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CONSTRUCTING CREDIBILITY: USING TECHNOSCIENCE TO LEGITIMATE STRATEGIES IN AGRIFOOD GOVERNANCE*

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ABSTRACT

Agrifood scholars working within a political economy framework increasingly draw upon the concept of governance to analyze the regulation of global agricultural and food systems. An important limitation of this approach is that it fails to explain how governance strategies are legitimated. Drawing on three diverse cases that span three continents, our paper examines how standards makers appeal to technoscientific norms and values to establish both credibility for their standards and their authority in constructing them. These cases explore the development and implementation of a standard requiring complete elimination of a tart cherry insect pest in the United States; the process of establishing and maintaining red meat hygiene standards in the processing and retail sectors of South Africa; and the role of GLOBALGAP standards for pesticide residues in protecting worker health and safety in the Chilean fresh fruit export sector. These cases illustrate how appeals to technoscience mask controversy and vested interests and allow actors to exclude, conceal, and mystify possible alternatives; and they demonstrate the value that science and technology studies can bring to bear in understanding agrifood governance.

With the extension of global trade and deepening of neoliberal economic policies, agrifood scholars increasingly draw upon the concept of governance for analyzing how food and agricultural (agrifood) systems are regulated (Gibbon and Ponte 2008). In contrast to a distinct government (legislative, executive, judicial) approach to regulation, governance includes all of the formal and informal interactions between actors within a particular society and across societies who are

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engaged in the activity of coordinating and regulating sectors of the economy (Higgins and Lawrence 2005). While governance is frequently contrasted with the idea of government, and used as a "euphemism for private power" (Peine and McMichael 2005:19), the line between governance and government can be overstated. New forms of governance do not represent the demise of state authority, but the blurring of regulatory boundaries between the state, market, and civil society (Higgins and Lawrence 2005; Peine and McMichael 2005; Smith and Mahutga 2008).

From a sociological perspective, governance is an important area of inquiry because of its role in shaping relationships of power and inequality. Particular governance structures and practices produce divisions of labor within the agrifood system, contributing to the uneven allocation of financial, material, and human resources, as well as costs and rewards (Ponte and Gibbon 2005; also, see Gereffi, Korzeniewicz, and Korzeniewicz 1994). Consequently, the concept of governance is useful for understanding how actors, institutions, and organizations within agrifood systems use their power and authority to shape this division of labor.

A key contribution of the Michigan State University (MSU) School of Agrifood Studies in Global Governance and Technoscience has been to advance the notion that standards, with their corollary monitoring and enforcement institutions such as audits, grades, and third-party certification (TPC), are now central to the governance of global value chains (see Busch and Bain 2004; Busch and Juska 1997; Hatanaka, Bain, and Busch 2005; Konefal, Mascarenhas, and Hatanaka 2005; Reardon et al. 2001). Drawing on Actor-Network Theory (ANT), these scholars sought to demonstrate how such institutional arrangements allow participants within the chain to act "at a distance" (Latour 1987) and are increasingly used by a range of actors—whether public, private, or hybrid— *strategically*. Agrifood standards embody formal and informal rules, processes, and practices, which determine how a commodity will pass along the chain. Thus, actors can use these standards to enforce rules, regulations, and practices, thereby achieving a range of objectives. Such objectives can include, for example, gaining access to new markets, coordinating operations, providing quality and safety assurance to consumers, and defining niche and brand-name products.

While governance has emerged as a useful heuristic device for investigating the multiple actors, sites, practices, and institutions that regulate the agrifood sector, less emphasis has been placed on examining how governance strategies are legitimated. In this paper, we seek to extend the work of the MSU School by asking:

How do standards makers[1] justify their role in determining how commodities and goods should be governed? How do their standards achieve credibility? How are the boundaries regarding what is and what is not included in standards and audits determined? Here, we argue that standards makers appeal to technoscientific norms and values to establish both credibility for their standards and their authority in constructing and upholding these standards.

We draw on three disparate case studies to illustrate these points. Our first case focuses on a public standard requiring complete elimination of a particular insect pest of the U.S. tart cherry industry. This historical case illustrates that while governance can be rooted in the larger political economy of the agrifood system, it can also be shaped by a technoscientific paradigm in which all political and economic problems are solved via modern, rational, reductionistic approaches (Rosenberg 1997a). The second case follows efforts to establish and maintain red meat hygiene standards in the processing sector of South Africa. An increased emphasis on scientific hygiene standards coincides with a desire to create the appearance of a food safety system that is separate from the realm of politics, yet this case study exposes the difficulty of separating standards from the messiness of social life. In the third case, we examine GLOBALGAP[2] requirements for how third-party certifiers (TPC) should verify the standards of GLOBALGAP. Despite claims of objectivity, consistency, and independence we find that the organization's requirements lead to considerable disparities in standard enforcement, which reflect the retailer member's strategic interests. All three case studies reveal how appeals to technoscience by standards makers mask controversy and vested interests and allow actors to exclude, conceal, and mystify possible alternatives. More important, these cases show how standards and other associated requirements (e.g., audits, grades, and TPC) can result from an inaccessible and/or non-representative process.

LEGITIMATING GOVERNANCE STRATEGIES

Particular governance strategies cannot simply be imposed by using state or market power, but rather actors must establish their legitimacy to develop standards and various certification strategies (Clapp and Fuchs 2009; Higgins and

[1] By standards makers we refer to both public and private actors who not only are involved in the development of standards, but may also be involved in their implementation and enforcement.

[2] Until September 2007, GLOBALGAP was called EUREPGAP. To avoid confusion, the organization is consistently referred to in this paper as GLOBALGAP.

Larner 2010). Relevant here is legitimacy theory, which suggests that "organizations exist in society under an expressed or implied social contract"[3] (Campbell 2000). Legitimacy is the "generalized perception or assumption that the actions of an entity are desirable, proper, or appropriate within some socially constructed system of norms, values, beliefs, and definitions" (Suchman 1995:574). To achieve legitimacy, an organization goes through a process of legitimation where it "seeks approval (or avoidance of sanction) from groups in society" (Kaplan and Ruland 1991:370). More recently, legitimacy theory has been expanded to the field of social and environmental accounting, as well as corporate social reporting (CSR).

One way that actors achieve legitimacy is through discursive and communicative practices (Clapp and Fuchs 2009; Gibbon and Ponte 2008). Of particular significance is how actors draw on a combination of "expert discourse," appeals to "expert knowledge and practice" (Gibbon and Ponte 2008:366), and technoscientific norms and values (Bingen and Busch 2006). For example, although the technical efficacy of audits are often unknown, audits create organizational legitimacy and relationships of trust among stakeholders based on the assumption that they are developed by experts and provide transparency and accountability (Courville, Parker, and Watchirs 2003; Pentland 2000; Power 1997).

Similarly, what we find embedded within standards is an appeal to technoscientific values, like objectivity and value freedom. Standards are viewed as one means to achieve an objective world, because standards help to define what is to be traded, establish agreed upon practices to structure production processes, fix levels of consistent product quality, and make possible the location of production around the globe (Busch 2000b). For example, Hill (1990, 1996) and Jones and Hill (1994) have argued that standards should be uniform, reduce transaction costs, and improve market efficiency. To accomplish this, standards should be based on rules of measurement that are quantifiable and scientific. A good standard must incorporate rules of measurement as well as grades (classification systems that utilize quantifiable attributes), which become the means through which standards can be quantified (Jones and Hill 1994). Grades are intended to eliminate or minimize the subjective criteria inherent in creating standards (Hill 1996; Jones and Hill 1994). They are the outcome of tests or measurements. Testing makes it

[3] The philosophical concept of the social contract sought to explain the relationship between government and the people and assumed that legitimate authority to rule must be based on the consent of the people.

possible to distinguish one type of entity from another, to differentiate among similar types of entities, and to link an entity to a particular set of characteristics. From a business point of view, constraints on what governance tools—grades, standards, tests—are adopted are purely structural, technical, or economic (Gibbon and Ponte 2008; Hill 1990).

Scholars from the MSU School were among the first to argue that standards and the certification of standards are not determined through some objective, value-neutral scientific process (Bain, Deaton, and Busch 2005; Bingen and Siyengo 2002; Busch 2000b; Tanaka 2005). Instead, these scholars demonstrated that standards are the outcome of negotiations and strategic action, which means that standards embody the asymmetrical power relations, interests, and values of different actors in the value chain (Bingen and Siyengo 2002). Rather than being simply technical devices, standards and certification play key roles in ordering social relations that, in turn, serve to influence, coordinate, and govern the global agrifood system (Busch and Bain 2004).

In his seminal piece, *The Moral Economy of Grades and Standards*, Busch (2000b) argued that standards discipline not just things, but also markets, people, and nature. He stated that standards not only define "what (who) is good and what is bad," but also discipline "those people and things that do not conform to the accepted definitions of good and bad" (Busch 2000b:273). In a similar vein, Miller and O'Leary ([1987] cited in Higgins and Larner (2010)) argued that technologies such as standards "do not simply intervene in, and govern, pre-existing social problems or domains, but instead serve to construct 'a particular field of visibility' which makes social domains knowable and governable" (p. 239). Likewise, tests are constructed within a particular sociotechnical and political context (e.g., MacKenzie 1987) and they measure the characteristics valued (Pinch 1993; Singer 1996). Passing a test, for instance, indicates the right production techniques, the right procedures, the right distribution methods, and overall the right stuff (Busch and Tanaka 1996). Thus, standards and tests of standards are measures by which we judge not only products and processes, but also human and nonhuman entities.

While Busch and others have extensively challenged the idea that standards are objective tools for handling issues of technical compatibility, we argue here that an appeal to technoscientific discourse by standards makers remains critical to legitimating standards and certification strategies. Standards and certification are not only a manifestation of the "structural and discursive" power that actors hold, "but also a means of extending it" (Fuchs, Kalfagianni, and Arentsen 2009:39). We now turn to a brief discussion of our methods, followed by our three case studies.

These cases illustrate how standards and standard makers use scientific discourse to expand their capacity and limit the capacity of others to reshape natural, social, political, and economic relationships.

METHODS

Analysis of the development of tart cherry standards making is based on archival research and content analysis that took place between 2003 and 2005. Data were collected from university, federal, state, and local sources including museums, libraries, and the personal files of investigators, extension agents, growers, and industry associations. These archival materials included statutes, organizational documents, letters, and meeting minutes; extension bulletins and research articles; pesticide use and application instructions; and trade journals and newspaper articles. The South African red meat hygiene standards case is based on field research conducted during 2000 and 2001, and follow-up visits in 2007 and 2009. Approximately 100 stakeholders involved in the South African red meat industry were interviewed over this ten-year period, with several actors re-interviewed during subsequent visits. In addition, information is drawn from technical reports and government legislation. The GLOBALGAP case is based on field research undertaken in Chile in 2004 and again in 2005. Fifty-two interviews were conducted with stakeholders involved in the Chilean export fruit sector and/or the GLOBALGAP certification program. It also includes content analysis of historical studies and technical literature related to GLOBALGAP and the Chilean export fruit sector.

APPEALING TO TECHNOSCIENCE

Michigan Tart Cherries

The tart cherry (*Prunus cerasus*) is a fruit used primarily in confectionaries, most notably in pie. In the United States, commercial production takes place in the northern states, approximately 75 percent of which occurs in Michigan. Most of Michigan's commercial production takes place in the western counties bordering Lake Michigan, with 50 percent taking place in a four-county region in the northern portion of the lower peninsula. The crop is almost entirely processed, and until recent years, most of it was canned. Producers in the northern counties started planting tarts on a commercial scale in the late 1800s because it was a high value crop that would grow on otherwise marginal land and it required little intervention. Tart cherries were suitable for the harsh biophysical environment and they could be easily prepared for processing by floating them in water to remove debris and

insect infested fruit (Pettit 1926). A lack of formal rules governing tart cherries further simplified production. Michigan tarts were not subject to legally binding standards until the State of Michigan passed the General Law Governing the Shipment of Fruits and Vegetables in 1913. This statute outlined a broad set of product and packaging requirements, as well as a minimum grade for what could be sold in the market. More important, this rule signaled the beginning of standards making for specialty crops at the subnational level.

Most nineteenth and early-twentieth century farmers who were growing fruit paid little attention to pests as there were few incentives to do so. This was not the case for "orchardists" (Bogue 1985)—farmers whose primary income was fruit or "elite gentlemen farmers" (e.g., doctors, lawyers) who specialized in fruit. For these orchardists, insects were the "enemy" and they expected both the State and the agricultural university to give them a mechanism for control (cf., Rosenberg 1997a; Russell 1999). Nevertheless, it was not until two crucial events occurred that insects, particularly larvae, became a key point of governance in the Michigan tart cherry commodity chain. First, as required by the Pure Food and Drug Act of 1906, the Bureau of Chemistry (1906), later known as the U.S. Food and Drug Administration (FDA), began testing canned cherries in the mid1920s to ensure that they were wholesome and free of adulteration. Agency inspectors found many lots that were excessively wormy (Junod 2005). As a result, FDA investigators developed a detection method that could be used by processors to determine whether incoming loads were infested (Pettit and Tolles 1930). In this procedure, also known as the "Howard Method," a sample of cherries is broken up and boiled, turning any live, translucent, maggots opaque; then the sample is run through a sieve. The remaining particles are decanted several times to float off the debris and the residual is transferred to a black pan where the maggots could be observed and quantified. Canners who "tested the test" (MacKenzie 1999; Pinch 1993) found it to be a successful technique for exposing the presence of maggots (Pettit 1926), which contributed to its official adoption by the FDA in 1928 (Beyer and Hanna 1970). Thus, the Howard Method became a means for implementing a "purity" or wholesomeness standard.

The second event that influenced the direction of tart cherry governance was the passage of Public Act 86 (Michigan 1929), most commonly called the "zero maggot law." While not the only insects to lay eggs in the cherries (e.g., plum curculio, *Conotrachelus nenuphar* [Herbst]) (Howitt 1993), this formal standard required complete control of two species of cherry fruit flies (CFF)—the eastern cherry fruit fly (*Rhagoletis cingulata* [Loew] and the black cherry fruit fly (*Rhagoletis*

fausta [Osten Sacken]) – which are small two-winged arthropods (Pettit and Tolles 1930). Eventually, State legislation and federal regulation (Agricultural Marketing Service 1949; Production and Marketing Administration [1941] 1946), made it illegal for growers to have, for processors to receive and/or manufacture, and for anyone to transport cherries containing CFF or their maggots. Even cherries that were to be juiced could not contain worms or maggot parts (Bureau of Foods and Standards 1938).

However, by the late 1920s, key members of the industry in the northern counties were sent to the State, and in particular the Michigan Department of Agriculture (MDA), to demand protection from the FDA's test (Beyer and Hanna 1970). These growers, and their local processors, believed the Howard Method would allow inspectors to find more infested cherries than ever before possible, meaning that many loads of tarts would be rejected and canned cherries would be subject to federal seizure. Moreover, a sample found to contain maggots would cost growers and/or canners not only income, but also the loss of their reputation. Rather than causing the State to do away with the test, the growers' appeal opened the door to the development of a system of standardized practices—practices intended to standardize growers' behavior. These practices were established by a team of "experts" from the state land grant institution, later known as Michigan State University (MSU), who possessed the power, tools, and methods to see, interpret, and reveal maggot "facts," as well as an unquestioned belief in the efficacy of technoscience to control them (Gossel 1993; Harding 1991; Knorr-Cetina 1981; Rosenberg 1997b). In other words, State and University efforts began to focus on developing a set of tools to ensure that "good" growers (Busch and Tanaka 1996) could pass the test, rather than on the spirit of the FDA standard (Busch 2000a), which was to ensure the production and sale of wholesome fruit. Moreover, the development of these tools solidified the University's role as a standards maker.

Controlling maggots. Beginning in 1929, the MDA began to enforce the "zero maggot law" by dispersing an inspector, with the authority to condemn orchards and cherries, to each of the 22 counties in the growing region (Houk 1954). Over several years this team of inspectors trapped and monitored insects and used the Howard Method to test the fruit. When CFF were discovered, the inspectors notified the MDA, which in turn asked MSU entomologists and chemists for a scientifically-based control mechanism, which was understood to mean chemical pesticides (Beyer and Hanna 1970; Houk 1954; Rosenberg 1997b). Using a network of newspaper, telephone, and radio communications, as well as the assistance of county extension agents and processors, MSU notified growers of CFF emergence

and their treatment "recommendations." State law compelled growers in the area of emergence to comply with the recommended lead arsenate or lime-sulphur sprays and to destroy any fruit on their property found to be infested (Pettit and Tolles 1930). Yet, many growers were slow to do so, as tarts were a favored cash crop precisely because they were low maintenance.

Thus, University actors joined with the State to legitimate and to enforce the standard by strategically engaging the broader industry with verbal, visual, and written images that not only framed maggots as a problem, but also framed what they were supposed to see, pay attention to, and by implication, ignore (Ihde 1995; MacLachlan and Reid 1994). First, in 1931, the State established traveling laboratories, staffed with inspectors and chemists that went into growers' orchards and tested their crops (Figure 1) (Houk 1954). According to the Commissioner of Agriculture (State Department of Agriculture 1933) at the time, these labs were of "inestimable value from an educational standpoint in convincing growers of the hazard of the cherry fruit fly and its destructive character" (p. 4). Second, the University took the lead in organizing extension meetings with visual demonstrations, disseminating publications with diagrams (Pettit and Tolles 1930), and writing articles for local newspapers and trade magazines with descriptions of CFF and their life cycle. Third, the problem of CFF was illustrated individually by having the growers carry out some trapping themselves (State Department of Agriculture 1933), and illustrated in a very public way, by State "cleanup campaigns" that removed "wild" and abandoned trees. Finally, University entomologists developed an emergence calendar, and testing of the calendar found it to be "so dependable that many canneries refused to buy cherries that had not been sprayed in accordance with it" (Michigan State College Extension Division 1941:61). Consequently, the calendar and associated pesticide applications became "the gold standard" of practice.

Within five years of the FDA's adoption of the Howard Method, the struggle to "see" CFF was over.[4] It had been successfully transformed into the most important problem facing the industry (Busch 2000b). Simultaneously, growers were given a "silver bullet" – a legitimated set of standardized practices that were scientifically designed, developed, and vetted. The CFF calendar, in particular, became the new reality, what was valued. As a result, the "zero maggot law" itself

[4]We use "see" intentionally. Authors such as Latour (1987), Ihde (1995) and Haraway (1995) illustrate the ways in which technoscientific apparatuses reveal nature (e.g., microscopes), frame particular attributes of nature (e.g., photographs), and teach us how to think about nature (e.g., literature).

had not only become a credible standard, but the complete elimination of maggots became the morally right thing to do.

Figure 1. Testing Cherry Samples in a Mobile Laboratory (Ball 1965).

Mystification. Embedded within the CFF control program was an implicit promise that the industry needs no longer to think about maggots—just follow the plan. Consequently, the industry remained on essentially the same path for the next 80 years. For growers, CFF management was "magic" (Clarke 1999). New generations of growers and processors matured and became primary owner-operators, but had never seen a cherry fruit fly nor, by their own admission, could they recognize one if they had (Worosz 2006). The "experts" (e.g., University entomologists, crop consultants, extension agents) became mystified, as well. Over the years, some actors came to understand some relationships among some components of the CFF management program, but not all components nor all relationships (e.g., the basic biology of CFF, but not its role in orchard ecology) (Perkins 1982). This lack of knowledge masked the actual standards makers and supported the belief that tart cherry pest management could be approached, indefinitely, in a reductionistic way. Acceptance of this mystification allowed them to promote program efficiency and effectiveness while simultaneously suppressing

any opposition. In fact, the risks of challenging the system became, as a contemporary entomologist stated, "insurmountable" (Worosz 2006:153).

Undemocratic choices. A superficial examination of CFF governance might convey it is a tale of democracy in action. The control mechanisms that became the new standard of production were an outcome of at least some growers' appeal to technoscience. Likewise, the zero maggot law did not just "happen"—it was the outcome of political pressure from a particular group of growers. As Busch (1989) suggested, technoscience (i.e., pesticides, entomology, state law) became not only a tool for certain actors to legitimate a standard, but also a means of changing the rules of the game and modifying the "structure so that it better suits their desires, needs and interests" (p. 14). Sacrificed, for instance, was the development of an organizational infrastructure that could access situated knowledge (Haraway 1995), the collective and historical knowledge that only the actual producer community could possess (e.g., the locations of high density pest populations; the ways that pests respond to local weather and terrain; the pest control strategies developed locally). Also sacrificed was the ability to ask questions and propose alternatives (cf., Wynne 1996). As a result, the maggots' "offensiveness" was accepted without questioning whether or not the existence of maggots is bad, and how "we" know maggots are bad. Unquestioned was the demand for complete elimination of maggots, the extent to which agrichemicals were the only viable way to overcome the FDA testing procedure, and the potential consequences of these standards (Rouse 1987).[5] Hidden were the ways in which most growers were marginalized in the decision-making process and nearly all growers were ultimately deprived of the freedom to make choices. In essence, this case illustrates that, while industry governance can be rooted in a particular history and culture, it does not necessarily mean that governance is democratic, or that decisions emerge from public participation and receive majority support. In fact, some decisions and strategies can be "locked in" (Hogg 2000; Rosenberg 1997b) such that seemingly successful choices are made and technologies are used repeatedly with little contestation.

South African Red Meat Hygiene Standards

Unlike the tart cherry case, red meat hygiene standards in South Africa originated during an extremely undemocratic period, the apartheid era, and

[5] Concerns about the potentially harmful effects of pesticides, especially arsenate compounds had been raised decades earlier and forgotten (e.g., Taft 1895; 1899); growers were initially warned to avoid chemical applications during bee pollination, to be mindful of the potentially toxic effects to the foliage, to use caution in handling, and to preclude residue consumption.

standards makers made no pretense that hygiene standards were democratic. Thus, hygiene standards had to be reconfigured in the 1990s with the introduction of democratic governance and free market principles. During the apartheid era, South African agriculture was government-directed and all red meat-processing facilities (e.g., slaughterhouses, facilities for further processing) were required to follow the same, extremely rigid, standards. The standards generally focused more on the structure of the slaughterhouse than on the safety of the product. Politically, this attentiveness to the structure of processing facilities was used as a control mechanism by the State to regulate who owned and operated a processing facility. The Meat Board, a government-established marketing board, had the statutory authority to oversee the registration of key participants in the industry, keep industry records, and collect a levy from farmers for each animal slaughtered (Ransom 2006). ABACOR, a government-controlled company that owned and managed eleven large slaughterhouses in major cities, controlled 70 percent of the industry in the 1980s. The Meat Board provided permits to farmers that dictated where their animals were to be taken for slaughter and how many animals each farmer was allowed to slaughter. The farmer then had to pay to transport the animals from the farm to whichever slaughterhouse they were assigned.[6]

The situation in South Africa until the end of apartheid represents what many food safety scholars have long noted about hygiene standards that there are some anti-competition standards "masquerading as safety standards" (Ross 1990:12). However, there is a general view among food safety experts that "there are also genuine safety standards that . . . benefit the diffuse interests of consumers" (*Ibid*). Embedded in this perspective is the assumption that good safety standards are neutral in their political and economic consequences. The point being made here is that even good safety standards can be highly politicized and anti-competitive for certain portions of a population.

Democracy and Deregulation. With the fall of apartheid and the closing of most agricultural control boards (done to liberalize the South African economy, reduce power and authority concentrated within the boards, and reduce concentration in the industry), the South African government attempted to implement more flexible hygiene standards. This was a part of a larger process of democratization, deregulation, and integration of previously disenfranchised black South Africans. Farmers were no longer assigned to specific slaughterhouses and guidelines for

[6] This system gave unfettered power to control boards that could make life financially difficult for farmers simply by assigning them to a slaughterhouse at the opposite end of the country.

building and owning a slaughterhouse were relaxed during deregulation.[7] All these factors combined led to an explosion in the number of operating slaughterhouses, with a total of 450 registered slaughterhouses operating in 2000, as compared with 281 slaughterhouses in 1990. As of 2009, there were 452 registered slaughterhouses and they ranged in size from operations that slaughter one animal per week, to operations that slaughter 1,700 animals per day.

With the increased number of slaughterhouses, an overall decline in government resources for hygiene inspection, and South Africa's adoption of neo-liberal economic policies, the South African government, in cooperation with some industry actors, introduced the Hygiene Assessment System (HAS) to slaughterhouses in 2000. Adapted from the United Kingdom, which utilized HAS from 1995 to 2005, HAS is a scoring system that assesses hygiene in a slaughter facility by taking into account the plant's structure, equipment, and managerial operation. HAS was based on a 100-point scale (100 being the highest), with trained veterinarians conducting regular inspections of slaughterhouses, where they used their judgement and experience to assess the HAS score (Pinillos and Jukes 2008). Because of the scoring system, HAS allows government officials and consumers to compare the scores received by different slaughterhouses. In South Africa, HAS was seen to reduce the subjectivity of the assessment of hygiene standards in the slaughterhouses and to standardize the assessment across all regions (Interview with government official 2000). HAS was viewed by South African government officials and some industry actors as a preliminary step toward improving food safety and hygiene in the industry. This is because HAS relied upon criteria considered to contribute to safe food (e.g., visual assessment of equipment) and a HAS score was seen as more objective than previous types of assessment (e.g., in theory two different inspectors should end with similar scores if both evaluated the same facility).

HAS was viewed as preliminary in 2000, because globally most Western, industrialized countries had already adopted, or were in the process of adopting, another hygiene management system, popularly known as HACCP. HACCP refers to Hazard Analysis Critical Control Points, which is a food safety management system whereby meat plants identify "critical control points" where contamination is likely to occur. Once these points are identified, performance standards and

[7] The guidelines for operation as specified in the Abattoir (the French term for slaughterhouse) Hygiene Act remained in place, although according to individual officials involved with slaughterhouse hygiene, many new slaughterhouse owners did not initially understand that the Act still applied.

monitoring procedures are put into place at each point to ensure no contamination, in theory, occurs. Developed by the Pillsbury Company for the U.S. National Air and Space Association (NASA) in the 1960s, the U.S. Department of Agriculture (USDA) adapted HACCP for use in the meat industry in the 1990s. The USDA argued that HACCP provided a more science-based approach to meat inspection, which includes testing for pathogens that are not visible to the unaided human eye. While a full review of HACCP is beyond the scope of this case study, the most important point to be made as it relates to South Africa is that HACCP is very expensive to implement. Unlike HACCP, HAS does *not* conduct any microbiological tests to assess the presence of contamination at a slaughter facility. In addition, within a HAS system (as adopted in the UK), inspectors visit regularly to score the facilities. In contrast, HACCP relies upon audits, whereby an inspector reviews a company's records related to hygiene practices and HACCP-based procedures in the plant. Both the microbiological testing and the audits (and associated required record keeping) contribute to higher implementation costs for HACCP. Thus, HAS provided a compromise in that it was a more "objective" approach—it attempted to standardize how all facilities were evaluated, but it did not cost as much as HACCP to implement.[8]

At the time, costs of implementing new hygiene regulations were an important consideration, since many small slaughterhouse operators, the group least able to handle the enormous costs of HACCP, were black South Africans. Ultimately, larger firms have more capital to invest in meeting standards and, unlike small to medium processors, they do not experience new regulations as a major increase in the cost of production (Dunn 2003). In addition, with extreme inequality and severe unemployment in the formal sector, South Africa's government had an interest in maintaining small to medium-sized processors. Thus, with the implementation of HAS a "paradigm shift" was asked of inspectors and the industry.[9]

Paradigm shift. According to government officials and inspectors in 2000, the paradigm shift involved the adoption of a more holistic approach to the meat commodity chain. This holistic approach can be seen in the name given to the new

[8] In the United States, when HACCP became mandatory for all meat processors, the USDA attempted to offset the burden to very small, small, and medium processors by extending the deadline by which these operations had to achieve compliance.

[9] While this idiom is used by members of the red meat commodity system, especially people working in the government, Kuhn's (1962) work, *The Structure of Scientific Revolutions*, is often associated with this phrase in the science and technology studies literature.

legislation, the Meat Safety Act of 2000, as opposed to the legislation it replaced entitled the Abattoir Hygiene Act of 1994. A part of this holistic focus is a move away from standards as strictly a pass/fail measure to an acceptance of differences between processors and retailers and the clientele they serve. One inspector labeled it "relative standards" with the explanation that the fast food chain selling R20 million (approximately $2.5 million USD in 2000) should be held accountable for more hygiene and food safety standards (in part, due to the increased complexity of a system set up to feed so many more people) than the individual selling street food earning R20 (approximately $2.50 USD) a week. In addition, inspectors were asked to recognize establishments that are always striving to improve within the environment in which they operate. The official red meat inspectors' handbook states that larger slaughterhouses are to be held accountable for higher (or tougher) requirements. The reason for needing higher requirements in bigger slaughterhouses is that "higher throughput enlarges the risk of contamination" (National Department of Agriculture 2000:8). As might be expected, the idea of a paradigm shift has received harsh criticisms of favoritism, especially from processors and retailers who are in full compliance with the law.

Despite efforts to advance hygiene standards in South Africa, there is a wide and growing disparity in the maintenance of these standards among the slaughterhouses. Generally, the largest processors in the South African industry have moved forward and become HACCP compliant. By gaining HACCP compliance, the largest processors effectively gain access to, and secure contracts with, international customers (export markets), high-end retail chains, and tourist resorts. Meanwhile, the South African government has struggled to ensure basic enforcement of the Meat Safety Act. The struggle to ensure enforcement is due to fragmentation and a lack of specificity within the Meat Safety Act (e.g., technically multiple companies can be offering meat inspection services); a lack of uniformity in hygiene standards across the different provinces within South Africa; and allowances for slaughterhouse facilities to pay their own hygiene inspectors (thereby ensuring a conflict of interests) (Interview with slaughterhouse organization member 2007).

Ironically, the failure of the State to effectively enforce a minimum level of hygiene, combined with a recent increase in concentration and vertical integration in the industry, leaves small and medium-scale processors in an untenable position. The hygiene standards that small and medium-scale processors utilize are dependent upon the legitimacy of the State. That is, national hygiene standards are deemed legitimate because the State adopts and enforces scientifically-based

hygiene standards. However, since the State has not effectively implemented and enforced HAS, processors that could have adopted HACCP and paid a TPC to be certified as HACCP compliant. As illustrated by one independent South African butcher, this allows processors who can adopt more rigorous hygiene standards to set themselves apart from and above the rest of the meat processors in the industry. Here the butcher was trying to meet the hygiene requirements of a large South African tourist resort that wanted him to adopt HACCP in his facility and most likely become compliant with ISO 22000, which is a food safety management system that incorporates HACCP. The butcher stated, "health regulations are a money making scam, just because I do not pay money and keep big files… hygiene standards like ISO 9000[10] manipulate the market so big firms can take it for themselves" (Interview with independent butcher store owner 2007). Unfortunately for the small butcher, keeping big files of written records of a hygiene management system coincides with the view that records provide evidence of scientific practice. In addition, the records contain the microbiological data collected from facilities that periodically test the levels of bacterial contamination in the plant. Therefore, the facilities that can afford to keep records (and conduct microbiological testing) are deemed more scientific in their hygiene management than those that cannot afford to maintain the proper records (due to limited personnel, space, etc.). Therefore, owners of slaughter facilities and butcheries that have less capital, which are disproportionally small to medium-sized operators, do not have the newest hygiene management systems and are therefore not considered to produce red meat that is safe for public consumption, irrespective of the product that they produce. Similarly, much of the microbiological testing that accompanies HACCP programs gives the appearance of increased precision and accuracy, yet for much of the bacteria discovered, no evidence exists that such bacteria, especially in very small amounts, are in any way problematic (Busch forthcoming).

Within a new democracy like South Africa, more scientific approaches to the maintenance and enforcement of hygiene in slaughterhouses are accepted as a means to break away from the long history of (ab)using hygiene standards to exclude and marginalize specific groups of people. However, as this case study reveals, enacting more scientific approaches does not correct pre-existing inequalities. In addition, while there has been an increase in the diversity of people

[10] Although the butcher says ISO 9000 in his quote, this shows his lack of familiarity with ISO standards, which are private standards that require a fee to be deemed ISO compliant. ISO 9000 does not actually incorporate HACCP. However, ISO 22000, which became available in 2005, is a food safety management system that incorporates HACCP.

participating in meat processing, a reliance on "scientific" hygiene approaches has stifled discussion and debate about power, inequality, and the role of the State "under a veil of expertise and pure technique" (Dunn 2007:41). Moreover, those that can afford newer, more expensive hygiene standards are deemed more legitimate, which reveals that the market, in addition to the state, becomes a key factor in establishing legitimacy. With South African hygiene standards, the state did attempt to provide some semblance of compromise in the introduction of new hygiene standards. However, a combination of factors, including resistance by large meat processors and the increasing importance of free market principles, have largely eroded opportunities for increasing democratic governance and participation in the red meat-processing sector.

GLOBALGAP AND THIRD-PARTY CERTIFICATION

As the two previous cases reveal, until recently, standards for what many consider to be public goods, such as food safety, were largely the prerogative of government. However, in the United Kingdom (UK) and Europe, major food retailers have begun to establish themselves as the new "food authority," using their market power to develop and impose standards and certification systems onto their suppliers (Busch and Bain 2004; Konefal et al. 2005; Lawrence and Burch 2007; Reardon et al. 2003). An important example of this is GLOBALGAP, which was established in 2001 by a handful of major UK and European food retailers, and is now "the most widely implemented farm certification scheme" in the world[11] (Eurofruit Magazine 2008: npn). Suppliers of fresh produce to GLOBALGAP members are required to meet an array of standards not only for food quality—long within the purview of retailers— but also for so-called public goods such as food safety, worker welfare, and the environment.

Prior efforts by corporations to establish their own standards, especially for labor and the environment, have been widely criticized as biased, especially without independent monitoring and verification programs (O'Rourke 2006). How then can we account for the success of GLOBALGAP in establishing its authority to create and enforce a set of standards for producers within its global value chains? Of critical importance are efforts by GLOBALGAP to legitimate its governance strategies through an appeal to technoscientific values, such as independence and objectivity (practices are based on scientific evidence using outside experts), within

[11] In March, 2010, GLOBALGAP had nearly 100,000 certified producers in 100 countries and 37 retailer members.

its public discourse. Central to GLOBALGAP's practices is its use of TPC, which ostensibly embodies these technoscientific values. That is, the authority and credibility of GLOBALGAP standards rest largely on its requirement that "independent" and "impartial" third-party auditors assess, evaluate, and certify grower compliance with GLOBALGAP standards annually (e.g., EUREPGAP 2004). Objectivity here is sustained on the premise that the practice of auditing is independent from the standards-setters[12] (GLOBALGAP, 2008). However, this conceptual separation is misleading because, in crafting its standards and their compliance criteria, GLOBALGAP itself establishes the boundaries of acceptable and non-acceptable levels of verification acted on by auditors.

The audit. Auditors are required to verify that growers meet the entire body of GLOBALGAP standards, or what GLOBALGAP calls "Control Points" (see GLOBALGAP 2009a, 2009b, 2009c). For all standards, growers are expected to maintain documentation that details how they have met each of the Control Points and auditors are expected to focus on reviewing this documentation. All Control Points are divided into three levels of compliance: 1) *Major Musts*, 100 percent compliance is compulsory; 2) *Minor Musts*, 95 percent compliance is compulsory; and 3) *Recommendations*, which are inspected by auditors, however, no minimum percentage of compliance is set and compliance is not a prerequisite for gaining certification (EUREPGAP 2004).

Turning to a comparison of two subsets from the body of GLOBALGAP standards – "Plant Protection" (an industry euphemism for pesticides) and "Worker Health, Safety and Welfare" (WHSW)[13] – five categories of verification requirements can be seen. These categories are: 1) laboratory tests; 2) official certification; 3) official registration; 4) visual inspection and; 5) documentation review (Table 1). Importantly, the data in Table 1 reveal that GLOBALGAP requires higher levels of verification to demonstrate compliance with its Plant Protection standards than with its WHSW standards. This is important because verification requirements directly affect the actions auditors take to ensure

[12] Members of GLOBALGAP's Sector Committees (e.g., for fresh fruit and vegetables) with the appropriate "technical ability", together with "external experts", are responsible for developing and reviewing a consistent, universally applicable set of 'best practices' and conducting risk assessments (GLOBALGAP 2008).

[13] GLOBALGAP standards for Plant Protection can be found in GLOBALGAP (2009a). GLOBALGAP standards for WHSW can be found in GLOBALGAP (2009c). Labor standards that deal specifically with the handling of pesticides can be found in GLOBALGAP (2009a).

TABLE 1. COMPLIANCE CRITERIA REQUIRED FOR PLANT PROTECTION [PESTICIDES] AND WORKER HEALTH, SAFETY, AND WELFARE STANDARDS.

	PLANT PROTECTION [PESTICIDES]				WORKER HEALTH, SAFETY, & WELFARE			
VERIFICATION REQUIREMENT	TOTAL CONTROL POINTS	MAJOR	MINOR	RECOMMENDED	TOTAL CONTROL POINTS	MAJOR	MINOR	RECOMMENDED
Certification.	5	2	1	1	1	1		
Registration.	3	2	2					
Laboratory Tests.	3	2	1					
Visual inspection or documentation review.	19	9	8	2	21	4	20	2
Total.	30	15	12	3	27	5	20	2

compliance, which has been shown to influence the degree of grower compliance. Thus, particular standards and different requirements can cause inequitable outcomes especially for farm workers (see Bain 2010; Bain and Hatanaka 2010).

In response to several food safety crises, and with the strengthening of food safety regulation at both the national UK and European Union (EU) levels, GLOBALGAP has made it clear that its priority is maintaining consumer confidence in the safety of its products (EUREPGAP 2004). Consequently, for pesticide use by producers, GLOBALGAP has structured compliance criteria to ensure that a more substantive means of verification is required, including independent testing for specific performance indicators. In verifying standards for plant protection,[14] GLOBALGAP requires auditors to conduct a visual inspection and documentation review, which is typical. In addition, however, GLOBALGAP also requires that growers give auditors evidence of: 1) official certification; 2) official registration; and 3) laboratory test results (see Table 1). For five Control Points, GLOBALGAP requires compliance to be demonstrated through evidence of external "certification." For example, growers cannot simply assert that they are qualified to choose the appropriate pesticides for their crops, but must provide certificates of official training that support their claims. For three Control Points, GLOBALGAP requires that all agrichemicals used by growers are approved and registered with a public body and growers must provide evidence of this approval. Again, claims made by growers that they are using the appropriate pesticides in the appropriate manner must be supported by external evidence of compliance. For three Control Points, growers must provide the test results of product residue analysis conducted by independent laboratories as evidence that they are meeting standards for pesticide maximum residue levels (MRLs).

In this area, the risks are simply too high for GLOBALGAP to require that auditors merely review grower records and trust that they are accurate. As for pesticide residues, individual countries have established standards for MRLs and there are testing procedures in the UK and EU to ensure compliance. Furthermore, there is a high risk of reputation loss if retailers fail these tests. The UK government requires that the Pesticide Residues Committee (PRC) responsible for this program demonstrate transparency (what some call 'naming and shaming') by

[14]This section deals with standards of good practice in relation to: 1) choosing plant protection products; 2) application records; 3) pre-harvest intervals and application equipment; and 4) plant protection product residue analysis. For efficiency purposes, not included in this discussion are the standards for plant protection product storage, empty plant protection product containers, and obsolete plant protection products.

making its findings publicly available quickly (PRC 2007). Consequently, the results of its pesticide residue testing program, which includes the name of the retailer involved, are published on its website. Similarly, the EU has a 'rapid alert system' designed to share information among countries when problems with MRLs are encountered, that is, when MRLs are exceeded. Thus, to ensure that national and EU standards are met—and retailer reputations remain intact—GLOBALGAP's standards and compliance criteria for approved pesticides are quite comprehensive.

In contrast, there is little pressure on retailers to demonstrate specific measures to ensure worker health, safety, and welfare. In fact, it has been argued that the very buying strategies of retailers, such as just-in-time delivery and low prices, function to produce labor conditions that are precarious and unsafe (Bain 2010; Pearson 2007; Raworth 2004). Perhaps the most salient example is the comparison between GLOBALGAP's standard and verification requirements for pesticides on fruit and pesticides in humans. One of the central health and safety issues facing farm workers everywhere is their acute and chronic exposure to pesticides (see Bain 2010; Harrison 2008). While GLOBALGAP requires the testing of pesticide residue levels on plants it only recommends that workers who apply pesticides undergo an annual health check. Furthermore, whether the results of these health checks demonstrate worker exposure to pesticides or not is irrelevant to meeting the standard.

GLOBALGAP requires that grower compliance with standards for WHSW be supported by an additional level of verification (see Table 1). Here, any worker handling and/or administering chemicals, pesticides, or hazardous substances or operating complex or dangerous equipment must prove their competence by providing evidence of their qualifications. For example, a grower cannot simply claim that his or her workers know how to competently apply pesticides but must provide certified evidence. In addition, sometimes auditors are required to conduct a visual inspection to verify compliance. For example, that accident and emergency procedures are displayed in an accessible and visible location or that hazards are identified by a permanent and legible warning sign. For the most part, however, growers demonstrate their compliance with standards for WHSW through systems of documentation and auditors must trust the grower that the documentation is accurate. Most notably absent here is any requirement that auditors should interview workers to verify that the standards are being met.

A reliance on grower documentation regarding labor standards is problematic for several reasons. First, labor standards are one of the most contentious issues within the value chain and noncompliance with agricultural labor laws by producers

is widespread across the globe due to lax enforcement mechanisms (Bain 2010; Raworth 2004). Second, while auditors are theoretically independent, they are paid by growers and are therefore in a financially dependent relationship with them. In a competitive market for TPC there may be pressure for certifiers to trust that the documentation concerning labor standards is accurate when in fact it may not be (Bain and Hatanaka 2010). Finally, for labor, there is no way to measure whether workers agree that growers are complying with labor standards since they are entirely excluded from the verification process because GLOBALGAP does not require auditors to interview them. For example, a visual inspection might confirm to an auditor that "First Aid boxes" are indeed present or that "accident and emergency procedures exist" or that "living quarters are habitable and adequate." However, only interviews with workers could answer questions such as whether they understand the accident and emergency procedures or whether they know that First Aid provisions exist and that they have access to them when necessary. Interviews with workers would also provide more subjective understandings, such as whether workers themselves view their living quarters as habitable and adequate or whether they think that they have access to basic services and facilities.

In sum, an analysis of GLOBALGAP reveals that the verification levels required to demonstrate compliance with many standards for Plant Protection are extensive while verification of standards for WHSW is largely based on a review of grower records. The intent is not to argue that one category of verification is better than another, but to demonstrate that despite the public discourse about objectivity and independence, it is the standard setter—GLOBALGAP—and not the independent auditor who determines the compliance criteria for the standards. Moreover, the boundaries of acceptable and non-acceptable levels of verification to be acted upon by auditors do not reflect an objective scientific measure (e.g., exposure to pesticides), but the values and priorities of GLOBALGAP's retailer members.

More broadly, what is problematic about this process is that, in asserting its standards as scientific, retailers can justify the exclusion of farm workers from both the process of determining what a 'good' standard for worker health and safety should look like and how efforts to meet those standards should be verified. This is disconcerting since decisions about what should count as an acceptable standard or level of verification is always situated (Haraway 1995, 1997; Star 1991). In other words, all knowledge claims and "representation are inevitably partial, perspectival, and interested" (Rouse 1996:209). As Bendell (2005) argued in relation to the audit process, "'Evidence' is never 'objective' in that the person viewing it is involved in deciding what it means and whether it counts as evidence in the first place. One

auditor's 'evidence' is another auditor's clutter" (p. 367) He continued, "despite the rhetoric of professional objectivity, all auditing decisions are discretionary, at every moment of the audit process, from choosing whom to talk to, to what to ask, how to ask it, what to follow up on, and what to recommend" (Bendell 2005:367). To create more faithful, democratic accounts of the world, Haraway (1995) has called for accounts that are based on situated knowledges, where all vision is embodied and the struggle is always over whose view of the world —including marginalized farm workers—should count as rational.

CONCLUSION

The governance of agrifood systems involves the intersection of powerful and, often, competing interests. Within this context, Busch and the MSU School have demonstrated that rather than being benign, standards are shaped by the political and strategic considerations of the standards makers themselves and these standards then contribute to the constitution of institutions. The three cases studied in this paper have extended the work of Busch and the MSU School by arguing that politics and power in the agrifood system are often hidden behind the language of scientific objectivity and value neutrality. That is, in the struggle over whose rules should rule, both public and private sector standards makers appeal to technoscientific norms and values to legitimize *their* standards or corollary monitoring and enforcement mechanisms, such as audits and TPC. In establishing credibility for their standards or audit systems, standards makers in this paper could assert their authority to govern across industry sectors, nations, and global value chains.

The work of Latour (1999) has been central to the intellectual contributions of Busch and the MSU School. In his work, Latour problematizes such appeals to technoscience by powerful actors. From his perspective, efforts to separate scientific questions from political and moral questions—what he calls the "modernist settlement"— has been sustained out of a "fear of mob rule" by those in power. In other words, political and corporate elites attempt to maintain their position, in part, through an appeal to Truth and Reason (with a capital T and R), that is, an appeal to expert, scientific knowledge that can be used to counter the practical knowledge and understandings of the general populace. Those in power use Science (with a capital S) as an ideology, a political weapon against those who may disagree or those who wish to engage in politics and debate.

Our South African case demonstrated the use of Science as ideology regarding hygiene regulation. While not an overt goal, an appeal to scientific standards is one

way to create order and maintain the position of powerful actors during an extremely chaotic and turbulent period of change in South Africa. Of course, the danger, which is well represented in the case of controlling fruit fly larvae in tart cherries, is that attempts to maintain impermeable boundaries segregating Science from the rest of society will sustain a particular form of social, political, and economic order that is neither just nor sustainable. As the tart cherry case study points out, alternative options for thinking about pests in cherries have been almost completely ruled out of the realm of possibility, including adopting more sustainable, less chemically intensive ways of engaging with the presence of pests in cherries. The GLOBALGAP case demonstrates that, under the guise of scientific standards and TPC, major food retailers can shape standards, with their verification requirements, that reflect their strategic business interests. GLOBALGAP established standards for minimizing pesticide residues on fruit and for how those standards should be verified, both of which were considerably more stringent than GLOBALGAP standards for addressing pesticide poisoning in farm workers. This disparity reflects, on the one hand, the greater economic and reputational risks retailers face if they fail to meet European standards for MRLs. On the other hand, retailers are cognizant that there are few incentives, and that there are, in fact, economic disincentives for enhancing standards and TPC requirements that would improve the health and safety of farm workers.

In all three cases, we also demonstrate the ways in which standards makers utilize institutions to bolster their claims. If institutions are inherently political and ethical, then according to Busch, decisions over agrifood systems governance are decisions that necessarily adjudicate the degree to which we have fairness and equity in society. What flows from this, Busch (2000a) has argued, is the need for democratic processes to address such issues of equity and justice. He asserted that informed participation by citizens in decision making, including so-called technoscientific decisions, is critical since it is only through democratic participation that we can determine what our moral values are, or should be. Democracy in the case of standards and TPC then would ensure that a range of actors, including workers and farmers, could determine "what is moral, what is virtuous, what is right" through engaging in practices of "debate, dialogue, deliberation, and action" (Busch 2000a:148). In sum, determining what institutional forms are necessary to address questions of fairness and justice within the agrifood system is always a political process. Therefore, the active participation of actors involved in the process – whether they be Michigan fruit growers, South African slaughterhouse operators, or Chilean farm workers – is critical for sorting out distributional questions of how

the costs, benefits, and responsibilities of institutional reforms should be apportioned.

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