules and material measures) act as part of an invisible non-human infrastructure, that sustains networks and the functioning of societal phenomena such as the global economy (Murphy & Yates, 2009) or medical bureaucracies (Bowker & Star, 1999). As part of an infrastructure, standards underlie a variety of work, such as computer networks, and are often unseen until they break down (Bowker & Star, 1999). However, their adoption and maintenance require work, as infrastructure is fragile, problematic and exposed to ongoing disruptions. In an empirical study about the adoption of standardised medical protocols, Timmermans and Berg (1997) demonstrated that standardisation is locally formed and achieved in the specific places where standards are adopted. Higgins and Larner (2010) also argued that local practices, extra effort and interactions to standardise are required in order to make standards feasible.

Analytically, this means we should focus on 'standards in action' (Loconto & Demortain, 2017, p. 385), which is the space where standards encounter 'users and enforcers in specific geographic spaces'. Here, standards are performative (Law, 2008), which means that they must be interpreted by rule-takers. This type of interpretation is a process through which the standards, material devices and actors co-evolve to fit each other and produce new realities and practices. This process of co-evolution is best captured by the concept of translation (Brunsson & Jacobsson, 2000b) that originates from STS and is defined as the formation and stabilization of networks, composed of human and non-human actors, that make up society. As explained by Callon (1984), translation consists of four

contingent processes: problematisation (problem definition), interessement (locking in actor roles), enrolment (role definition and interrelation) and mobilisation (ensuring the representativeness of the spokespersons). In a translation process, mobilisation is the final result. Thus, if a translation is successful, this means that the spokesperson is correctly representing the network. It also means that the correct problem has been identified, the appropriate actors have been locked into their roles, and the relationships between the actors have been properly defined. For the case examined in this paper, this means that the perfect pineapple (the spokesperson) is correctly representing the network that was formed around the problem of multiple standards. The sociology of translation has been used by organisational and institutional theory scholars to explore the local adoption of one specific standard (Helin & Babri, 2015; Malets, 2013), or more generally to highlight the context-dependent interpretations of circulating ideas (Sahlin & Wedlin, 2008). In this article, we rely upon translation to theoretically derive our metaphor of *nesting*, which describes how producers translate multiple standards in production spaces, so that a network takes form to create and stabilise the perfect fruit.

Case and Method

We adopted a qualitative research design, suitable for studying the 'how' questions related to everyday practices and processes (Silverman, 2013). Through an iterative, inductive process of data collection, analysis and theory development (e.g. Miles, Huberman, & Saldaña, 2020), we explored local engagement with the standards in the Ghanaian pineapple export industry, a space of action where standards are ubiquitous. The pineapple is considered the fruit of kings (O'Connor, 2013), and its buyers demand both high quality and ethical standards. Consequently, all pineapple exporters conform to the Global good agricultural practices (GlobalGAP) standard (Baah Annor, 2018; Whitfield, 2012), large-scale plantations comply with the Fairtrade standard (Addoah & Sulemana, 2016; FAO, 2013), and exporters encourage smallholders to follow organic standards (Kleemann, Abdulai, & Buss, 2014). While both plantations with hired workers and cooperatives of smallholders cultivate pineapples (Suzuki, Jarvis, & Sexton, 2011), the industry is dominated by five plantations (Whitfield, 2016).

Data collection

To analyse multiple standards in action, Bartley (2011) suggests a two-step procedure: examination of the standards' meaning on paper, and then their implementation in practice. Following his suggestion, we collected, in a first phase, information about the circulating standards from the published standards, company and industry documents, internal memos, websites and scientific literature about the Ghanaian pineapple industry. The latter is particularly rich, as the industry underwent a fundamental shift from a booming to an ailing industry in the mid-2000s. This transformation attracted the attention of geographers, scholars of food studies and policy researchers.

In a second phase, we conducted purposefully sampled semi-structured interviews with six foreign buyers of Ghanaian pineapples, and one non-governmental organisation that organises awareness training about labour rights and the Fairtrade standards in the Ghanaian pineapple industry (447 minutes of tape recording, transcribed verbatim). Through these interviews, mainly focused on the needs, benefits and challenges of circulating standards, we gained access to the perspectives and experiences of those individuals who set and demand the standards. The interviews also had a preparatory function, as they provided information on the actual implementation of the standards – and facilitated field access. On site, data was gathered on the standards via participant observations (including 89 informal interviews), which is an appropriate method for analysing interactions and the meanings of material objects in everyday life (Denzin, 2009; Jorgensen, 2015). We conducted participant observations in two phases, in 2016 and 2017 (see Tables 1 and 2), to understand the

circulating standards, and how producers implemented and interacted with them to provide supermarkets with perfect pineapples. Equipped with personal in-depth experience in standards research in African agriculture and prior fieldwork in Ghana, we easily gained the necessary access required to accurately conduct participant observations (Denzin, 2009). During the first field phase (see Table 1), we collected information about the diversity of the producers and identified the key players and the different engagement points with the standards. This period of observations revealed that producers prioritise foreign standards differently and sometimes consider local standards that are rarely discussed in the literature. Following this observation, the second field phase (see Table 2) focused on the commonplace interactions with multiple standards from within large-scale pineapple plantations, as these companies consistently export perfect fruit. We also used this second phase to complete the database and to close empirical gaps, such as the practical handling of pineapples at the local markets and at the port. All participant observations were conducted overtly, as we disclosed our research intentions *a priori*. By the end of the fieldwork, we had visited the five most important pineapple plantations and the two Fairtrade certified cooperatives involved in export activities. Since all of these producers adhere to GlobalGAP and Fairtrade standards, our data represents the entire certified fresh whole pineapple export industry in Ghana.

During both field investigations, we closely observed the daily activities of individuals involved in the production and export of pineapples, watching for standard-related practices. Taking the role of 'an outsider, an investigator, [that is] nominally present to observe what people are doing in some setting or situation' (Jorgensen, 2015, p. 9), we observed the ordinary activities of a broad range of organisation members (e.g. individual farmers, members of cooperatives or industry associations, plantation owners, managers and workers of pineapple companies) who deal with the standards at different sites (e.g. cultivated land areas, administration offices, packhouses, processing factories). We reinforced our observations with informal interviews that took the form of 'casual conversations among acquaintances', captured in extensive field notes (DeWalt & DeWalt, 2011, p. 137). The conversations revolved around questions, such as: 'What are the standards that are followed?'; 'How and why are they implemented?'; 'What are the benefits and challenges that emerge by implementing the standards?' This approach prevented 'artificial' responses made for the satisfaction of the interviewer or imagined customers and auditors. We obtained responses that allowed us 'to learn a lot about what "actually happens"' (Watson, 2011, p. 204) when standards are in action. We complemented written data with visual data (e.g. photographs, short films, advertising posters, or labels) to better document our findings.

Data analysis

We began with inductive, descriptive coding of the empirical material, which is appropriate for summarising segments of field notes, to 'provide an inventory of topics for indexing' (Miles et al., 2020, p. 65). These codes mainly referred to the organisations and humans involved in pineapple production, and their everyday practices and struggles. In a second cycle, we incorporated selective photos in field notes and indexed our codes and data (Ritchie, Lewis, McNaughton Nicholls, & Ormston, 2014). The latter show organisational actors (e.g. plantations, smallholders) and their members' points of engagement with the standards (e.g. organising supply and export, harvesting, packing) referred to in the 208 pages of edited field notes. Thereby we have also integrated indices that refer to the standards. Lampland and Star (2009) warned that standards are easily overlooked and taken for granted, even by social scientists. There is a bias in ethical standards research that tends to elevate them over standards and measures for physical food qualities. To correct for this bias, and accurately capture what food producers translate from multiple standards, we adopted the typology proposed by Busch (2011) as the basis of our index.

Table 1. Participant observations in the Ghanaian pineapple industry (part 1).

Day	Places visited	Informal interviews with*	Date	Observations (1)** / Topics of informal interviews (2)***
1	Export organisation, drying factory	Sustainability manager, sourcing manager, member of cooperative	17 May 16	1. Organising supply, quality checking 2. Circulating standards, challenges & benefits, circumstances
2	Plantation, export organisation	General manager, farm manager, 2 export managers, 2 extension officers, member of cooperative	18 May 16	1. Organising supply, quality checking 2. Relations with buyers, circulating standards, challenges & benefits, producers, circumstances
3	Two plantations, packhouse, export organisation	General manager, sustainability manager, sourcing manager, 2 export managers, extension officer, certification officer, 3 workers	19 May 16	1. Organising export, harvesting, packing 2. Relations with buyers, challenges & benefits, producers, circumstances
4	Plantation, individual farm	Farm manager, individual farmer	20 May 16	1. Organising supply, quality checking, cultivating 2. Challenges & benefits, producers, circumstances
5	Export organisation, drying factory, local market	2 workers, 2 salespersons	21 May 16	1. Organising supply, organising export, local selling 2. Circulating standards, producers, pineapple pathways, circumstances
6	Export organisation, drying factory	3 workers, 2 individual farmers	22 May 16	1. Organising supply, quality checking 2. Pineapple pathways, circumstances
7	Cooperative, export organisation	6 members of cooperative, certification officer	23 May 16	1. Organising supply, organising export, quality checking, cultivating 2. Relations with buyers, circulating standards, challenges & benefits, producers, pineapple pathways, circumstances
8	Two plantations, export organisation, drying factory	2 export managers, certification officer, 2 individual farmers, member of cooperative	24 May 16	1. Organising supply, organising export, quality checking 2. Circulating standards, pineapple pathways, challenges & benefits, circumstances
9	Plantation, cooperative, export organisation	General manager, farm manger, sourcing manager, 2 members of cooperative	25 May 16	1. Organising supply, quality checking, planting, cultivating 2. Challenges & benefits, producers, circumstances
10	Drying factory	General manager, sustainability manager, 2 workers	26 May 16	1. Manufacturing 2. Relations with buyers, circulating standards, challenges & benefits, pineapple pathways, circumstances
11	Export organisation, drying factory	Sourcing manager, export manager, 2 workers	27 May 16	1. Organising supply, organising export, manufacturing 2. Relations with buyers, circulating standards, pineapple pathways, circumstances

*The titles listed are self-descriptions.
**Observations took place at the locations visited and focused on different points of engagement with standards: 1. organising supply, 2. organising export, 3. quality checking, 4. planting, 5. cultivating (incl. weeding, spraying, forcing, etc.), 6. harvesting, 7. packing, 8. manufacturing, 9. local selling.
***Informal interviews were conducted at the places visited and took place with the individuals listed. The topics covered: 1. relations with buyers, 2. circulating standards (variety of standards in the pineapple industry), 3. challenges & benefits (of the various standards), 4. producers (variety of producers in the pineapple industry), 5. pineapple pathways (fresh export, local market, drying, etc.), 6. circumstances (climate change, fierce competition by Costa Rican pineapple plantations, reputation of agriculture, etc.).

Table 2. Participant observations in the Ghanaian pineapple industry (part 2).

Day	Places visited	Informal interviews with*	Date	Observations (1)** / Topics of informal interviews (2)***
1	Plantation, packhouse	General manager, export manager, production manager	13 Mar 17	1. Organising supply, planting, cultivating, packing 2. Relations with buyers, circulating standards, challenges & benefits, producers, pineapple pathways, circumstances
2	Plantation	Plantation owner, general manager, quality control manager, production manager, 2 workers	14 Mar 17	1. Quality checking, cultivating 2. Circulating standards, producers, pineapple pathways, circumstances
3	Plantation	Plantation owner, export manager, certification officer	15 Mar 17	1. Organising supply, quality checking, cultivating 2. Relations with buyers, circulating standards, challenges & benefits, pineapple pathways
4	Packhouse	Plantation owner, packing supervisor, certification officer	16 Mar 17	1. Packing 2. Circulating standards, challenges & benefits, pineapple pathways, circumstances
5	Plantation	General manager, harvesting supervisor, 2 workers	17 Mar 17	1. Organising supply, harvesting 2. Relations with buyers, circulating standards, challenges & benefits, circumstances
6	Supermarkets, local markets	Salespersons	18 Mar 17	1. Local selling 2. Circulating standards, circumstances
7	Headquarters Ghana Agriculture Workers Union (GAWU)	Chief executive officer GAWU, programmes officer GAWU, Women's Project Coordinator International Union of Food (. . .) (IUF)	20 Mar 17	1. – 2. Circulating standards, challenges & benefits, producers, pineapple pathways, circumstances
8	Headquarters Sea Pineapple Export Ghana (SPEG)	General manager, technical officer	21 Mar 17	1. Organising export 2. Circulating standards, challenges & benefits, producers, pineapple pathways, circumstances
9	Port	Principal public affairs and marketing officer	22 Mar 17	1. Organising export 2. Circulating standards, circumstances
10	Plantation	General manager, corporate affairs and marketing officer	23 Mar 17	1. – 2. Relations with buyers, circulating standards, challenges & benefits, producers, pineapple pathways, circumstances

*The titles listed are self-descriptions.
**Observations took place at the locations visited and focused on different points of engagements with standards: 1. organising supply, 2. organising export, 3. quality checking, 4. planting, 5. cultivating (incl. weeding, spraying, forcing, etc.), 6. harvesting, 7. packing, 8. manufacturing, 9. local selling.
***Informal interviews were conducted at the places visited and took place with the individuals listed. The topics covered: 1. relations with buyers, 2. circulating standards (variety of standards in the pineapple industry), 3. challenges & benefits (of the various standards), 4. producers (variety of producers in the pineapple industry), 5. pineapple pathways (fresh export, local market, drying, etc.), 6. circumstances (climate change, fierce competition by Costa Rican pineapple plantations, reputation of agriculture, etc.).

Busch (2011) suggests differentiating between four types of standards that are applicable to humans and non-humans. The first type – *olympics* – are concerned with selecting a winner, either in a positive (e.g. quality award for the best chocolate) or in a negative way (e.g. a shaming 'prize' for the unhealthiest nuts, based on cholesterol level). While olympics can be important in some agri-food systems, they play no role in our empirical study. *Filters* demand and highlight specific qualities of products and their producers, whether it is being organic, GMO-free or fairly traded. They operate in a radical either-or mode, as they immediately eliminate those that do not meet the requirement. In contrast, *ranks* put products or actors 'in some sort of (usually) linear hierarchical order' (Busch, 2011, p. 45). For food, the grading of physical qualities like moisture, size or colour constitutes an omnipresent form of ranking. They arrange products into different categories, for example, eggs that are ranked from jumbo to peewee sizes. But there are also more sophisticated ranks to be found in the food arena, e.g. the prestigious rankings about coffee roasters or wineries. *Divisions* separate product characteristics without ranking them *a priori*. Country origins or food varieties (e.g. Granny Smith, Fuji, or Pink Lady apples) assume this task by considering the whole varietal spectrum, although old varieties can fall into oblivion while rare or new ones can go unnoticed. Used together, these different standards define the goodness of food and allow us to capture the full multiplicity of standards that producers encounter in their daily practices.

Having specified the circulating standards already present in the Ghanaian pineapple industry, we then searched our data for the mediating variables (Miles et al., 2020, p. 241) of translation, leading to the perfect fruit. We identified these in the collective work that is not always standardised into work protocols, but rather in routinised workarounds. We obtained insights progressively, as the analysis was structured as a continuous movement between emerging theoretical conceptualisations of reality, and empirical observations (Denzin, 2009). Through this iterative analytical process, the metaphor of nesting emerged inductively as a means of capturing the network constructed among the multiple standards for the perfect fruit. To corroborate our findings and to compensate for a potential observer bias, we triangulated our work with extensive secondary literature on the Ghanaian pineapple industry (Flick, 2018).

Findings

In this section, we introduce and explain how multiple, potentially competing standards are translated by producers. First, we present the problem definitions for the multiple standards in action in the Ghanaian pineapple industry. Second, we detail how producers interest and enrol human and non-human actors to form a new network around multiple standards, leading to the perfect pineapple. We use our empirical data to describe this as a nesting process.

Problematising multiple standards in pineapple production

As explained in the introduction, producers need to deal with multiple standards on a daily basis. This becomes a problem as each standard contains priorities that should be standardised (e.g. processes, products, performances) to produce specific qualities (e.g. fairness, food safety, sugar content). We classify them as ranks, divisions and filters[2] (see Table 3) and explain the problems that they create for producers in the Ghanaian pineapple sector. To date, the literature claims that the presence of these different standards creates confusion and often reduces the agency of producers (Coslovsky, 2014; Freidberg, 2004; Ponte & Gibbon, 2005). Instead, we show that producers problematise multiple standards in a proactive way, to initiate the translation process.

Rank standards. Ghanaian pineapples which are destined for export are regal fruits: golden, well-formed, spotless and topped with a stunning crown that makes up one third of the fruit. The ranks

Table 3. Standards in the Ghanaian fresh whole pineapple industry and their origins.

	Olympics*	Ranks	Divisions	Filters
Detected standards in the field	none	Colour, size, outer beauty, degrees Brix (sugar content)	Pineapple varieties (MD-2, Smooth Cayenne, Queen Victory and Sugarloaf)	GlobalGAP, Fairtrade, rarely Organic
Origins of detected standards	none	Specific ranks are requested by the buyers – ranks stem from the 15th/16th century, when pineapples were discovered and were a symbol of luxury and wealth	Specific divisions are requested by the buyers. Their preferences have shifted from Smooth Cayenne to MD-2 (developed by DelMonte in Costa Rica in the mid-2000s)	Filters are requested by the buyers who requested GlobalGAP standards from the 2000s and introduced Fairtrade in 2001

Sources: information compiled from observations, informal interviews, documents and secondary literature.
*Olympics, ranks, divisions and filters are different types of standards (Busch, 2000).

that guarantee this perfect outward appearance (e.g. colour, size and physical appearance) originated in the times of kings and world explorers. The inner quality of the pineapple is specified by the Brix rank. This rank rates the sugar content (the higher the Brix rank, the sweeter the fruit) and determines the appropriate time to export. Supplying sweet pineapples is challenging, because pineapples do not ripen post-harvest. If harvested too early, pineapples lack flavour and are too acidic; if they are harvested too late, they become too vulnerable to shock and bruising during transportation. In Ghana, the commercial, profit-driven fresh pineapple export sector took root in the 1980s, thanks to investments by local entrepreneurs with international financing. Before this, small-scale pineapple production existed for a government-owned processing firm that canned pineapple juice (FAO, 2013). Pineapple exports grew rapidly, and the golden fruit became Ghana's first horticulture export product (Danielou & Ravry, 2005). The Ghanaian industry boomed in the 1990s and early 2000s thanks to the development of a fast delivery system of air- and sea-freighted pineapples (FAO, 2013). In the mid-2000s, Costa Rica displaced Ghana as the dominant pineapple producer (Vagneron, Faure, & Loeillet, 2009; Whitfield, 2016). In 2015, Costa Rica exported 735 000 tons of pineapples to Europe (CBI, 2019), whereas Ghana only sold 43 000 tons overseas (see Figure 1).

Division standards. In current Ghanaian fields we find the following divisions: the bottle-shaped Sugarloaf (the so-called local variety, which is seldom exported because of its green colour and white flesh), the small-sized Queen Victoria, the Smooth Cayenne, and its hybrid MD-2 (CBI, 2019). Theoretically, divisions do not rank; rather, they place pineapples into different categories. However, customers can apply divisions in a hierarchical order and thus create preferences for some divisions over others. We saw this with Ghanaian pineapples. During the golden age of Ghanaian pineapple production (1990-2004), farmers exported the Smooth Cayenne with growing prosperity, but, in the mid-2000s, the transnational company Del Monte, with operations in Costa Rica, introduced the MD-2 variety to the market and disrupted the global pineapple business (Vagneron et al., 2009). Del Monte's aggressive marketing campaigns for MD-2 (promoting improved shelf-life and inner and outer qualities), convinced retailers of the MD-2's superiority, causing the floor to drop on prices for the Smooth Cayenne (Fold & Gough, 2008). Ghanaian producers were unable to promote their Smooth Cayenne variety, and likewise, many of them failed to make the investments needed to cultivate the MD-2 variety (Whitfield, 2012, 2016). Consequently, the Ghanaian industry fell into a crisis with steadily decreasing export numbers (see Figure 1).

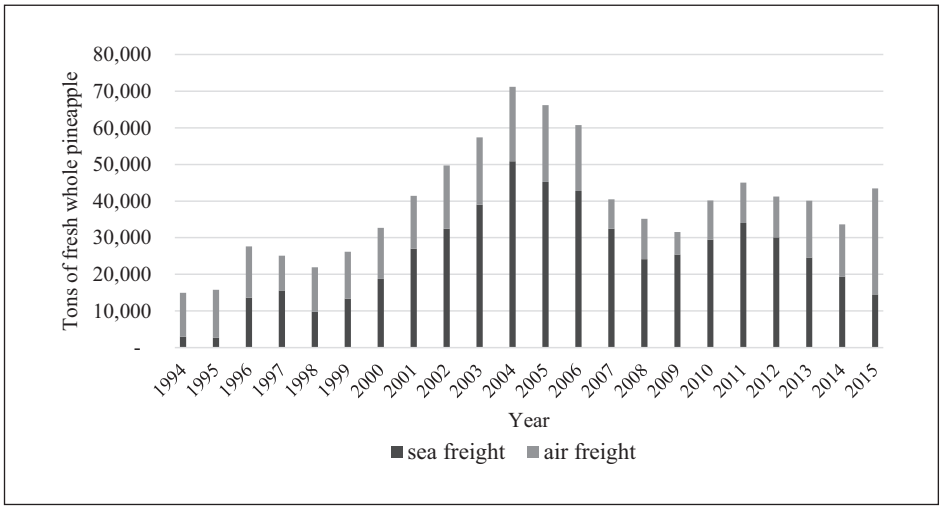

Figure 1. Export trend of Ghanaian fresh whole pineapples (sea freight and air freight)
Source: SPEG (Sea-freight Pineapple Exporters of Ghana), data obtained 21 March 2017.

Smallholders were severely affected by the crisis (Fold & Gough, 2008), and only a handful of plantations survived (Whitfield, 2016) – a mere sliver of the 50 exporters operating at the industry's peak (FAO, 2013).

Filter standards. Filters ensure the supply of ethical pineapples. From 2000, Northern supermarkets required Ghanaian producers to adopt the GlobalG.A.P. standard (Baah Annor, 2018; Whitfield, 2012). This process standard filters for food safety and good agricultural practices and is a precondition for selling to European supermarkets (CBI, 2019). Fairtrade, which filters for ethical production and fair-trading conditions, is not a mandatory standard for the export business. Nevertheless, the standard has been positively received by Ghanaian pineapple producers. In 2001, the first plantation adopted the Fairtrade standard and with it captured new export markets. A long-term European buyer of Ghanaian pineapples recounted:

> The supermarket already had a supplier [. . .] and we needed a rationale, an added value to become added [in their assortment]. And then they [the supermarket chain] told us that they can do something for us [buying our Ghanaian pineapples], if we are Fairtrade certified. And this was the way we entered [this new market]. (interview 15 Feb 2016)

In line with such positive effects on the markets, other pineapple plantations also adopted the Fairtrade standard, and policymakers saw the standard as a way to find beneficial niche markets (FAO, 2013). Today, all Ghanaian pineapple plantations can label their fruit as Fairtrade, but demand for Fairtrade pineapples has dropped sharply as in 2010 many British retailers ceased to buy Fairtrade certified products.

In summary, different types of standards have accumulated over time, and while the focus has shifted from physical qualities to the practices of production and trade, the new ethical standards have *not* replaced the previous standards that defined material and organoleptic qualities. On the contrary, the new standards were added and only served to multiply the standardised expectations for the perfect pineapple. Dealing with this multiplicity is the core problem that initiates translation (*problematisation*).

Nesting multiple standards: a clarification of interessement and enrolment through nesting

Producers, as rule-takers, are constantly challenged to integrate the accumulating standards into their daily production routines. We have proposed the metaphor of *nesting*, as a way to understand how producers translate multiple standards to a network of human and non-human actors. We use this metaphor of nesting to depict a way of thinking about how producers translate multiple standards into a network of human and non-human actors. The spokesperson of this network is the perfect pineapple (*mobilisation*). These networks are locally contingent because each organisation must develop intra-organisational collective practices (Shove, Pantzar, & Watson, 2012). We call these practices prioritising standards, enrolling additives and creating residues, and in the following sub-sections we present our empirical findings to illustrate them. We begin with prioritising standards, which first occur in offices and then in the fields and packhouses. We then explain how enrolling additives and creating residues occurs after prioritisation but feeds back into the prioritisation practices. These three practices are ways to interest and enrol human and non-human actors into the network (*interessement* and *enrolment*), and are specific to dealing with multiple standards *(problematisation)*. We conclude with a third, summarising sub-section that highlights nesting as an iterative process that can circulate standards back into the spaces where they are set.

Nesting by prioritising standards. *Prioritising standards* refers to the practice whereby producers take multiple, non-hierarchical standards and introduce a hierarchical order, based on their localised priorities. For example, producers can give higher priorities to specific divisions (e.g. MD-2), while considering a rank (e.g. size) to be a lower priority. Prioritisation occurs in the producers' offices, where the organisational leadership, consisting of the owners, managers and certification officers, make strategic decisions and take actions regarding the standards. The appointment of certification officers is part of the solution to the multiple standards problem, as this establishes dependency between the organisations and the standards. Since filters such as GlobalGAP and Fairtrade call for specified organisational and agricultural practices and significant documentation, plantations hire well-educated workers as certification officers. Their tasks include the 'paperwork' and the enforcement of the standards among the workers. As a certification officer described:

> Workers need a lot of training to meet the standards. But once they are trained, it becomes easier. But the company and the manager always need to be alert so that the standards are met. [. . .]. Because the company does not want to lose the certifications, you need to do many trainings with the workers. [. . .]. I do all the training. I collect all the documents and tell all the departments which documents are needed. (field notes 19 May 2016)

Certification officers thus take on important intra-organisational control work to pass through the filters, but the prioritisation of the multiple standards begins earlier, as the upper management decides the importance of the individual standards. For example, because of the crisis in the sector, plantation managers have generally decided to switch to the cultivation of pineapples that meet the MD-2 division (Ouma, 2015) and all plantations implement GlobalGAP, as it is *de facto* mandatory for export (Baah Annor, 2018). In this context, GlobalGAP makes the implementation of a further filtering standard easy. For this reason, the plantations adopted the Fairtrade standard that promised better prices and trading conditions. The general manager of the association Sea-freight Pineapple Exporters of Ghana (SPEG), explained:

> The implementation of the Fairtrade standard was not a big challenge for the farms, because of the GlobalGAP standard a lot had already been done and prepared. It [the implementation of Fairtrade] did not demand too much. (field notes 21 Mar 2017)

The above quote demonstrates that producers consider the interactions between standards when translating them into practice. In this vein, Kleemann and co-authors (2014) explained that pineapple producers no longer needed to follow GlobalGAP if they implemented the Organic standard, as the latter can replace the former. From the producers' perspective, filters tend to be complementary rather than competitive, as they are among the standard-setters (Fouilleux & Loconto, 2017; Reinecke et al., 2012). Our multi-sited field work, however, shows that producers combine the filters with other standards in unique ways – thus 'locking in' other human and non-human actors.

Plantations prioritise standards differently. The most ambitious prioritisation is decided by a plantation that simultaneously operates as a locally based intermediary, that buys and exports pineapples from neighbouring plantations. It follows all circulating filters (Fairtrade, Organic, GlobalGAP), favours the most difficult division for production (MD-2) without ignoring the other divisions, and targets ambitious ranks (e.g. big sizes, bright yellow colour). Another plantation, which claims to produce the tastiest pineapples in Ghana, prioritises standards in a different way. Together with the management, the owner decided to stop translating the Fairtrade standard into future work practices, as new trade relations with Lebanese customers were on the horizon. While their prices are lower, the Lebanese customers are ready to buy greenish, small or slightly deformed pineapples that are not desired by the Fairtrade customers. Another plantation has already decided to exclude the Fairtrade standard and has set in motion the decertification process. According to its managers, the effort needed to meet the certification requirements of the Fairtrade standard were not worth it. Instead, revitalising an almost forgotten division (Sugarloaf) is thought to more easily translate into their production and marketing practices. These differences in prioritising foreign standards is consequential for the continuation of the translation process, but producers continue to enrol more standards.

Producers engage with standards other than those stemming from international markets for fresh whole pineapple. It is important to understand that despite the dominance of global value chains in the discourses around tropical commodities (Ouma, 2010), in order to make standards work in action, the producers also rely upon local markets which have different standards. The standards set by local buyers that produce pineapple juice, fresh cut, or dried pineapples, are different from the export standards, as the former primarily define a minimum Brix level, claim GlobalGAP, and select only some divisions (see Table 4). Hence, the standards from local buyers that process pineapples are obviously less demanding. They are easily met when export is the priority, and the production managers and workers rarely prioritise them in everyday work. Nevertheless, producers must decide whether to engage with the low standards from local buyers, because compliance means a change in practices. Two examples demonstrate that not all plantation managers are willing to enrol them.

All Ghanaian pineapple plantations are free zone companies, meaning they are tax exempt for all imports for production and for exports from duty-free zones. For this reason, one plantation only considers the standards from local buyers that belong to the free zone and resists the standards from the juice factories. The manager explains: 'We avoid working with local processing factories. We try to keep the fruits in the free zone because the effort and costs [to sell locally] are far too big' (field notes 23 Mar 2017). In contrast, another plantation prioritises differently and engages with the standards from the local juice makers by requiring packhouse workers to engage in specific sorting activities. The prioritisation of (local and international) standards that is done in the offices of managers and owners determines the set of standards that are implemented.

Prioritisation thus initiates the nesting process, but it is then constantly adjusted. It helps us to understand why producers decide which standards to follow and which ones to resist (Timmermans & Epstein, 2010). However, actually resisting the power of a standard can be difficult, because the organisations that set and enforce standards have made their adoption mandatory (Brunsson, 2000; Murphy & Yates, 2009), and an obligatory passage point for selling food (Coslovsky, 2014; Freidberg, 2004; Henson & Humphrey, 2010). Evidenced as all pineapple producers place a high priority on the GlobalGAP filter and the MD2 division, as these are considered prerequisites for

exporting fresh whole pineapple overseas. Yet, some producers are reconsidering their current prioritisations of divisions to enrol unimportant filters (Organic) or resist others (Fairtrade). We know that producers give low priority or even resist foreign standards if domestic regulations develop (Bartley, 2014; Wijaya & Glasbergen, 2016) or local markets emerge (Schleifer, 2015). Our data also suggests that producers consider the interactions between relevant standards when deciding which standards to follow and which to resist. This prioritisation requires actions by the producers so that all standards are met, and this is where we notice the work of additives and residues.

Nesting by enrolling additives and creating residues. *Enrolling additives* is part of the nesting process, where humans and non-humans are allocated essential roles by the producer in order to achieve their priorities. The term additive refers to the additional human and non-human actors who are brought in to buttress the interactions between multiple conflicting standards. *Creating residues* refers to how producers render actors invisible in their practices if they are considered irrelevant or worthless by a given standard. We explore how these two activities – enrolling additives and creating residues – complete the nesting process, and feed back into the prioritisation of multiple standards. We explain these activities through the work of employees, supervisors and managers, in three successive stages of pineapple production: planting, harvesting and packing.

Planting: At this initial stage, workers plant suckers of specific varieties, aligned to prioritised divisions made by the farm managers: mostly the MD-2, and seldom the Smooth Cayenne or Queen Victoria, and hardly ever the bottle-shaped greenish Sugarloaf.[3] Diversity is thus reduced from the outset, and certain divisions are not even considered in the planting if the export market is the objective. When planting, the producers seek to anticipate the buyers' demands by following the forecasts based on experiences. For example, knowing that it takes about 9 months for a pineapple to grow and that the fruits can be harvested 20 weeks after forcing the plant to bloom, workers schedule the planting and forcing in time for a December harvest, when Northern consumers desire pineapples for Christmas dinner (field notes 15 March 2019).

Despite the careful planning of the planting process, the harvests may not perfectly match with the buyers' prioritised standards. This means that the export managers must reprioritise the standards that they are following, in order to also source from smallholders (Suzuki et al., 2011). In line with this, the export manager of the plantation intermediary explains: 'I only work with the [smallholder] cooperatives when I have too few pineapples or need special varieties for export' (field notes 19 May 2016). The latter is particularly urgent, as the plantations have almost completely switched their production to MD-2 and often fail to meet the rare customer demands for Smooth Cayenne, Sugarloaf or Queen Victoria. Since the plantation intermediary gives high priority to the Fairtrade standard, selling about 40% in Fairtrade quality, the pineapples sourced from smallholders must often also meet this standard. However, Ghanaian smallholders lack the skills and resources to meet the Fairtrade standard (Ouma, 2015; Whitfield, 2012), which is why sourcing Fairtrade pineapple from smallholders remains a challenge. To overcome this, the intermediary plantation helps two nearby cooperatives to meet the Fairtrade standard. In practice, this means the certification officer of the plantation intermediary takes over some of the cooperatives' standards work:

> The farmers, [. . .] they are often illiterate; they cannot read. And for them, the documentation and keeping the records and getting the information is a serious problem. That is why we give them support. [. . .] these farmers have an e-mail address, but they usually do not check the mail regularly, as they do not have access to internet [. . .] I check e-mails [. . .], and we make pre-audits [. . .] to help them so that they do not get decertified. [. . .] If there are some non-conformities, we help them to solve the problems. We give the cooperatives support in Fairtrade certification when we have Fairtrade orders; if not, it would not be necessary to support them in getting and maintaining the certification. (field notes 23 May 2016)

Table 4. Standards from local buyers that process pineapples.

	Pineapple juice	Fresh cut pineapple	Dried pineapples
Ranks*	Minimum Brix (sugar content): greater than 13	Minimum Brix: greater than 13	Minimum Brix: greater than 13
	Colour is not specified	Colour is not specified	Colour is not specified
	Size is not specified	Small sizes are allowed	Minimum size: greater than 0.5 kg
	Physical defects allowed and crown is not relevant	Minor physical defects allowed, and crown is not relevant	Minor physical defects allowed, and crown is not relevant
Filters	GlobalGAP is not required	GlobalGAP	GlobalGAP
	Fairtrade status is not required	Fairtrade status is mostly not required	Fairtrade status is mostly not required
Divisions	Primarily Smooth Cayenne and to a lesser extent MD-2, Queen Victoria and Sugarloaf	Smooth Cayenne and to a lesser extent MD-2 and Sugarloaf	Smooth Cayenne and MD-2 requested equally (current experimentation with Sugarloaf)

Sources: information compiled from observations, informal interviews, documents and secondary literature.
*Ranks, filters and divisions are different types of standards (Busch, 2000). In the field, ranks are specified according to varieties and are dependent on individual customer requirements. In certain cases, they can differ from the specifications given here.

The quote clearly explains that the support given to the cooperatives is not an act of goodwill; it is a means to enrol smallholder cooperatives into the plantation networks, so that they can be properly represented by the perfect fruit.

Harvesting: Production managers regularly check the size and colour of the pineapples, and their sugar content using a refractometer (Brix level), in order to determine the optimum time for harvesting. Despite enrolling these non-human actors into the network, the simultaneous nesting of the ranks of colour and Brix remains difficult. An upper Brix limit is defined by the buyers to ensure a good shelf-life, and to avoid bruises and damage during transport. Consequently, the fruit cannot mature indefinitely. Nevertheless, foreign customers request uniformly yellow pineapples, without the knowledge that this appealing yellow colour naturally develops late and unevenly from the bottom to the top of the fruit. Nor do they know that while certain varieties will never become yellow, they have the desired sweetness. In order to fulfil these conflicting ranks, workers apply a chemical (ethephon) a few days before harvesting, so that 'the fruits ripen evenly, remain firm for two to three weeks after harvest, and attain the golden yellow colour that consumers desire' (OECD, 2006, p. 139). In a conversation about the so-called de-greening of pineapples, an experienced pineapple farmer noted sarcastically: 'If you want them yellow, we make them yellow' (field notes 24 May 2016). The spraying of ethephon is thus a new and additional non-human actor that is enrolled by the producers to buttress the local engagement with multiple standards.

Although ethephon simplifies the nesting of the conflicting ranks (colour and Brix), its enrolment does not ensure that all ranks are met. Sizes can be important too, as one export manager pointed out:

> Northern customers not only require a specific Brix [rank] but also certain sizes. The sizes cause big problems [. . .]. On a virgin field, they [the plantations] can produce the required sizes, but after some time, the pineapples do not grow very well, particularly when there is a lack of rain. (field notes 18 May 2016)

As there are always fruits in the field that do not satisfy all ranks, the workers have learned to pick the fruits selectively. On the tractor ride from one plot to the next, the supervisor instructs the

workers which size and colour are harvested next (field notes 17 Mar 2017). Due to the dominance of selective harvesting, a manager summarises that 'complete harvesting is rarely the case' (24 May 2016). Workers may not harvest pineapple plots with an insufficient Brix rank and they also leave the fruits that are too small. This selective harvesting practice is necessary to meet the multiple standards, as explained by a farm owner: 'We need to do these [Brix] checks on the field to serve the pineapples in the qualities the buyers want them. This is very, very important to prevent claims and rejections by the buyers' (field notes 16 Mar 2017). Nesting multiple standards for the sake of the perfect fruit thus requires the producers to construct local networks that enrol workers, managers and non-human actors, such as chemicals or fruits.

Packing: To stabilise and ensure the nesting of multiple standards in action, the plantations installed cooling systems to guarantee the freshness of their fruits, and built post-harvest facilities to provide the best packing environments for the graded fruits (Whitfield, 2012). In these facilities, commonly known as packhouses, we can observe the continuation of the nesting process. The harvested pineapples are washed and put on a running conveyor, where female workers pick the well-ranked pineapples and pack them into ready-made standard cardboard boxes. Each worker is responsible for packing one size only and it is typically 'the big ladies who take care of the big pineapples' (field notes 16 Mar 2017). Badly ranked fruits are considered deficient (e.g. too big/small/deformed, filled with insect holes, an unpleasant crown that is too small/big or duplicated) and are not exported overseas. The quantity of pineapples excluded from export throughout the entire production process is high. In a distressed manner, a general manager acknowledged: 'At our farm, currently only every second sucker planted will develop into a marketable fresh whole pineapple' (field notes 13 Mar 2017). Farm managers from other plantations (field notes 13 Mar 2017 and 23 Mar 2017) and the general manager of SPEG (field notes 21 Mar 2017) confirmed the levels of residual pineapples, explaining that they stemmed from unfavourable weather conditions, a lack of investment, and problems with the retention of well-trained workers.

Yet, we observed that some producers seek to fight the residues generated by international standards by prioritizing the local standards. In the packhouses, the upper management's decision to enrol local standards has manifested in more complex sorting practices. Here, the women packed the best pineapples into the standard cardboard boxes, the residual pineapples of a certain size into plastic crates for delivery to the factory that processes fresh cut fruit, and the smallest pineapples were left on the conveyor belt to fall onto the floor. Juice for the local market is made from this fruit. This everyday packing work seems so routine that it is easy to forget that the additional two destinations for pineapples are the result of a locally specified prioritisation of foreign and local standards.

Both activities – the enrolling of additives and creating residues – are pragmatic responses by the producers to the conflicting standards. These activities are considered to be specific types of a slippage, that refers to the work of human actors to generate the fictive realities that uphold the standards (Lampland & Star, 2009). Generally, slippages 'occur between the institutional template and the exigencies of daily life' (Barley, 1986, p. 80), and organisations are particularly susceptible to them (Babb, 2003). In our case, the slippages – the enrolling of additives and creating residues – were meant to facilitate the fulfilment of multiple standards. We found that pineapple producers construct fictive realities by enrolling ethephon as an additive to achieve the conflicting ranks (colour and degree Brix). One plantation intermediary upholds conflicting standards (rare divisions, such as Smooth Cayenne, and filter Fairtrade) by enrolling two cooperatives of certified small-scale farmers who have support, so that they maintain the Fairtrade certification. Since additives are not intended by the standards-setters, the producers keep them hidden in their production space. The residues also remain hidden and become constitutive elements of the local network that producers construct around multiple standards. The creation of residues

empirically demonstrates the key theoretical insights of the STS scholars who argue that standards put into action render certain aspects visible, while making others invisible (Bowker & Star, 1999; Lampland & Star, 2009; Loconto, 2014b). The multiple standards render the residues invisible for those outside the adoption space, but critically important in the case of the food standards deal with material products and the producers who make them (Bingen & Busch, 2006). Consequently, the residues are not only non-human products but also the human producers. We know that the imposition of industrial standards can discriminate against smallholders (Baah Annor, 2018; Freidberg, 2004; Mutersbaugh, 2005; Staricco & Ponte, 2015), and we find that the nesting can overburden the smallholder cooperatives, exacerbating existing inequalities in local spaces of adoption. The cooperatives lack the organisational, financial and human resources and the country-level institutions necessary to construct the standards infrastructure (cf. Loconto & Busch, 2010). This is why only two cooperatives export small volumes of Fairtrade certified pineapples – thanks to the enrolment of an additive.

Mobilising the perfect pineapple and nesting as an iterative process

The problematisation and nesting of the multiple standards that we have outlined in the previous sections, ensures the export of the perfect pineapple (*mobilisation*). For this perfect pineapple to be mobilised in global markets, it must properly represent the networks. Our data shows that this is achieved when nesting is an iterative process. Thus, nesting can push standards from the space of action back into spaces of standards-making.

Work done by employees, supervisors and managers in the field and in the packhouse feeds back into the initial prioritisation of standards. For example, upper management considers the residual pineapples that emerge during the nesting process when deciding which standards will be followed. While these residues are hidden from the buyers, the producers cannot distance themselves (Corvellec, 2018). For them, the fact that nesting standards means creating residues does not make financial or ethical sense (in terms of ecological and social justice). While producers enrol humans (e.g. smallholder cooperatives) or non-humans like chemicals (think of ethephon), refractometers or cooling systems to stabilise the networks around prioritised standards, they also adapt their priorities. That is why we found differences in the prioritisation of the standards we described at the beginning of the findings section. While some producers decide to lock in local standards to their networks, so that residues are reduced, others decide to engage with almost forgotten divisions (e.g. Sugarloaf), and others plan to no longer follow the Fairtrade filter standard. This reprioritisation has occurred because Fairtrade customers typically also desire medium sizes (1.5–1.8 kg), which are difficult to produce in depleted soils and under drought conditions that are typical in Ghana (field notes 24 May 2016). Since each growing season is different, the nesting of multiple standards in action is an ongoing, iterative process.

The enrolment of the chemical ethephon has not only ensured the implementation of conflicting standards at the production level but has led to the rise of new standards. When the European Commission passed a zero-tolerance directive for ethephon, the Ghanaian pineapple producers successfully campaigned against the ban and negotiated an exceptionally high maximum residue limit for ethephon (OECD, 2006). Nevertheless, over-application still occurs. In October 2017 an international newspaper reported on this activity in the neighbouring country Benin:

> In December, Benin's government banned exports of the fruit after repeated warnings from the European Union about pineapples treated with the pesticide ethephon. [. . .] Benin's authorities imposed a voluntary export ban while it got its house in order. [. . .] The country's food standards agency ABSSA [Agence beninoise de securité sanitaire des aliments] now carries out tests in the fields and at airports before shipping. (*Daily Mail*, 11 Oct 2017)

In other words, the continued overuse of ethephon has resulted in a new standard to govern this chemical, which was originally enlisted to help the producers meet existing, multiple standards. This example illustrates that the practical nesting of multiple standards in action can develop into a new object of standardisation, nourishing the proliferation of standards and the need for new translations.

The three practices of prioritisation, enrolling additives and creating residues are constitutive of the iterative nesting process that translates multiple standards into the perfect fruit (Figure 2). Nesting goes beyond a marketing strategy based on competition and segmentation (Varadarajan, 2010), because the prioritisation, additives and residues empower the producers to construct organisational practices that favour local relationships and practices, whereas marketing is only a source of revenue. For example, the relationships between plantations, smallholders and local buyers that process pineapples enable the producers to order their own specialised fields and processing techniques that are in line with their internal standards projects (e.g. large monoculture plantations, industrial style packing plants). Rather than being detached from producers' local realities, we argue that the nesting of multiple standards contributes to the producers' realisation of these local realities. Thus, while nesting remains purposively hidden in the spaces of adoption, rendering this nesting process visible can circulate standards back into spaces of standards in the making.

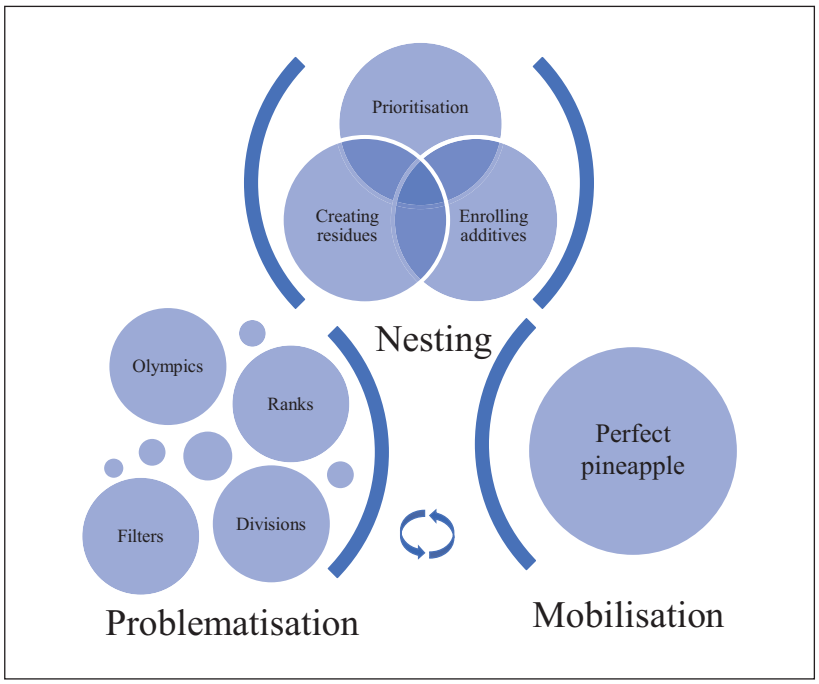

Figure 2. Local nesting in translating multiple standards. The three practices of prioritisation, enrolling additives and creating residues are constitutive of the iterative nesting process that translates multiple standards into the perfect fruit. It follows the problematisation of multiple standards (olympics, filters, ranks and divisions) and ensures the export of the perfect pineapple (mobilisation).
Source: authors' own.

Conclusion

A growing number of standards are involved in organising the production and exchange of food. While the literature highlights the prevalence and multiplicity of standards (e.g. Brunsson & Jacobsson, 2000a; Djelic & den Hond, 2013; Henson & Humphrey, 2010; Timmermans & Epstein, 2010), the literature on the adoption of standards typically examines individual standards (Haufler, 2018; Higgins & Larner, 2010; Loconto & Demortain, 2017; Tempel & Walgenbach, 2007). By distinguishing the multiplicity of standards according to Busch's (2011) typology, we shift analytical attention away from a saturated focus on individual standards, to how they interact with other standards in spaces of adoption. More specifically, by studying how producers translate multiple, potentially competing standards, this article fills a research gap about the agency of producers, who are often depicted simply as rule-takers, to make multiple standards work locally in order to serve perfect food globally.

We studied the translation of multiple standards in the Ghanaian pineapple industry and introduced the metaphor of nesting to explain how producers translate conflicting standards. As a metaphor, nesting is a theory derived from the reading of the everyday translations of standards into practice in the production spaces of the global food system. It captures the local work of producers that is needed to overcome the tensions between the generalised standards and local practices (Brunsson et al., 2012; Timmermans & Epstein, 2010). Specifically, we argue that the local work consists of intra-organisational practices (prioritising standards, enrolling additives, creating residues) that together ensure that many standards are implemented, even if they are contradictory. While nesting enables us to speak more broadly about what it means to implement multiple standards that materially embody consumer visions of perfection, it also contributes to the sociology of standards, the literature on standards adoption, and organisation studies.

First, we add a nuanced, yet realistic, understanding of nesting to the sociology of standards, which we used to direct our attention to the adoption spaces and the local practices therein (Busch, 2011; Higgins & Larner, 2010; Loconto & Demortain, 2017; Timmermans & Berg, 1997; Timmermans & Epstein, 2010). Within this theoretical strand Lampland and Star already used the term nesting to describe the interaction of standards, writing that standards are being nested, when 'they fit inside one another, somewhat like a set of Russian dolls (matiruska)' (Lampland & Star, 2009, p. 5). In contrast, our data shows that standards in everyday practices do not fit together like Russian dolls but require local efforts to maintain a nesting process. While at the beginning of the nesting, when the upper management prioritises standards, there may be a belief that standards are simply made to fit, it becomes clear during the production processes in the fields and packhouses that multiple standards force trade-offs. In these situations, producers invoke additives and create residues so that the standards can be enrolled into a network that materialises in the perfect fruit.

Second, the metaphor of nesting allows us to articulate the agency of food producers in the processes of standards adoption. Understanding how producers actively engage in a process that prioritises, adds and eliminates standards, humans, and non-humans demonstrates that producers are not passive adopters of standards – a perception that is fostered by studies that rightly highlight power imbalances between those who write and those who implement the standards (Coslovsky, 2014; Freidberg, 2004; Ponte & Gibbon, 2005). Rather our empirically derived description of nesting unravels the ways in which the producers accommodate multiple standards within their own strategies, and thereby regain their agency. This means that the construction and maintenance of local and organisation-specific nesting is a demonstration of producers' agency, which is not only restricted to resisting standards (Schleifer, 2015) or creating new competitive standards (Foley, 2017; Schouten & Bitzer, 2015). Instead, they demonstrate their agency and creativity directly in

rule implementation, by taking decisions on what and how to translate. The metaphor of nesting thus captures the producers' capacity to act independently (of standards), but it also tells us that the adoption of multiple standards is intense work, which can disadvantage those organisations that lack financial, organisational and human resources. These organisations, often smallholder cooperatives, not only need support for the implementation of individual standards, but must also learn how to best combine different standards through nesting.

Third, and most importantly, nesting introduces an analytical framework that enables organisation scholars to explore multiple standards in action in food systems, and beyond. It unpacks what it means to be organised so that multiple standards can be implemented. While organisation scholars have limited their focus on the multiplicity of standards to the identification of competing and conflicting relations (Djelic & den Hond, 2013; Reinecke et al., 2012; van den Ende, van de Kaa, den Uijl, & de Vries, 2012) or meta-standardisation (Djelic & den Hond, 2013; Fransen, 2015; Loconto & Fouilleux, 2014), the metaphor of nesting allows us to explain what it takes (i.e. a producer organisation) to implement these conflicting standards. Nesting thus extends the insight that standard implementation requires collective work (Distelhorst et al., 2015; Perez-Aleman, 2010), particularly in the context of multiple standards. In this article, we focused on food standards, but other sectors – green buildings, cosmetics, healthcare systems, energy – are likewise flooded by standards (Laurent & Mallard, 2020). We assume that nesting plays out differently in these sectors, since enrolling additives might be particularly problematic in the cosmetic industry, due to concerns over skin sensitivity, allergies, nanoparticle uncertainties, etc., while creating residues may be an important element for studying nesting standards for green buildings, where material standards, energy-saving standards, fire codes, carrying weights and aesthetics compete. Organisation scholars can therefore apply the metaphor of nesting in other empirical contexts. Therefore, they should care about residues and additives, as they are not intended by the standard-setters but can translate into undesired consequences for our environment, health and society.

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Notes

1. The 'producer' refers to producer organisations, as the organisation of producers into formal work structures is fundamental for achieving standards. Theories of global governance describe producers as typical rule-takers in situations of private governance, so we have used these terms interchangeably.

2. While olympics occur in the consumption arena, when, for example, self-proclaimed health experts evaluate pineapples as the second healthiest fruit, they remain absent in the production space.
3. A sucker is a shoot (new plantlet) that grows from the base of the plant.

References

Abbott, K. W., & Snidal, D. (2001). International 'standards' and international governance. *Journal of European Public Policy*, *8*, 345–370.

Addoah, T., & Sulemana, A.-R. (2016). *Securing decent work in tropical fruit export production. An analysis of working and living conditions in banana and pineapple plantations in Ghana*. Retrieved from http://www.bananalink.org.uk/sites/default/files/Ghana_research_report_2016_FINAL.pdf

Baah Annor, P. (2018). Smallholder farmers' compliance with GlobalGAP standard: The case of Ghana. *Emerald Emerging Markets Case Studies*, *8*, 1–21.

Babb, S. (2003). The IMF in sociological perspective: A tale of organisational slippage. *Studies in Comparative International Development*, *38*, 3–27.

Bain, C., Ransom, E., & Higgins, V. (2013). Private agri-food standards: Contestation, hybridity and the politics of standards. *International Journal of Sociology of Agriculture and Food*, *20*, 1–10.

Barley, S. R. (1986). Technology as an occasion for structuring: Evidence from observations of CT scanners and the social order of radiology departments. *Administrative Science Quarterly*, *31*, 78–108.

Bartley, T. (2011). Transnational governance as the layering of rules: Intersections of public and private standards. *Theoretical Inquiries in Law*, *12*, 517–542.

Bartley, T. (2014). Transnational governance and the re-centered state: Sustainability or legality? *Regulation & Governance*, *8*, 93–109.

Bingen, J., & Busch, L. (2006). *Agricultural standards: The shape of the global food and fiber system*. Dordrecht, NL: Springer.

Blowfield, M. (1999). Ethical trade: A review of developments and issues. *Third World Quarterly*, *20*, 753–770.

Boiral, O. (2007). Corporate greening through ISO 14001: A rational myth? *Organisation Science*, *18*, 127–146.

Bowker, G. C., & Star, S. L. (1999). *Sorting things out: Classification and its consequences*. Cambridge, MA: MIT Press.

Brunsson, N. (2000). Organisations, markets and standardisation. In N. Brunsson & B. Jacobsson (Eds.), *A world of standards* (pp. 21–49). Oxford: Oxford University Press.

Brunsson, N., & Jacobsson, B. (2000a). *A world of standards*. Oxford: Oxford University Press.

Brunsson, N., & Jacobsson, B. (2000b). Following standards. In N. Brunsson & B. Jacobsson (Eds.), *A world of standards* (pp. 125–137). Oxford: Oxford University Press.

Brunsson, N., Rasche, A., & Seidl, D. (2012). The dynamics of standardisation: Three perspectives on standards in organisation studies. *Organisation Studies*, *33*, 613–632.

Busch, L. (2000). The moral economy of grades and standards. *Journal of Rural Studies*, *16*, 273–283.

Busch, L. (2011). *Standards: Recipes for reality*. Cambridge, MA: MIT Press.

Callon, M. (1984). Some elements of a sociology of translation: Domestication of the scallops and the fishermen of St Brieuc Bay. *Sociological Review*, *32*, 196–233.

CBI (Centre for the Promotion of Imports). (2019). Exporting fresh pineapple from West Africa to Europe. Retrieved March 9, 2017, from Ministry of Foreign Affairs website: https://www.cbi.eu/market-information/fresh-fruit-vegetables/pineapple-west-africa/

Corvellec, H. (2018). Waste as scats: For an organisational engagement with waste. *Organisation*, *26*, 217–235.

Coslovsky, S. V. (2014). Economic development without prerequisites: How Bolivian producers met strict food safety standards and dominated the global Brazil-nut market. *World Development*, *54*, 32–45.

Danielou, M., & Ravry, C. (2005). *The rise of Ghana's pineapple industry. From successful takeoff to sustainable expansion* (No. 93). Washington, DC: World Bank.

Denzin, N. K. (2009). *The research act: A theoretical introduction to sociological methods*. New Brunswick, NJ: Aldine Transaction.

DeWalt, K. M., & DeWalt, B. R. (2011). *Participant observation: A guide for fieldworkers* (2nd edition). Lanham, MD: Altamira Press.

Distelhorst, G., Locke, R. M., Pal, T., & Samel, H. (2015). Production goes global, compliance stays local: Private regulation in the global electronics industry. *Regulation & Governance*, *9*, 224–242.

Djelic, M.-L., & den Hond, F. (2013). Introduction: Multiplicity and plurality in the world of standards. *Business and Politics*, *16*, 67–77.

FAO (Food and Agriculture Organization). (2013). *Analysis of trade impact on the fresh pineapple sector in Ghana* (No. 41). Retrieved June 15, 2018, from http://www.fao.org/3/a-ar708e.pdf

Flick, U. (2018). Triangulation. In N. K. Denzin (Ed.), *The Sage handbook of qualitative research* (5th edition, pp. 444–461). Los Angeles: SAGE Publications.

Fold, N., & Gough, K. V. (2008). From smallholders to transnationals: The impact of changing consumer preferences in the EU on Ghana's pineapple sector. *Geoforum*, *39*, 1687–1697.

Foley, P. (2017). The territorialisation of transnational sustainability governance: Production, power and globalisation in Iceland's fisheries. *Environmental Politics*, *26*, 915–937.

Fouilleux, E., & Loconto, A. (2017). Voluntary standards, certification, and accreditation in the global organic agriculture field: A tripartite model of techno-politics. *Agriculture and Human Values*, *34*, 1–14.

Fransen, L. (2015). The politics of meta-governance in transnational private sustainability governance. *Policy Sciences*, *48*, 293–317.

Freidberg, S. (2004). *French beans and food scares: Culture and commerce in an anxious age*. Oxford, New York: Oxford University Press.

Giuliani, E., Ciravegna, L., Vezzulli, A., & Kilian, B. (2017). Decoupling standards from practice: The impact of in-house certifications on coffee farms' environmental and social conduct. *World Development*, *96*, 294–314.

Haufler, V. (2018). Producing global governance in the global factory: Markets, politics, and regulation. *Global Policy*, *9*, 114–120.

Helin, S., & Babri, M. (2015). Travelling with a code of ethics: A contextual study of a Swedish MNC auditing a Chinese supplier. *Journal of Cleaner Production*, *107*, 41–53.

Henson, S., & Humphrey, J. (2010). Understanding the complexities of private standards in global agri-food chains as they impact developing countries. *Journal of Development Studies*, *46*, 1628–1646.

Higgins, V., & Larner, W. (2010). *Calculating the social: Standards and the reconfiguration of governing*. Basingstoke, UK: Palgrave Macmillan.

Jorgensen, D. L. (2015). Participant observation. In R. A. Scott & S. M. Kosslyn (Eds.), *Emerging trends in the social and behavioral sciences* (pp. 1–15). Hoboken, NJ: Wiley.

Kleemann, L., Abdulai, A., & Buss, M. (2014). Certification and access to export markets: Adoption and return on investment of organic-certified pineapple garming in Ghana. *World Development*, *64*, 79–92.

Lampland, M., & Star, S. L. (2009). *Standards and their stories: How quantifying, classifying, and formalising practices shape everyday life*. Ithaca, NY: Cornell University Press.

Lasztity, R. (Ed.). (2009). *Food quality and standards*. Oxford, UK: EOLSS.

Latour, B. (2005). *Reassembling the social: An introduction to actor-network-theory*. Oxford: Oxford University Press.

Laurent, B., & Mallard, A. (2020). *Labelling the economy: The politics of qualification in contemporary markets*. Basingstoke, UK: Palgrave Macmillan.

Law, J. (2008). On sociology and STS. *Sociological Review*, *56*, 623–649.

Locke, R. M., Rissing, B. A., & Pal, T. (2013). Complements or substitutes? Private codes, state regulation and the enforcement of labour standards in global supply chains. *British Journal of Industrial Relations*, *51*, 519–552.

Loconto, A. (2014a). Assembling governance: The role of standards in the Tanzanian tea industry. *Journal of Cleaner Production*, *107*, 64–73.

Loconto, A. (2014b). Sustaining an enterprise, enacting sustainabiliTea. *Science, Technology & Human Values*, *39*, 819–843.

Loconto, A., & Busch, L. (2010). Standards, techno-economic networks, and playing fields: Performing the global market economy. *Review of International Political Economy*, *17*, 507–536.

Loconto, A., & Demortain, D. (2017). Standardisation as spaces of diversity. *Engaging Science, Technology, and Society*, *3*, 382–392.

Loconto, A., & Fouilleux, E. (2014). Politics of private regulation: ISEAL and the shaping of transnational sustainability governance. *Regulation & Governance*, *8*, 166–185.

Malets, O. (2013). The translation of transnational voluntary standards into practices: Civil society and the forest stewardship council in Russia. *Journal of Civil Society*, *9*, 300–324.

Miles, M. B., Huberman, A. M., & Saldaña, J. (2020). *Qualitative data analysis: A methods sourcebook* (4th edition). Los Angeles: SAGE Publications.

Murphy, C., & Yates, J. (2009). *The International Organisation for Standardisation (ISO): Global governance through voluntary consensus*. London: Routledge.

Mutersbaugh, T. (2005). Fighting standards with standards: Harmonisation, rents, and social accountability in certified agrofood networks. *Environment and Planning A*, *37*, 2033–2051.

Nicolini, D., Mengis, J., & Swan, J. (2011). Understanding the role of objects in cross-disciplinary collaboration. *Organisation Science*, *23*, 612–629.

O'Connor, K. (2013). *Pineapple: A global history*. London: Reaktion.

OECD. (2006). *Limiting pesticide residues in pineapples* (pp. 131–143). Paris: OECD.

OECD (2020). *International standards for fruit and vegetables*. Retrieved February 21, 2020, from https://www.oecd-ilibrary.org/agriculture-and-food/international-standards-for-fruit-and-vegetables_19935668

Ouma, S. (2010). Global standards, local realities: Private agrifood governance and the restructuring of the Kenyan horticulture industry. *Economic Geography*, *86*, 197–222.

Ouma, S. (2015). *Assembling export markets: The making and unmaking of global food*. Oxford: John Wiley & Sons.

Perez-Aleman, P. (2010). Collective learning in global diffusion: Spreading quality standards in a developing country cluster. *Organisation Science*, *22*, 173–189.

Ponte, S., & Gibbon, P. (2005). Quality standards, conventions and the governance of global value chains. *Economy and Society*, *34*, 1–31.

Purvis, A. (2003, July 13). Lovely shape, no wrinkles, perfect skin. Fruit like this doesn't just grow on trees, you know. *The Observer*, pp. 169–171.

Reinecke, J., Manning, S., & von Hagen, O. (2012). The emergence of a standards market: Multiplicity of sustainability standards in the global coffee industry. *Organisation Studies*, *33*, 791–814.

Riisgaard, L. (2009). Global value chains, labour organisations and private social standards: Lessons from East African cut flower industries. *World Development*, *37*, 326–340.

Ritchie, J., Lewis, J., McNaughton Nicholls, C., & Ormston, R. (Eds.). (2014). *Qualitative research practice: a guide for social science students and researchers* (2nd edition). Los Angeles: SAGE Publications.

Sahlin, K., & Wedlin, L. (2008). Circulating ideas: Imitation, translation and editing. In R. Greenwood, C. Oliver, R. Suddaby, & K. Sahlin-Andersson (Eds.), *The Sage handbook of organisational institutionalism* (pp. 218–242). London: SAGE Publications.

Schleifer, P. (2015). Private governance undermined: India and the roundtable on sustainable palm oil. *Global Environmental Politics*, *16*, 38–58.

Schouten, G., & Bitzer, V. (2015). The emergence of Southern standards in agricultural value chains: A new trend in sustainability governance? *Ecological Economics*, *120*, 175–184.

Shove, E., Pantzar, M., & Watson, M. (2012). The dynamics of social practice: Everyday life and how it changes. London: SAGE Publications.

Silverman, D. (2013). *Doing qualitative research: A practical handbook*. London: SAGE Publications.

Staricco, J. I., & Ponte, S. (2015). Quality regimes in agro-food industries: A regulation theory reading of Fairtrade wine in Argentina. *Journal of Rural Studies*, *38*, 65–76.

Suzuki, A., Jarvis, L. S., & Sexton, R. J. (2011). Partial vertical integration, risk shifting, and product rejection in the high-value export supply chain: The Ghana pineapple sector. *World Development*, *39*, 1611–1623.

Tampe, M. (2018). Leveraging the vertical: The contested dynamics of sustainability standards and labour in global production networks. *British Journal of Industrial Relations*, *56*, 43–74.
Tempel, A., & Walgenbach, P. (2007). Global standardisation of organisational forms and management practices? What new institutionalism and the business-systems approach can learn from each other. *Journal of Management Studies*, *44*, 1–24.
Timmermans, S., & Berg, M. (1997). Standardisation in action: Achieving local universality through medical protocols. *Social Studies of Science*, *27*, 273–305.
Timmermans, S., & Epstein, S. (2010). A world of standards but not a standard world: Toward a sociology of standards and standardisation. *Annual Review of Sociology*, *36*, 69–89.
Vagneron, I., Faure, G., & Loeillet, D. (2009). Is there a pilot in the chain? Identifying the key drivers of change in the fresh pineapple sector. *Food Policy*, *34*, 437–446.
Van den Ende, J., van de Kaa, G., den Uijl, S., & de Vries, H. J. (2012). The paradox of standard flexibility: The effects of co-evolution between standard and interorganisational network. *Organisation Studies*, *33*, 705–736.
van der Grijp, N. M., Marsden, T., & Cavalcanti, J. S. B. (2005). European retailers as agents of change towards sustainability: The case of fruit production in Brazil. *Environmental Sciences*, *2*, 31–46.
Varadarajan, R. (2010). Strategic marketing and marketing strategy: domain, definition, fundamental issues and foundational premises. *Journal of the Academy of Marketing Science*, *38*, 119–140.
Watson, T. J. (2011). Ethnography, reality, and truth: The vital need for studies of 'how things work' in organisations and management. *Journal of Management Studies*, *48*, 202–217.
Whitfield, L. (2012). Developing technological capabilities in agro-industry: Ghana's experience with fresh pineapple exports. *Journal of Development Studies*, *48*, 308–321.
Whitfield, L. (2016). New paths to capitalist agricultural production in Africa: Experiences of Ghanaian pineapple producer–exporters. *Journal of Agrarian Change*, *17*, 535–556.
Wijaya, A., & Glasbergen, P. (2016). Toward a new scenario in agricultural sustainability certification? The response of the Indonesian national government to private certification. *Journal of Environment & Development*, *25*, 219–246.
Wijen, F. (2014). Means versus ends in opaque institutional fields: Trading off compliance and achievement in sustainability standard adoption. *Academy of Management Review*, *39*, 302–323.

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