



Corporate investments in supply chain sustainability: Selecting instruments in the agri-food industry



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ABSTRACT

Private investments to address environmental issues are perceived as a powerful engine of sustainability. For the agri-food sector, multiple instruments have been developed to green supply chains. Yet little is known about the underlying process and conditions under which green sourcing concerns lead to the adoption of specific sustainability instruments among agri-food companies. This study: i) offers a synthesis of the most commonly used instruments agri-food companies adopt to promote sustainability in their supply chains; ii) proposes an analytical framework to elucidate how those decisions are made, based on the competitive environment in which firms operate—with respect to location of their raw materials, technologies available to their suppliers, leverage over upstream suppliers, and end-markets' characteristics; and iii) presents seven case-studies illustrating the decision-making process leading to the adoption of a specific instrument by a particular company. Companies that do not have sustainable technologies available to improve their environmental practices but operate in highly sensitive places are better off taking their operation somewhere else. But companies with available cleaner technologies, effective law enforcement and control over the supply chains, as well as a brand to protect, can capitalize on their environmental efforts by introducing strict standards, such as third-party certifications. Enforcement of social and environmental regulations at countries of origin is a key factor that deters companies from adopting very strict standards, even if they have a brand value to enhance. The multiplication of private labels and initiatives are, in most cases, not driven by a desire to disorient the consumer, but rather by a careful consideration of the complex conditions under which agri-food supply chains operate. With minor adaptations, the framework could be applied to other economic sectors that have environmental impacts, from mining and energy-generating industries, to apparel, and electronics.

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1. Introduction

In response to growing information about the negative ecological impacts of deforestation caused by agricultural expansion in the tropics (Lambin and Meyfroidt, 2011), civil society organizations, consumers in importing countries and shareholders have begun pressuring international suppliers to provide products that meet higher social and environmental standards. This has prompted many multinational food companies to undertake initiatives

that “green” their supply chain (Dauvergne and Lister, 2012). Globalization thus has the potential to mitigate the negative impacts of increasing global demand for land-based products by creating incentives for landowners to produce without degrading ecosystems or exacerbating socioeconomic disparities. Those initiatives are not without critics, who state that standards are put at levels that do not satisfy local and social norms for sustainable development (Nikoloyuk et al., 2010).

These industry-led agricultural sustainability initiatives represent new “hybrid” or “multi-partner” forms of social and environmental governance, with varying degrees of engagement by governments (Lemos and Agrawal, 2006). Private investments to address environmental issues are perceived as a powerful engine of

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sustainability. Such investments vary in scope, institutional design framework, and enforcement mechanisms. Several studies have sought to explain why private forms of value chain governance have become more common in recent years, what are the bargaining processes that have led to the arrangements we have today, and how those arrangements affect the actors in the value chain (Challies, 2012; Gereffi et al., 2005; Giovannucci and Ponte, 2005; Lee et al., 2012; Seuring and Müller, 2008). Yet little is known about the underlying process and conditions under which green sourcing concerns lead to the adoption of *particular types* of sustainability instruments among agri-food companies.

Here we argue that a separate focus on the agri-food industry and its associated supply chains is warranted given its many unique attributes vis-à-vis energy, manufacturing, and other industries. These differences include: i) the diffuse and seasonal nature of agricultural production (e.g., processors and retailers must ultimately source from a large number of producers, in many cases small-holders, from a wide diversity of climates), ii) the high levels of market concentration at the food trading node of the supply chain (UNCTAD, 2009), and iii) the extent to which production processes can visibly influence the quality and safety of the product (e.g., *terroir*). The first attribute implies extreme difficulty in monitoring environmental behaviors and labor standards or assessing the ecological impacts related to current practices across regions. The second attribute creates unique opportunities for environmental and social NGOs to pressure suppliers into taking action. The third attribute creates new marketing opportunities based on product differentiation. Furthermore, most sustainability instruments adopted by agri-food retailers focus on the production stage of the supply chain (i.e., agriculture) (Power, 2010), due to its expansive impact on ecosystem services and rural well-being. Agriculture accounts for the largest appropriation of water, land and, in many countries, agriculture is the largest source of greenhouse gas (GHG) emissions (Smith et al., 2007). It also employs 40% of the global population (United Nations, 2016).

In this paper, we aim to advance the understanding of agri-food firms' rationale for adopting specific sustainability instruments. We address the question of how the competitive environment in which firms operate—with respect to environmental pressures and opportunities at the place of origin of their raw materials, leverage over upstream suppliers, and end market characteristics—influence their incentives and ability to adopt such instruments. We identify not only the conditions under which the adoption of sustainability instruments is more likely to occur (as discussed by Mayer and Gereffi, 2010), but more fundamentally, how these conditions collectively determine what *specific* sustainability instrument is adopted. We focus primarily on environmental rather than social considerations, given agriculture's profound impacts on ecosystem services and on the disparity of technological advances across countries and crops that could render cleaner production practices.

2. Materials and methods

In this section, we first review, based on the literature, the main sustainability instruments adopted in the agri-food industry and the conditions influencing their selection. We then introduce the seven case studies used in this study.

2.1. Types of sustainability instruments and their potential impacts on the environment

Sustainability instruments are a form of strategic CSR (Porter and Kramer, 2006) that companies use to gain a competitive advantage and expand their market share. One key source of

competitive advantage across all industries is to improve brand image (Mayer and Gereffi, 2010). This is particularly relevant for the agri-food industry because.

sustainability is increasingly viewed as a quality attribute, enabling firms to garner price premiums from the market (Crowder and Reganold, 2015). For publicly traded agri-food companies, the adoption of sustainability instruments may increase its stock price (Smith, 2007). Furthermore, firms often use sustainability instruments as a way to manage catastrophic reputational (Godfrey et al., 2009) and supply risks. The long and diffuse supply chains characteristic of the agri-food industry are exposed to a wide range of risks, including changing government regulations, uncertainty about production conditions—in terms of social, political, climatic, or biological factors—and the difficulty of identifying illegal or unsafe practices of second tier or third-tier suppliers (Dauvergne and Lister, 2012). By self-regulating, firms can anticipate and discourage government imperatives to change regulations and penalties, improve traceability and accountability across the supply chain, and ensure consistent quality and a reliable supply (Nadvi, 2008). This is particularly important in cases where private companies' behaviors expand beyond the reach of individual national governments' jurisdiction, and even global authorities (Vogel, 2006).

The types of sustainability instruments employed by the agri-food sector vary from very lax self-defined investments that improve production practices at origin, to strict third-party audited codes of conduct (Cuffaro and Liu, 2008; Walker et al., 2013). Market-based instruments for sustainability have been grouped in previous studies according to whether companies decide to act unilaterally or through collaborative instruments (Griffin and Prakash, 2014), or according to the type of actor (private, public, and so forth) involved in instruments' design and implementation (Delmas and Young, 2009). Here we characterize the types of instruments available to companies by scope and environmental stringency (Table 1; Fig. 1). By scope we refer to the actors in the supply chain who are bound by the instrument (i.e., whether it applies to producers at origin, manufactures, and/or retailers). We define stringency based on three criteria: i) whether suppliers are asked to conform to a specific standard or whether it is sufficient to show general improvement in practices towards a goal; ii) whether specific on-farm and off-farm conservation measures—i.e., protection of local ecosystems—are included and enforced in the instrument; and iii) whether the responsibilities of verification and compliance are in the hands of an independent party (i.e., third party), an independent party in conjunction with the firm (i.e., second party), the firm itself (first party), or not done at all. The literature has shown that corporate codes of conduct or ethical guidelines rarely exclude non-compliant providers (Lund-Thomsen and Lindgreen, 2013), while third-party certification schemes and moratoria have embedded mechanisms to exclude non-compliant providers from the supply chain. Studies have also shown that instruments that lack external auditing are subject to evasion and shirking (King and Lenox, 2000). An instrument's ranking along the stringency gradient is heuristic and provides an indication of their relative potential to influence environmental impacts. It does not constitute a definitive metric of their actual impacts on land use, a task beyond the scope of this study.

2.1.1. Lower stringency instruments

Direct investments at origin and internal codes of conduct occupy the lowest levels of the stringency hierarchy. Both of these instruments may consider land use constraints and compliance with local environmental laws, but they are designed and managed by the company so they are not independently audited. Furthermore neither instrument tends to be compulsory. Producers are

only asked to show continuous improvement towards the adoption of particular practices and are not excluded from supplying if some of the characteristics are not met. Direct investments are further limited by the fact that they target individual projects and are not uniformly applied throughout the supply chain.

2.1.2. Medium stringency instruments

The next level of stringency includes multi-stakeholder roundtables, retailer-imposed standards, and third-party certification (often multi-stakeholder roundtables may lead to third-party certification). Multi-stakeholder roundtables are the result of a broad-base agreement, including industry participants and NGOs. Land use restrictions are included in the code, but producers are not always required to comply with it, just to share good practices. Among participants, only those producers that opt for certification are audited by an external body that verifies compliance and establishes sanctions. End-market or retail-imposed standards occupy the next level of the hierarchy. They are mainly driven by food safety considerations and pesticide residue regulations at destination, but do include compliance with environmental regulations that directly protect ecosystems in the country of origin. They are second-party audited and environmental requirements might be above local law (particularly for pesticides), as they refer to standards in consuming countries, where environmental policies tend to be stricter. Third-party certification is considered more stringent than roundtables because the code of conduct is established independently by an NGO, based principally on best practices. All of the certification programs used in agriculture have land restrictions that are equal or higher to local environmental regulations. Because they are third-party audited and sanctions exist for non-compliance, their ability to enforce the land use restrictions embedded in the code is higher.

2.1.3. High stringency instruments

Appellations of origin and bans and moratoria are at the top of the stringency hierarchy. Appellations of origin are defined by producers but sanctioned by governments. They protect traditional land uses and cultural practices that have allowed a continued use of the landscape for decades, if not centuries. Bans and moratoria are, by definition, the most stringent instruments for land use conservation, as they prevent agricultural, fisheries or forestry resource use. As they are generally third party audited, they have the greatest capacity to influence ecosystem conservation.

2.2. Conditions influencing the selection of specific instruments

Synthesizing the literature on how companies make decision about sustainability, we propose here a set of decision points that agri-food companies face when determining how to invest in sustainable supply chains. These decision points are influenced by: i) environmental pressures and opportunities relating to the places where their raw materials come from; ii) the company's own leverage in the supply chain; and iii) market opportunities for their products (Mayer and Gereffi, 2010; Waldman and Kerr, 2014).

2.2.1. Pressures and opportunities at the place of origin

2.2.1.1. *Environmental risks are high and known by civil society groups (or even governments) who have started pressuring companies to address them.* Expansion of different commodities is associated with varying levels of environmental damage and media attention. For example, cattle-grazing in long deforested pastures of the French Alps results in little land cover change. In contrast, recent expansion of soybean and oil palm into forests in South America and Southeast Asia causes substantial carbon emissions, biodiversity loss, and water pollution (Carlson et al., 2012; Fearnside, 2001).

Deforestation for cattle and soybean production occurs both in the Amazon and Chaco forests of South America, but the Chaco has attracted little public attention, while the Brazilian Amazon has become a centerpiece of international conservation campaigns (Adam, 2009; Greenpeace, 2006; Wallace, 2007). Thus, the combination of high environmental damage and high media attention influence firm's potential for reputational losses. By managing risks upstream in the supply chain, companies shield themselves from reputational and brand damage (Godfrey et al., 2009) and can protect their moral capital (Vogel, 2006). If those impacts are low, unknown, or fall below the radar of consumers' groups, civil society or governments, companies will have little incentive to act (unless acting on intrinsic motivations).

2.2.1.2. *Technologies are available at a reasonable cost.* A firm will not adopt a sustainability instrument that requires its suppliers use a specific technology if that technology greatly increases production costs, relative to revenues, unless larger market shares or a price premium for more sustainable production can be obtained from the final consumer and passed on to the producer to offset these costs. For example, requiring soybean farmers to rehabilitate degraded lands for production would substantially increase input costs for soybean oil and meal producers. In the face of such restrictions, companies are better off abandoning operations in very fragile areas where there is a large environmental risk and awareness of the role of the company in exacerbating such risk.

2.2.1.3. *Environmental governance at origin is strong and supportive.* The stronger the governance system at origin, the higher the willingness a company would have to invest in voluntary CSR instruments that go beyond compliance with local regulations (Rodriguez et al., 2014). Strong governance systems reduce country risk and may provide support to private sustainability instruments in ensuring compliance (Carter and Rogers, 2008). Typically, countries with middle to high-income levels, such as most of Latin America, do provide such an institutional support while most sub-Saharan African countries do not (Collier, 2008). Companies such as Mars that source cocoa from Côte d'Ivoire or Ghana have fewer incentives to adopt strict environmental instruments, compared to companies, such as Chiquita that source bananas from Costa Rica, Ecuador, or Colombia. Instead, they might opt for strengthening the production conditions at origin through technology transfer and farmers' support that would later lead to the adoption of stricter standards, as the environmental practices and governance institutions improve.

2.2.2. Leverage over upstream suppliers

2.2.2.1. *The company exercises effective control over its supplier.* Vertical integration reduces transactions costs derived from implementing, overseeing and enforcing the establishment of sustainability instruments with suppliers (Deininger and Byerlee, 2012). Because companies are able to exercise control on the supply, their standards can be more enforceable and thus more credible (Wahl and Bull, 2014). Supply chains for sugar, palm oil, and bananas are highly integrated and thus have more leverage over changing production practices compared to those where disperse smallholders prevail, such as cocoa, coffee, or rubber.

2.2.3. End market characteristics

2.2.3.1. *The brand recognition is high and the raw material is highly visible in the final product.* High-brand recognition leads to a high value but also a high reputational risk attached to the brand (Godfrey, 2005). If the brand recognition is high, and the final product is highly visible in the eyes of the consumer, companies are better off developing a code of conduct, that is moderately stringent

and whose results can be communicated to consumers. Coffee for example, is only minimally processed and everything from production practices to roasting influences the flavor of the bean. Thus roasting companies can use their own code of conduct to enhance production practices while supporting their brand. For other products, such as palm or soybean oil, opportunities for differentiation based on quality or origin are slim. Few consumers are aware that their soap or biscuits are made from palm oil whose production may have led to the conversion of primary tropical forests. Companies in those sectors maybe be better off adopting a pre-competitive instrument, in which industry-wide commitments to sustainability are made and companies gain a “license to operate” but without necessarily investing on very strict standards and expensive communication campaigns. When brand recognition is low, companies may be better off committing to compliance with a retailer-imposed code of conduct that gives them access to clients and markets, without having to invest in positioning a brand. These mechanisms tend to be business-to-business engagements in which the supplying company ensures compliance with a standard but such compliance is seldom communicated to consumers under the form of an external seal or label. Instead, compliance is used to enhance the super-market brand value as a responsible retailer (Haddock-Fraser and Fraser, 2008).

2.2.3.2. The raw material is only made in a specific place and its quality attributes cannot be replicated. If product quality is linked to the unique biophysical climate and cultural practices in that region (e.g., coffee or cheese), companies are better off trying to protect the place of origin for that product and traditional production practices via Appellations of Origin. If the product is more generic (e.g., bananas or soybeans), third-party certification standards are a better option, as they show the company's (and brand's) commitment to sustainability, but sourcing can come from different places, thus supplying the mass market. As quality becomes attached to specific places, manufacturing companies start to move from third-party certification to origin certification to capture the value linked to the specific origin and quality, without losing their commitment to environmental improvements.

Based on the above analytical framework, we developed a decision tree to predict which instrument will be chosen by agri-food companies (Fig. 2). A company's decision begins at stages of environmental risks and community awareness of such risks. If neither of these conditions exists for the commodities and regions in question, a company will not adopt an environmentally-focused sustainability instrument. If they do exist the specific instrument chosen will depend on the unique combination of pressure points, leverage, and competitive context that apply to that company for the commodities, regions, and end-markets in question.

2.3. Case studies

For an initial testing of the analytical framework outlined above, we selected seven case studies based on heterogeneity in both the dependent and independent variables: i) coverage of all seven types of agri-food sustainability instruments outlined above, and ii) coverage of a wide range of commodities, regions, and end-markets. Case selection and description was based on the existing literature, non-directive interviews with company executives from Mars Inc, Chiquita Brands Inc., and Asocolflores, and our own empirical research on some of the commodity supply chains (Garrett et al., 2016; Lamarque and Lambin, 2015; Rueda and Lambin, 2013). Our small-N comparative case study approach allows us to consider the full contextual complexity of existing sustainability instrument adoption in the agri-food industry when inductively tracing the causal mechanisms that lead to the adoption

of a particular instrument. This approach limits generalizability vis-à-vis statistical analysis, but enhances the conceptual validity of our conclusions (George and Bennett, 2006).

2.3.1. Case A. Cargill in Brazil

The production of soybeans reached 278 million tons in 2013 (FAO, 2015). The main producers are the United States, Brazil, and Argentina. Four large multinational companies—ADM, Bunge, Cargill, and Louis Dreyfus—dominate the global trade and processing markets for soybeans (Goldsmith and Hirsch, 2006; James et al., 2013). The major importers of Brazilian soybean products are China (27%) and Europe (7%).

In 2007, Greenpeace led a campaign against deforestation for soybean production. Cultivation in the Brazilian Amazon has been associated with large environmental impacts that are widely publicized (Greenpeace, 2006), such as the conversion of native vegetation to intensive agriculture and the displacement of cattle ranching into the Amazon biome (Barona et al., 2010; Arima et al., 2011; Brannstrom et al., 2008; Macedo et al., 2012). Soybean production there requires intensive usage of lime, fertilizers, and pesticides (Garrett et al., 2016). Because of the large environmental impacts and NGOs' pressure, members of the Brazilian Association of Vegetable Oil Industries (Abiove) and the National Association of Cereal Exporters (ANEC) signed a moratorium, that is, a voluntary agreement for not purchasing soybeans produced in areas deforested after July 24, 2006. The moratorium was renewed until May 2016, when it was renewed indefinitely (NWF, 2015).

2.3.2. Case B. Mars Inc. in West Africa

Five million tons of cocoa are produced every year (FAO, 2015). West Africa produces close to 70% of the total output, mainly from Côte d'Ivoire and Ghana. Global trade is highly concentrated as 5 grinders—Cargill, ADM, Barry Callebaut, Petra Food and Blommer—control over 50% of the global market (Tropical Commodity Coalition, 2012). The chocolate manufacturing sector is dominated by 5 companies—Kraft, Mars, Nestlé, Hershey's and Ferrero (Ibid). Mars is a US-based company in the food and beverages sector, with annual net sales in candy products alone of close to \$17 MM, representing 15% of the global chocolate market.

Cocoa's environmental impacts are large but have remained largely unknown to markets. From the 19th century, it expanded from South America, to the rest of the Americas, Africa and South East Asia. In West Africa, cocoa expansion has historically been the main source of deforestation (Gockowski and Sonwa, 2011; Rice and Greenberg, 2000). Issues of child labor and modern forms of slavery have been the main concerns in the cocoa industry, above environmental issues (Tropical Commodity Coalition, 2012).

2.3.3. Case C. Starbucks Corp. buying from multiple origins

Global Coffee production reached 8.8 million tons in 2012 (FAO, 2015). Brazil, Vietnam and Indonesia dominate the market with 56% of total production. The value chain is highly concentrated: three very large transnational companies – Nestlé, Mondeléz and DE Master Blenders 1753, and a few big coffee roasters such as Smucker's, Strauss, Starbucks and Tchibo—control most of the coffee consumed worldwide (Panhuysen and Pierrot, 2014). Coffee has seen a process of product differentiation based in both quality and sustainability claims (Rueda and Lambin, 2013), of which Starbucks is perhaps one of the pioneers and the most successful example (Thompson and Strickland, 2003). Starbucks is the largest coffee house in the world, roasting and selling its own coffee directly to consumers with estimated revenues of US\$13 billion annually.

Table 1
Sustainability instruments in the agri-food sector organized by scope (e.g., supply actor bound by the instrument).

Instrument	Supply chain actor bound by the instrument	Description	Are suppliers asked to conform with the instrument?	Are nature conservation laws and practices included and enforced in the instrument?	Means of verification of compliance & actor in charge
Direct investment at origin	Producer	Allocation of technical & financial resources to develop projects in the field. Includes resources for improving farming practices (e.g., planting material, technical assistance, fertilizers) or for improving living conditions of local communities (e.g., provision of drinking water, electricity, schools or clinics).	No	No	1st party: The company decides how much to invest, how to monitor resource use and how to communicate its efforts to clients and consumers.
Geographic indications	Producer + Manufacturer	They refer to the geographical environment—and, in specific cases, also to the cultural practices—where a product is grown or produced, and whose quality is dependent on that location (Barham, 2003). Appellations of origin are a type of geographic indication that include protection of the place of origin and of the characteristics of the traditional production method. Appellations of origin are protected by intellectual property rights, through formal systems, trademarks, certification marks, collective membership marks, and denominations of origin (Giovannucci et al., 2009).	Yes, in order to be purchased as certified and for the product to bear the label	Compliance with local regulations is required. Under Appellations of origin the protection of the place of origin and of the characteristics of the traditional production method is required.	2nd-party: The standard is set by the association of producers of the specific locale and compliance is audited by an independent party.
NGO-led certification	Producer + Manufacturer	NGOs devised standards for the social, environmental and economic conditions of production. They typically cover tropical commodities that rely on manual labor—where concerns over both labor and environmental conditions are high. Coffee, bananas, tea and cacao are the bulk of this type of certification. The standards have strong scientific support and input from stakeholders. The main certification programs in the food market today include Rainforest Alliance, UTZ, Fairtrade, and Organic ^{a,b}	Yes, in order to be purchased as certified and for the product to bear the label	Compliance with local and international regulations is required. Additional protection for land cover, biodiversity, and water resources, and fair labor practices are also mandatory	3rd-party audited; full separation and traceability is required throughout the supply chain.
Multi-stakeholder commodity roundtables	Producer + Manufacturer	These have proliferated in recent years, under the encouragement of global environmental NGOs, particularly WWF. They include products like palm oil, aquaculture, cotton, sugar, biofuels, soy, seafood, beef, cacao, forests, and even water (WWF, 2013). Government agencies have offered financial support to the roundtables but have not directly participated, with the exception of the Roundtable for a Sustainable Cocoa Economy (Brassett et al., 2010).	Actors in the roundtable share best practices and may establish their own code of conduct for production practices that include social, economic and environmental aspects.	Standards comply with local regulations regarding land use restrictions. They can be more ambitious than those established by supra-national organizations such as the WTO (Brassett et al., 2010). Critical issues, such as threats to biodiversity, tend to be left out (Djama and Daviron, 2010). In some cases, such as the Roundtable for Responsible Soybeans and the Roundtable on Sustainable Palm Oil production, certification can only be granted to farms that follow rules restricting new land conversion from native vegetation (RSPO, 2013; RSTS, 2014).	No audit required for joining the roundtable. When a standard is developed, a third-party organization audits compliance. Manufacturing companies are only bound to comply with reporting purchases of compliant products; full traceability is not required. Roundtables could lead to the adoption of more demanding instruments, such as bans and moratoria (see below).
Internal code of conduct	Producer + Manufacturer	Individual firms define a set of criteria that may include aspects of quality, safety,	Producers are required to declare their degree of compliance with the code of	Land use regulations (e.g., conservation of riparian vegetation) are included to	2nd-party: Usually verified by independent party

		production practices, and traceability to ensure product compliance with a minimum standard set by the firm. Producers are required to declare their degree of compliance with the code of conduct, and to show continuous improvement over time, but are not excluded from supplying if some of the criteria are not met. Companies ensure traceability and product separation through the supply chain.	conduct and to show continuous improvement over time, but are not excluded from supplying if some of the criteria are not met.	the extent that they are part of the regulatory framework in the producing country.	
Retailer-imposed standard	Producer + Manufacturer + Retailer	Driven by concerns over quality, food safety and reputational risk, global retailers have imposed a series of requirements on their suppliers. EurepGap (Now GlobalGap) was the first of these efforts, launched in 1997 by a coalition of European supermarkets (Nadvi, 2008) to set a European-wide harmonized standard covering food safety, sustainable production, workers and animal welfare, responsible use of water, compound feed, and plant propagation materials. Today GlobalGap comprises 16 standards covering 400 crops, livestock and aquaculture products, and more than 112,600 producers in over 100 countries (GLOBALGAP, 2016). These standards meet and often exceed the legal requirements of the countries of consumption, and are a barrier to entry for non-compliant suppliers. These codes apply to manufacturing companies as well, but retailers are not bound to comply with the environmental and social standards set to producers and manufacturers.	Yes, in order to be purchased as certified and for the product to bear the label	Compliance with local regulations is required. Under Appellations of origin the protection of the place of origin and of the characteristics of the traditional production method is required.	2nd-party: The standard is set by the association of producers of the specific locale and compliance is audited by an independent party.
Bans and moratoria	Producer + Manufacturer + Retailer	These are extreme actions undertaken by corporations, other actors in the supply chain, or consumer groups to restrict their practices so completely as to stop production or purchases from places where the environmental or social conditions are highly detrimental and where no sustainable alternative can be foreseen.	Yes, in order to be purchased as certified and for the product to bear the label	By excluding high conservation value areas from production, this type of instrument has a high probability of effectively protecting valuable ecosystems.	Enforceability is usually a combined effort between governments and companies, but companies committing to the ban adopt traceability systems that allow them to ensure compliance of their suppliers.

Source: Authors.

^a Organic certification is the only standard that became a government-defined code in most countries, due to the proliferation of seals in the market and the pressures from large agricultural corporations to have a level field in which to participate.

^b ISO 14001 is also part of this group. Compliance with the ISO 14001 standard is highly demanding and is seldom applied to tropical commodities that are processed elsewhere, probably due to the high cost of adoption in developing countries (Neumayer and Perkins, 2004).

2.3.4. Case D. Chiquita Brands Inc., a vertically integrated company

The global production of bananas reached 102 million tons in 2012 (FAO, 2015). Most of it is consumed domestically and only 20% reaches the international market. Latin America represents 70% of total exports. Chiquita, Dole and Del Monte represent 37% of the market, down from 65% in the 1990s; and Chiquita alone accounts for 18.7% of the market (FAO, 2014).

Starting in the early 1990s, Chiquita faced pressures from civil society to respond to the social and environmental risks caused by the industry (Human Rights Watch, 2002). Bananas are planted as a mono-crop, with high use of pesticides as they are highly susceptible to plagues and diseases. The cultivation requires abundant water but also drainage. The hydrology of many coastal areas, particularly in Latin America, has been greatly altered to make room for banana's expansion (Byerlee and Rueda, 2015).

2.3.5. Case E. Cheese in the French Alps

The Rhône-Alpes region, located in the northern French Alps, is famous for its cheese production. Mountain regions include multiple *terroirs*, and strong identities and traditions related to agricultural production and food processing (Santini et al., 2013). Adding-value by producing and labeling high quality products is one of the strategies adopted by farmers to protect traditional practices from being standardized and to compensate for higher production costs to compete with non-differentiated markets.

2.3.6. Case F. The Colombian cut-flower industry

Colombia is the second world exporter of cut flowers after Holland. There are over 200 companies that produce and export the flowers, mainly to the US market but also to Europe and Japan. Beginning in the early 1990s, environmental, health, and safety issues began to receive considerable attention in global flower markets. Some countries—notably Germany—initiated schemes to certify that flower suppliers met environmental and health safety standards (i.e., the Flower Label program), related to water and pesticide use, mainly. This demand coincided with adverse publicity, including the documentary “Love, Women and Flowers” (1988) that denounced female exposure to highly toxic pesticides in the Colombian cut-flower industry. Local environmental authorities not only provided the threat of regulation, but signed voluntary agreements with the sector to improve practices in the crop (Blackman et al., 2013).

2.3.7. Case G. Wilmar International Ltd. in Indonesia

Global palm oil production totaled 55.8 million tons in 2013 (FAO, 2015). The main producers are Malaysia and Indonesia, accounting for roughly 82% of global supply. Indonesia is now the single largest producer of palm oil in the world with 26.9 million tons/year (about 48% of global supply). About 50–70% of the new oil palm area in Indonesia came from clearing intact or logged forests (Carlson et al., 2012; Miettinen et al., 2012). Largely due to conversion for oil palm, rates of deforestation in Indonesian Borneo (or Kalimantan) increased by 50% between 2004 and 2012 and now exceed deforestation rates in the Amazon (Hansen et al., 2013; Margono et al., 2014). The replacement of primary forest with oil palm monocultures results in substantial carbon dioxide emissions as well as loss of habitat for biodiversity. It also reduces the cultural ecosystem services available from these landscapes (Carlson et al., 2012; Chan et al., 2012). Greenpeace and other environmental groups began pressing oil palm producers and exporters in the early 2000s in an effort to halt deforestation.

The palm oil supply chain is highly concentrated at the manufacturing and trading stages and largely dominated by two companies—Wilmar International and Cargill. Wilmar is the largest oil palm plantation owner, the largest processor and merchandiser

of palm oils, and the largest palm biodiesel manufacturer in the world. It controls about a third of the world trade (Wilmar, 2015). Wilmar operates over 160 processing plants in more than 20 countries, with a primary focus on Indonesia, Malaysia, China, India and Europe. Wilmar does not typically sell its products directly to consumers, rather it sells meal and oil to consumer goods manufacturers like Unilever, Nestlé, and Procter and Gamble (Wilmar, 2015). The company processes palm fruit from thousands of providers. Once the fruit gets to the mill, the supply chain is vertically integrated, from processing to trade.

3. Results

3.1. Case A. Cargill adoption of Brazil's soy moratorium: A high stringency instrument for fragile ecosystems, when no alternative exists

Cargill decided to become a signatory of the soy moratorium.¹ The company has large market shares and a relatively high level of control of its suppliers, which allows it to exercise the required leverage along its supply chain to enforce a strict environmental standard. Although the company does not own soybean farms in Brazil, it owns processing facilities and ports in that country, and manages the distribution and logistics portion of the soybean supply chain. Commitments were credible given Brazil's relatively strong environmental governance. Brazil already had stringent institutions governing deforestation on private properties in the Amazon prior to the establishment of the moratoria (Garrett et al., 2016), and in the late 2000s the country scaled up its capability of enforcing them.

In the market, soybeans are hardly recognized by consumers; they are crushed and processed into soybean meal for livestock feed, cooking oil, biodiesel, or food ingredients. They have low potential for differentiation based on quality. Cargill produces, distributes and sells processed soybean products under many different brand names (i.e., Crisco), so the broader Cargill brand is rarely recognizable in the final product. These factors explain why Cargill accepted to be part of the moratoria, committing not to contribute to additional deforestation in the Amazon basin, with great confidence in its ability to enforce the ban to all its providers, but not necessarily communicating its efforts to the final consumers.

3.2. Case B. Mars' investments at origin: A starting point for more stringent requirements in the long-run

Mars, the chocolate giant, has put forward a “Sustainable Cocoa Initiative” with a diversified portfolio of instruments to advance sustainability. Nevertheless, investments in productivity and research and development take precedence (Mars, 2013). Its “Vision for Change” program is based on: i) helping farmers improve productivity; ii) promoting good agricultural practices to increase soil fertility; and iii) invigorating rural communities to improve their living standard (FSG, 2013). The company has also committed to certify 100% of its supply as sustainably produced, but that commitment has been delayed until the year 2020 (Child, pers com.).

In terms of leverage in the supply chain, Mars faces high costs in trying to implement strict sustainability instruments. First, it faces a fragmented supply chain and relies on local and international

¹ Cargill also participates in the Round Table for Responsible Soy (RTRS), a multi-stakeholder instrument. Although the RTRS developed a third-party certification scheme, adoption is still negligible (Garrett et al., 2016).

traders to collect the supply from scattered, poorly organized smallholders, who do not have the means and technology to improve practices and increase yields (Matissek et al., 2012). Secondly, the institutional support to adopt better farming practices and environmental protection is weak in many West African countries, as states have relatively low capacity to design, implement and enforce environmental policies (IUCN, 2014).

The competitive advantage that Mars would gain from adopting, enforcing and communicating a very strict sustainability standard to its consumers is limited. Although the chocolate taste is emblematic of all chocolate bars, cocoa is usually not the main ingredient in the bar. The origin of the cocoa in the final product is never disclosed to consumers. Mars provides for the mass market and not for niche markets. The company has over 20 brand names, diluting the brand recognition in the mind of consumers. In sum, Mars faces very limited incentives to choose a very strict environmental standard, since it lacks the ability to make its commitments credible and enforceable, institutional support at origin is weak, and consumers' awareness of environmental issues is low. Furthermore, the enactment of strict standards might actually negatively impact the more marginal producers, given their low capacity to adopt new technologies. The company therefore decided to invest in promoting sustainable agriculture practices that increase productivity, as a precondition to a stricter certification instrument to be adopted in the future.

3.3. Case C. Starbucks' internal code of conduct: Balancing stringency, market differentiation and a diffuse value chain

In 1998 Starbucks, with the support of Conservation International, developed its own code of conduct, the C.A.F.E Practices, which is independently audited. To be a Starbucks provider, a cooperative or exporter must identify the farmers' current practices and compare them to the code to obtain a score. Then, it must produce an improvement plan to implement changes in order to meet the required level or practice. The standard is becoming mandatory for all Starbucks producers, but it is based on a verification system that measures improvements over time, not necessarily compliance with a set level from day one. By 2013, 90% of the coffee bought by Starbucks was involved in C.A.F.E practices, and the goal for 2015 is to reach 100%. Starbucks also purchases some Fair Trade coffee (about 8% of its supply) and organic (1%) (Semroc et al., 2012).

Coffee's environmental impacts are mainly associated with the conversion of shade-grown, diverse agro-ecological systems to sun-exposed mono-crop cultivation. This intensification of coffee cultivation impacts biodiversity (Perfecto et al., 1996). It also causes soil degradation and a high dependency on synthetic fertilizers and pesticides. Additionally, the de-pulping of washed Arabica coffee, which represents about 33% of global output and the bulk of Starbucks' purchases, can use large amounts of water that causes eutrophication of downstream water (FNC, 2008). Concerns over these unsustainable practices in coffee production have been put forward by the main NGOs promoting sustainable agriculture since the early 1990s (FLO, 2013; Perfecto et al., 1996; RA, 2012). Although most practices could be improved, Starbucks faced high costs of implementing more sustainable technologies, because it lacked control over the supply chain to enforce changes at low cost. Starbucks sources its own coffee from 27 countries in Latin America, Asia and East Africa, with no control over production methods or crop traceability—millions of farmers produce the beans, and sell through hundreds of thousands of local traders and cooperatives (Semroc et al., 2012). Therefore, it has very little leverage to induce the adoption of a very strict standard. Additionally, the institutional environment in producing countries is very uneven

and not always conducive to the enforcement of high standards (Dasgupta et al., 2001).

In spite of these limitations, an opportunity existed for Starbucks to increase its revenues from engaging in sustainability efforts and communicating those efforts to consumers. Coffee is sold fresh with very little processing; the raw material is highly visible to consumers. Coffee has been the poster child of product differentiation based on physical and sensorial quality attributes as well as efforts towards sustainability (Ponte, 2002; Roseberry, 1996). So companies operating in the coffee sector have large incentives to create their own code of conduct, to communicate their efforts, and use them as a differentiating factor in the market. Together, the above factors explain why Starbucks opted for an instrument that is relatively weak on producers—i.e., requires improvement toward standards defined by the company, not *a priori* compliance—but that sends a strong signal to consumers through independent verification and labeling.

3.4. Case D. Chiquita's third-party standard: when all conditions align

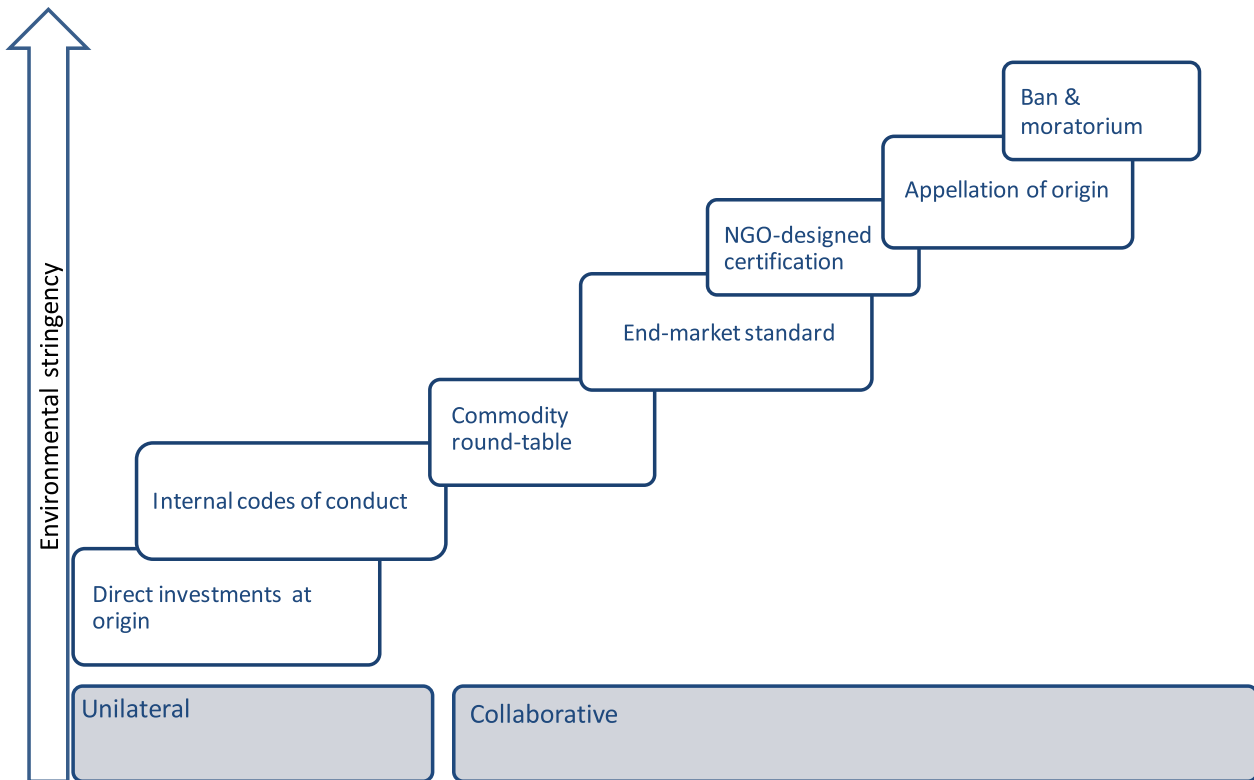
After working with the Rainforest Alliance for several years to improve practices in banana plantations, Chiquita adopted the Rainforest Alliance certification in 2004. By now, it has achieved 100% coverage. The transition to more sustainable practices was feasible because the company could replace high toxicity pesticides with lower toxicity ones. Water management and biodiversity conservation measurements were implemented, helping the company reduce cost and use resources more efficiently. Environmental institutions in México, Colombia and Ecuador, the main countries of origin, were becoming stronger in the same period, providing the necessary support to Chiquita for enforcing the new practices, and leveling the field for all competitors. In addition, implementing the required technological change was feasible as Chiquita sources about 50% of its bananas from its own plantations, while the rest comes from medium and large-scale providers with long-term contracts. Adopting certification certainly affected costs, but given the company's high market share and vertical integration, it had the required leverages to enforce compliance in the plantations it operates or contracts from. It could therefore more easily absorb the extra costs than if acting in a perfectly competitive market.

Finally, profit and market share considerations suggest that Chiquita had incentives to add value to its brand and communicate its efforts to consumers by adopting a strong sustainability standard that bore a label, given the high visibility of the raw material in the final products (raw bananas and fruit beverages).

3.5. Case E. Appellations of origin for cheese in the Alps: Protecting unique landscapes and their products

The Massif des Bauges is part of the pre-alpine mountain range. Cheese producers there, facing a highly competitive market, adopted various geographical indications that do not increase production costs but differentiate their products. The first regional label was launched in the late 1970s. In the early 2000s, a group of farmers applied for and obtained a Protected Indication of Origin (PIO) for the *Tome des Bauges*, a cheese that is produced only within the *Massif des Bauges* (Lamarque and Lambin, 2015).

This labeled cheese production is subject to specific requirements for herd feeding, dairy cattle breeds, and limitation of production volume. Some requirements for cheese production are linked to land management. Milk has to be produced and processed in prescribed areas, coming from herds of dairy cows with a given percentage of local cow breeds. The *Tome des Bauges* PIO limits annual milk production at 5500 kg per lactating cow on average for



Note: We define stringency based on three criteria: i) whether suppliers are asked to conform to a specific standard or whether it is sufficient to show general improvement in practices towards a goal; ii) whether specific on-farm and off-farm conservation measures are included and enforced in the instrument; and iii) whether the responsibilities of verification and compliance are third, second, or first-party, or not done at all.

Fig. 1. Sustainability instruments in the agri-food sector organized by environmental stringency, e.g. potential to reduce negative environmental impacts.

the herd. The composition of the staple feed of the herd requires a minimum time on pasture, and prescribes the quantity, type, and origin of hay consumed during the winter period (Lamarque and Lambin, 2015). By adopting geographical indications with stringent constraints, the challenge was not to reduce negative environmental impacts from the dairy sector, but rather to help maintain traditional, non-industrialized extensive agricultural practices that conserve the ecosystem services provided by multi-functional Alpine landscapes, including their aesthetic qualities.

Several actors are involved in the cheese supply chain, but the chain is highly coordinated. Milk is collected daily in each farm by the dairy cooperative, of which farmers are shareholders. These cooperatives transform milk into cheese and leave it to mature either completely or partially, in maturing cellars. The final product is then sold mainly by direct sale in the Rhones-Alpes region.

All producers are members of professional organizations in charge of the product. These organizations are in charge of the management, promotion and label protection of the product, the development of product specifications, and participate in the definition of the auditing plan. The certification process is performed through an external auditing firm. A strong and supportive governance system both nationally and regionally led associations of farmers to adopt a sustainability instrument with a strict verification and compliance system (Lamarque and Lambin, 2015).

The PDO *Tome des Bauges* is becoming the flagship product of the Massif des Bauges and is developing its commercial marketing in close collaboration with the agro-environmental activities of the “Parc Naturel Regional du Massif des Bauges”. The raw material (i.e., the milk) is highly visible in the cheese product, which can be differentiated based on taste. Farmers’ associations therefore had

an incentive to adopt a sustainability instrument that differentiates the product based on its unique location and to communicate it to consumers.

3.6. Case F. Retailer-imposed standards for Colombia's cut-flower industry: Gaining market shares when branding does not exist

The Colombian flower sector had already started to address environmental and social issues through a series of studies (Ministerio de Ambiente de Colombia, 2005). In 1996, the Association of Flower Growers and Exporters (Asocolflores), created a voluntary code of conduct that eventually led, in 2005, to a certification program of its own, called Florverde, independently audited. The program was based on cleaner production (less water, less energy and fewer toxic inputs), continuous improvement, measuring, recording and benchmarking (comparing each farm to others in the program). In 2008 that standard and its regulatory document were benchmarked against the GLOBALG.A.P. standard. GLOBALG.A.P. is an effort led by European retailers to ensure that products sold in their super-markets meet (and in some cases exceed) European environmental regulations and international labor treaties. Nationwide, 65 flower-exporting companies (equivalent to 32% of the industry and 39% of cut-flowers total exports) are GLOBALG.A.P.-certified.

Benchmarking the internal code to the retailer-imposed standard made sense for the Colombian companies that export to Europe: environmental and health risks associated with the production of flowers were substantial and widely known, at least in the European markets. Besides, the companies were also facing increasing pressures from the Colombian environmental

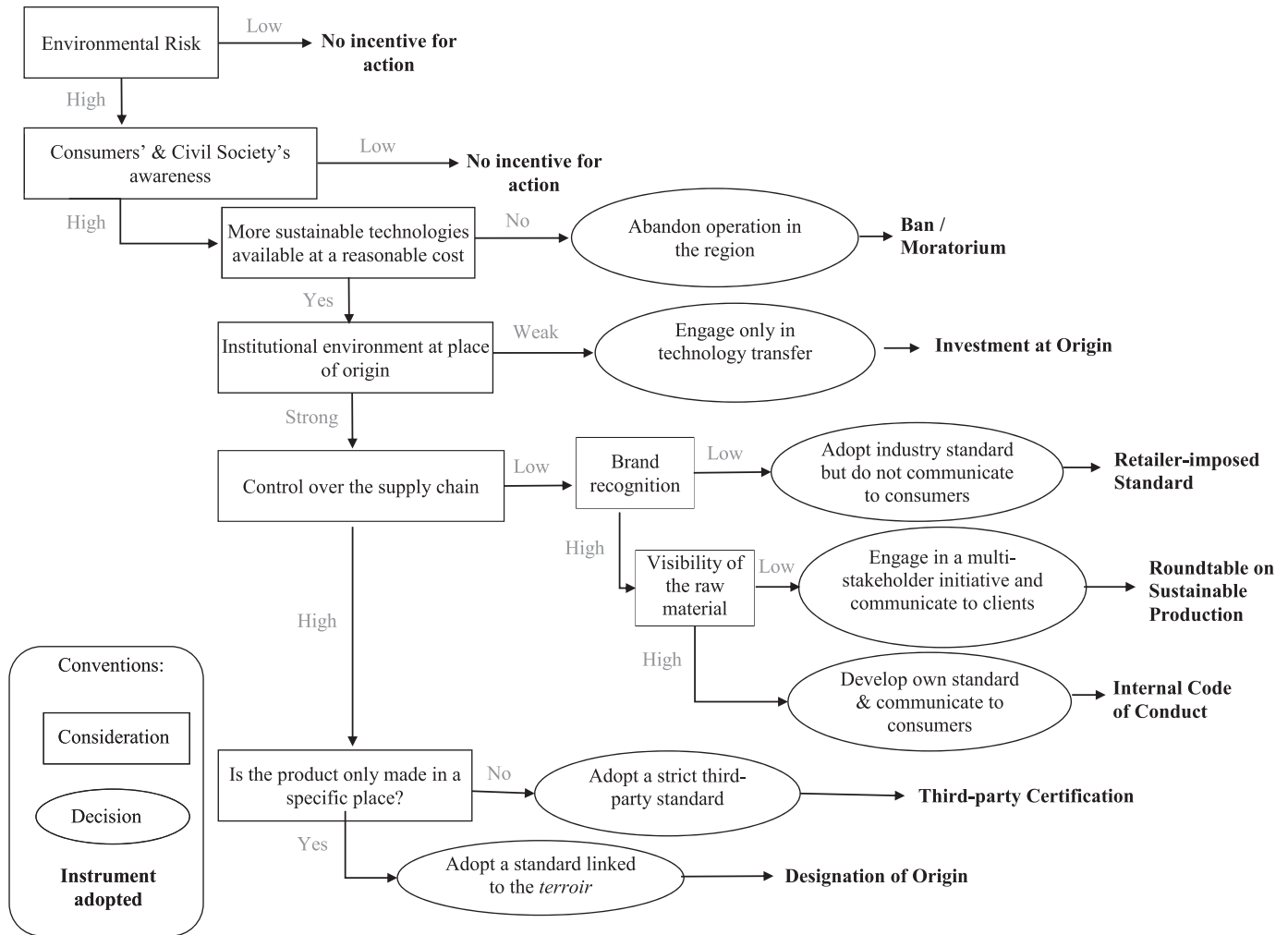


Fig. 2. Decision tree for firms' selection of a sustainability instrument.

authorities to reduce their water usage and improve pesticides use and disposal (Blackman et al., 2013). The industry association had invested considerably in improving practices and it already had a research center devoted to yield improvements and sustainable technologies, and an environmental management program to support technology transfer. Flower companies in Colombia are fairly integrated, as farmers produce, assemble and export finished bouquets. Introducing sustainable practices in such a highly integrated business was relatively cost-efficient, particularly for the larger companies. The Colombian flower sector, as a whole, has a large share of the international market (it is the second largest exporter after Holland), which also allowed exporting companies to engage in this certification scheme, funding its costs from their mark-up. Although exporting companies do not use their brand's name in the finished product, the raw materials (flowers) are the fundamental component of the finished product (the flower bouquet). Colombian flowers could greatly benefit from the differentiation of their product, if not directly to consumers, at least to retailers.

3.7. *Case G. Wilmar's involvement in a multi-stakeholder agreement: A pre-competitive alliance to obtain a "license to operate"*

Wilmar International joined the Roundtable on Sustainable

Palm Oil (RSPO) in 2005, in response to acute criticism from Greenpeace. RSPO was one of the first commodity roundtables, promoted by the World Wildlife Fund, a non-governmental conservation organization, concerned about the environmental and social impacts of oil palm. The roundtable provided a forum where farmers, processing and trading companies, as well as banks, retailers and consumer groups can discuss ways to improve the sustainability of the supply chain (Auld et al., 2009). Members jointly develop environmental and social standards and vote to approve or reject them.

Willmar sells oil palm materials to consumer goods manufacturers, which are often combined with many other ingredients to make highly processed products. It has no brand recognition in the mind of the consumer, no differentiated product. It has however, a very close relationship with large companies that directly engage with consumers (i.e. Nestlé and Unilever). Thus, the company needed to address sustainability concerns to the extent it was feasible, given the highly dispersed number of suppliers. Thus, Wilmar joined RS in 2005, proving its commitment to improving conditions in the supply chain, and subsequently pledged to make 100% of their supply compliant with RSPO standards by 2015, requiring the company to ensure that its business was not directly contributing to increase deforestation in Indonesia, and providing it a "license to operate" (Wilmar, 2015).

Table 2
Summary results of applying the framework to the case studies.

Criteria	Company (commodity)						
	Cargill (soybeans)	Mars Inc. (cacao)	Starbucks corp. (coffee)	Chiquita brands INT. (bananas)	Apilne producer associations (cheese)	Colombian exporters (cut flowers)	Wilmar international limited (palm oil)
1. Conditions at origin							
1.1. More sustainable technologies are available at a reasonable cost	NO	YES	YES	YES	YES	YES	YES
1.2. Environmental governance at the place of origin	STRONG	WEAK	DEPENDS ON THE COUNTRY	STRONG	STRONG	STRONG	STRONG
2. Leverage in the supply chain	HIGH	LOW	LOW	HIGH	HIGH	HIGH	HIGH
3. End-market conditions							
3.1. Product made only at a specific place	NO	NO	NO	NO	YES	NO	NO
3.2. Brand recognition	LOW	HIGH	HIGH	HIGH	HIGH	LOW	HIGH*
3.3. Visibility of the raw materials	Low	HIGH	HIGH	HIGH	HIGH	HIGH	LOW
Decision made	Ban or Moratoria	Investments at origin	Internal code of conduct	Third-party certification	Appellation of origin	Retailer-imposed standard	Multi-stakeholder initiative

Source: Authors

4. Discussion

Bringing together relevant literature on business strategy and sustainability, we proposed an analytical framework for understanding what factors determine private commitments to sustainable green production in the agri-food sector. We then applied the framework to a wide range of companies and products to illustrate how the analytical framework played out in recent decisions made by these companies (Table 2).

The framework showed that companies that do not have sustainable technologies available to improve their environmental practices but operate in highly sensitive places are better off taking their operation somewhere else by implementing a ban or moratorium. The reputational risks associated with sourcing from highly sensitive zones, such as the Amazon biome, are too high, given that production can come from elsewhere.

Enforcement of social and environmental regulations at countries of origin is a key factor that deters companies from adopting very strict standards, even if they have a brand value to enhance. Companies such as Mars or Starbucks face weak institutions in countries in West and East Africa that prevent them from introducing very strict standards. Instead, they have opted for investing in the farming communities to improve productivity and livelihoods, before committing to higher standards. In the case of Starbucks, the design and implementation of its own code of conduct has allowed the company to include suppliers who do not comply with all the requirements the company would like them to fulfill, but who are on a path to become more sustainable.

Companies with available cleaner technologies, effective law enforcement and control over the supply chains, as well as a brand to protect, can capitalize on their environmental efforts by introducing strict standards, such as third-party certifications. That is the case of Chiquita, a highly visible brand, vertically integrated company that has worked with the Rainforest Alliance to improve labor and environmental conditions in banana fields.

Even when conditions at origin are propitious, companies might restrain from engaging in their own sustainability standards because of marketing costs. When companies lack a brand in the market, efforts to position their own sustainability efforts will be too expensive compared to the gains. In these cases, companies are better off adopting sustainability standards developed by retailers (such as in the case of cut flowers) or by industry-wide agreements (such as in the case of palm oil). Such sustainability initiatives do not require large investments in positioning, but give support to the buyers of the product: the super-markets, in the case of flowers, or Nestlé, Unilever and the other buyers on palm oil, who do face consumers and have a brand reputation to take care of.

Finally, appellations of origin are a great strategy for highly differentiated products only if they are produced in a specific place of origin. Generic products would have a hard time convincing the market of their differences with close substitutes. Note that firms might use a combination of instruments to advance their sustainability agenda, or might evolve from one type of instrument to another, as its leverage, suppliers, and market outlets change.

It has been argued that competing labels and company programs generate confusion among consumers and create space for opportunistic use of false claims and greenwashing (Mitchell and Papavassiliou, 1999; Lyon and Montgomery, 2015). We argue that the multiplication of private labels and initiatives are, in most cases, not driven by a desire to disorient the consumer, but rather by a careful consideration of the complex conditions under which agri-food supply chains operate. These complex conditions include not only the geographical, logistic, and cultural challenges of globalized value chains, but also the specific characteristic of knowledge production and technology transfer, global and local

legislation, and pricing mechanisms. Once these conditions are understood, it is possible to comprehend why Nestlé would commit to 100% sustainable palm oil coming from tropical regions while working with technology transfer and quality improvements in, for example, milk districts around the world (Goldberg and Herman, 2007).

With minor adaptations, the framework could also be applied to other economic sectors that have environmental impacts, from mining and energy-generating industries, to apparel, and electronics. The specific environmental issues would vary—from land-use to water use and pollution—as will the stakeholders, and the specific instruments to address them; but the proposed rationale for understanding corporate behavior can be generalized to other industries in which hybrid forms of environmental governance are becoming prevalent.

5. Conclusion

In recent decades, private actors have devised a rich menu of instruments to promote sustainable sourcing, contributing to policy innovations to deal with environmental problems. We have argued that conditions in the countries of origin, arrangements in the supply chain and end-market characteristics combine to explain how corporate interest in sustainability translates into strategic choices, with specific commitments to environmental stewardship. We have moved the discussion on environmental governance one step further, inquiring not only about why companies engage in such efforts but how they select the specific instruments for action, depending on characteristics of their environment. The interaction of these factors results in tailor-made commitments to environmental stewardship, from very loose to highly ambitious ones. Blanket evaluations of the impacts of these hybrid forms of environmental governance will prove of little use. The intent, scope, and scalability of each instrument are different because each one has been devised to respond to specific organizational structures and institutional contexts. There is a large transaction cost in engaging with an industry to promote the sustainability agenda. Understanding *a priori* which are the best “buttons to press” in a given context is likely to yield considerable benefits. A promising field of inquiry is outlined here that can sharpen our understanding of corporate choice and should serve as the basis for assessing private firms’ impacts on the provision of ecosystem services and the long term sustainability of the export-oriented agricultural sector.

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