



## Traceability for Sustainability: Seeking Legitimacy in the Coffee Supply Chain

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## Traceability for Sustainability: Seeking Legitimacy in the Coffee Supply Chain

### Abstract

**Purpose:** The adoption of traceability systems and sustainability programs responds to different objectives among which the companies' need to be considered legitimate, hence, the aims of this study are first, to identify what is the relationship between traceability and sustainability in the food supply chain; and, second, to characterize the legitimacy-seeking purposes -i.e., moral, cognitive or pragmatic- driving companies to implement traceability systems along with sustainability initiatives.

**Design/ Methodology:** This study analyses the coffee supply chain, a globally dispersed commodity chain, where traceability initiatives usually respond to mandatory and voluntary quality standards and certifications of origin. The study involves nine cases at different stages of the coffee supply chain.

**Findings:** Our study provides a taxonomy of the traceability systems applied in the coffee supply chain. In addition, three main approaches to traceability for sustainability (TfS) are found in the coffee supply chain: synergistic, complementary or disconnected. Findings also reveal how traceability responds to different legitimacy-seeking objectives while triggering or complementing sustainability practices. Five research propositions and related directions for further investigations are elaborated from the results of our study.

**Originality:** This study explores rather limited studied area, investigating how companies in a food commodity chain address traceability and sustainability together while seeking legitimacy in the market. Moreover, the study is grounded on legitimacy theory, thus adding robustness to the analysis.

**Keywords:** traceability, sustainability, coffee industry, legitimacy theory

**Article classification:** Research paper

### Introduction

This study aims to address an increasingly challenge in food supply chains, that is traceability for sustainability, considering that consumers around the world emphasize the need for food that is not only safe and healthy but also ethical, organic, generates low carbon footprint, etc., which in turn calls for better and more efficient traceability systems (Aagerup *et al.*, 2019; Dabbene *et al.*, 2014; Rainero and Modarelli, 2021; Mohammed, 2020) in light of sustainability demands as well. Indeed, the relevance of traceability implemented not only for tracking and visibility purposes but for sustainability objectives is evidenced on previous literature. Specifically, traceability for sustainability (TfS) in food commodity chains is said to be a tool to guarantee products features, e.g., origin, quality, respect for people and environment (Norton *et al.*, 2014; Kuit and Waarts 2014). Nonetheless, research on the relationship and the purposes for implementing traceability for

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3 sustainability is not yet covered along multiple stages of the food supply chain and, research in this  
4 area could provide important insights to practitioners and policy makers for understanding and  
5 promoting the role traceability systems for sustainability objectives.  
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7 Recognition in the market, or the perception from the public or other stakeholders that  
8 companies are conforming to the societal expectations, values and beliefs is known as legitimacy  
9 (Schuman 1995) without which a company is not able to operate and grow (Castelló and Lozano  
10 2011). Sustainability is growingly expected in food industry (Dabbene *et al.*, 2014) becoming a  
11 requirement in the market under the consumer's demand for more responsible products. Hence,  
12 authors have highlighted how actions towards sustainability, environmental performance and  
13 reporting can help companies to demonstrate accountability and thus to obtain, maintain or repair  
14 legitimacy (Ellram and Goliac 2016; Alrazi *et al.*, 2015). In this scenario, the theoretical lens setting  
15 the ground in this study is the legitimacy theory (Schuman 1995) that provides the views for defining  
16 the scope of the research and for explaining the findings. The theory defines three forms of legitimacy:  
17 (i.e., pragmatic, moral, cognitive) a company could use to be recognized, specifically for our study,  
18 regarding traceability and sustainability.  
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20 It is widely known that traceability requires substantial investments in technology and  
21 processes aimed at tracking goods along the supply chain (SC). Traceability implementation cost is  
22 still proving to be a major barrier to overcome (Norton *et al.*, 2014; Kuit and Waarts 2014; ITC 2015;  
23 Saberi *et al.*, 2019), especially in the first production phases (Dabbene *et al.*, 2014; ITC 2015).  
24 However, the benefits of traceability that could counterbalance the costs along food supply chains  
25 (Dabbene *et al.*, 2014) are recognized as well. For instance, traceability helps reducing foodborne  
26 outbreaks (Magalhães *et al.* 2019), managing risks (Ringsberg, 2015), keeping consistency and  
27 market specific product features, efficient recall procedures, keeping a chain of custody (Norton *et*  
28 *al.*, 2014; ITC 2015; Karlsen *et al.*, 2013; Mejías *et al.*, 2019). In this line, authors in previous  
29 literature also highlight how traceability could contribute to achieve competitive advantages in terms  
30 of operational efficiencies, cost reductions, increased productivity, reputational benefits and  
31 improved environmental performance along the supply chain (Norton *et al.*, 2014; Karlsen *et al.*,  
32 2013; Canavari *et al.*, 2010; Stranieri *et al.*, 2017; Marconi *et al.*, 2017; Ringsberg, 2015; Rainero  
33 and Modarelli, 2021).  
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35 The coffee supply chain, an industry that employs millions of farmers in the world (DeFries  
36 *et al.*, 2017), and approximately half of them are small landholders (ICO, 2017; Vorley and Fox,  
37 2004). Coffee growers, processors, traders, roasters, packers and retailers are spread around the world  
38 and different sustainability challenges are faced upstream and downstream in this supply chain (FAO,  
39 2010; Ortiz-Miranda *et al.*, 2015; Luna and Wilson, 2017; Bashiri *et al.* 2021). Therefore, as a means  
40 to gain control and visibility of the more remote activities, different traceability solutions are  
41 emerging in this supply chain among which certifications are well spread. In addition to the standard  
42 voluntary certification schemes developed in the industry (i.e. Fairtrade, UTZ and Rainforest  
43 Alliance), some well-known coffee roasters in western economies have developed their private  
44 certification initiatives (Alvarez *et al.*, 2010; Longoni and Luzzini 2016). However, traceability and  
45 sustainability are not necessarily observed simultaneously and the food supply chain is no exception.  
46 Considering how Garcia-Torres *et al.*, (2019) defined traceability for sustainability as the “ability to  
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3 combine SC information sharing and visibility [...] for operational reasons and to ensure the  
4 reliability of sustainability claims”; the coffee supply chain efforts on traceability implementation  
5 still need to be expanded as for their sustainability purposes. In this line, the ITC (2015) argued how  
6 traceability for sustainability in food SCs become difficult because of lack of capabilities or skills  
7 and multiple requirements to fulfil. Besides, current debate in literature questions whether  
8 Traceability Systems (TS) are driven by quality or sustainability performance goals (Garcia-Torres  
9 *et al.*, 2019; Marconi *et al.*, 2017) or by the will to be recognized and accepted in the market (Aagerup  
10 *et al.*, 2019; Mejías *et al.*, 2019).

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12 Therefore, the coffee supply chain represents an interesting context for investigating the  
13 relation between traceability and sustainability along the SC, as well as the legitimacy motivations  
14 for implementing those in different tiers of the chain. Hence, the objectives in this study are i) to  
15 identify the TS implemented and their relationship with sustainability along the coffee supply chain,  
16 and ii) to investigate how the implementation of traceability for sustainability responds to legitimacy-  
17 seeking purposes in the coffee industry. This study is based on the analysis of multiple cases covering  
18 different stages in the coffee SC. Companies are of different sizes and in different geographical  
19 locations, allowing for a broader view of traceability and sustainability implications in this industry.

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21 Findings in our study provide several contributions. First, by identifying three types of TS for  
22 sustainability implemented in the coffee supply chain including companies in different supply chain  
23 tiers and observing the level of technology adopted. Second, the characterization of three types of  
24 relationships between traceability and sustainability that are influenced by company size, volume,  
25 product type and legitimacy-seeking form. Third, another novelty in our study is to lever on  
26 legitimacy theory for explaining the legitimacy-seeking forms that companies in the coffee supply  
27 chain have when implementing traceability and sustainability.

### 28 29 30 31 32 33 34 35 36 37 **Legitimacy Theory in Sustainability Studies**

38 Schuman (1995, p.574) defined legitimacy as the “generalized perception or assumption that actions  
39 or an entity are desirable, proper or appropriate within some socially constructed system of norms,  
40 values, beliefs and definitions”. Several authors have refined the concept explaining that legitimacy  
41 is a status or condition that is temporally and culturally defined (Alrazi *et al.*, 2015) that comes from  
42 meeting stakeholders’ expectations (Ellram and Golicic, 2016).

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49 Researchers agree on three forms of legitimacy (Schuman, 1995; Castelló and Lozano, 2011;  
50 Alrazi *et al.*, 2015):

- 51 • Pragmatic legitimacy: is granted based on the audience (e.g. stakeholders) self-interest  
52 perception of benefiting from the organization’s actions. It refers to the exchange between  
53 companies and their stakeholders as long as stakeholders receive direct or indirect benefit.  
54 Thus, companies face the challenge of demonstrating the value of their products and processes  
55 to get legitimacy.
- 56 • Moral legitimacy: is positive evaluation and approval when companies perform actions that  
57 promote societal wellbeing. It refers to the ‘right thing to do’ as judged by the stakeholders’  
58 belief. This form of legitimacy is considered to be more resistant to manipulation than  
59 pragmatic legitimacy.

- Cognitive legitimacy: is granted based on the comprehensibility of societal models in such a way that the organization's actions are taken for granted. It refers to an organization being consistent with audience (e.g. stakeholders) expectations. It is the most powerful source of legitimacy and the most difficult to influence.

Therefore, legitimacy exists whenever an organization's actions are in accordance with societal expectations (Alrazi *et al.*, 2015). Accordingly, companies design their strategy for acquiring, maintaining or repairing legitimacy (Schuman, 1995). The process aiming at any form of legitimacy is known as 'legitimizing', for obtaining legitimacy as a proactive strategy, while for repairing implies the reaction to face a crisis (Alrazi *et al.*, 2015). Hence, legitimizing refers to the actions that organizations put in place to be accepted in society by complying with norms, values, beliefs and definitions (Castelló and Lozano 2011).

With regard to sustainability, previous studies underlined that for gaining legitimacy, an organization benefits from its sustainability-related efforts. Starting with the environmental dimension, Ellram and Golicic (2016) argued that sustainability helps to enhance, maintain and acquire legitimacy. On the same line, Alrazi *et al.*, (2015) highlighted how environmental performance and reporting help companies demonstrating accountability and in turn obtain legitimacy, when there is a general perception of sustainability being desirable and appropriate. Similarly, Castelló and Lozano (2011) highlighted that sustainability, implemented as CSR initiatives could be driven by different types of legitimacy strategies among different type of companies. As Ellram and Golicic (2016) pointed out when studying environmentally friendly freight transportation services: the perception of legitimacy differs in different SC positions, where different approaches and perceptions of value exist. Other factors that Castelló and Lozano (2011) identified as influencing CSR are the cultural differences, industry sector, type of firms and geographical locations.

In this study, legitimacy-seeking approaches are observed with the aim of characterizing the motives for the traceability systems and sustainability strategies that are deployed along the coffee SC.

### **Traceability for Sustainability in Food Commodity Chains**

Traceability for sustainability (TfS), as defined by Garcia-Torres *et al.*, (2019) is the "ability to combine SC information sharing and visibility [...] for operational reasons and to ensure the reliability of sustainability claims". On a similar line, Marconi *et al.* (2017) argue that in order to succeed in sustainability, it is not enough to do well within company boundaries as all the actors that contribute to the final products should be traced. Companies that invest on increased transparency and traceability could have a competitive advantage (Canavari *et al.* 2010) and reputational benefits, thanks to TS that demonstrate a commitment to sustainability (Norton *et al.*, 2014; ITC, 2015). As shown in Mejías *et al.* (2019)'s study, implementing and managing sustainability in multi-tier SC, characterized by complexity and globalization, is still a challenge and TS can also help mitigating risk of unknown sourcing and the consequent social and environmental impacts along the SCs.

Food quality and safety are expected from food SCs and they could be ensured through traceability (Dabbene *et al.*, 2014; Karlsen *et al.*, 2013) implemented with different types of technologies (Magalhães *et al.* 2019; Rainero and Modarelli, 2021; Saberi *et al.* 2019:

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3 [Kittichotsatsawat et al. 2021](#)). Several definitions of food traceability are proposed. For instance, the  
4 Food and Agriculture Organization (FAO) defines traceability as “the ability to follow the movement  
5 of a food through specified stage(s) of production, processing and distribution” (Codex Alimentarius,  
6 2006). In Europe, a definition of traceability in agri-food supply chains is stated as “the ability to  
7 trace and follow a food, feed, food producing animal or substance intended to be, or expected to be  
8 incorporated into a food or feed, through all the stages of production, processing and distribution”  
9 (European Commission, 2002). Other organizations as the ITC and the International Organization for  
10 Standardization (ISO) also offer their definitions considering identification, tracing and tracking.  
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15 Among the benefits of TS in food chains are the huge potentials in efficiency gains (Costa *et al.*  
16 *et al.*, 2013; Ringsberg, 2015), competitive advantage (Canavari *et al.* 2010) food process control  
17 (Magalhães *et al.* 2019), and quality and identity preservation (Dabbene *et al.*, 2014; Smith, 2018;  
18 Rainero and Modarelli, 2021). Nonetheless, traceability implementation in food supply chains  
19 depends on several aspects as the company mission, the type of firms involved, technology constraints  
20 ([Kittichotsatsawat et al. 2021](#)), and the legal environment (Canavari *et al.* 2010). Therefore, also TFS  
21 in this sector addresses diverse challenges due to the level of company capabilities, skills, interest  
22 and willingness, and multiple requirements needed for implementation (ITC, 2015). In this line,  
23 certifications on agri-food commodities have become particularly important given an increased  
24 stakeholder pressure (Kolk, 2012; Reinecke *et al.*, 2012) and given the certification’s capacity to  
25 address a wide range of attributes (Ringsberg, 2015; [Bashiri et al. 2021](#)), among which sustainability.  
26 Coffee certification schemes are varied in their scope, premium prices and requirements. In order to  
27 fulfil the requirements of these different certifications different traceability systems can be adopted  
28 with different levels of complexity (Stranieri *et al.*, 2017).  
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35 Considering the characteristics of information shared, strategic or operational (Canavari *et al.*  
36 2010), and how the information is transmitted in the TS and according to the definitions by Dabbene  
37 *et al.* (2014), companies use different platforms that can be summarized in the following categories:  
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- 39 (1) Simple TS: mostly, operational information, product information is traced by means of  
40 documentation, e.g., transportation and import-export documentation, invoices.
- 41 (2) Advanced TS: can involve operational and strategic information. Tracing and tracking is  
42 recorded in databases developed by the companies themselves or by external organizations.
- 43 (3) Integrated TS: usually involves operational and strategic information. Is a system that allows  
44 all the actors in the supply chain to input product information into a common platform. An  
45 administrator is appointed for keeping consistency and control of the information inserted into  
46 the platform.  
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53 Then, traceability and sustainability are indeed related and expected in food industry (Dabbene *et al.*,  
54 2014) where companies aim at promoting, implementing and assessing sustainability along the SC  
55 (Garcia-Torres *et al.*, 2019, Marconi *et al.*, 2017) and varied TS are being implemented (Dabbene *et al.*  
56 *et al.*, 2014; Stranieri *et al.*, 2017; Saberi *et al.*, 2019; Rana *et al.*, 2021) with different levels of  
57 technology (Magalhães *et al.* 2019; Rainero and Modarelli, 2021; [Kittichotsatsawat et al. 2021](#)), to  
58 conform to such expectations, and in turn achieve legitimacy (Alrazi *et al.*, 2015). However, the  
59 relationship between traceability and sustainability in the global and complex context of food chains  
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3 is still to be studied.

4 In Table 1, the main constructs in the study are summarized.

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6 ----- TABLE I HERE -----  
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### 10 **Sustainability in the Coffee Industry**

11 Food commodity SCs, as coffee, are said to be important contributors to global greenhouse gas (GHG)  
12 emissions, from production (and its inputs) through processing, distribution and consumption, to the  
13 disposal of waste (FAO, 2010). Processing, trading, transporting, roasting, packaging, retailing,  
14 brewing, serving, etc., also have important contribution to emissions, communities' well-being and  
15 employment (FAO, 2010; ICO, 2017). Especially upstream actors face sustainability challenges as  
16 they deal with several constraints and restrictions. For instance, regarding economic development:  
17 price volatility, lack of long-term contracts and spot transactions that create a huge uncertainty for  
18 farmers and cooperatives, limited access to credit or financial aid, side selling for solving short-term  
19 liquidity problems (Ortiz-Miranda and Moragues-Faus, 2015). Instead, on the environmental side,  
20 farmers struggle with pest control and diseases and the need of using pesticides and fertilizers  
21 (Ntiamoah and Afrane, 2008), climate change, i.e. rising temperatures and rainfall variability,  
22 decrease yield and reduce quality as well (Ovalle-Rivera *et al.*, 2015). These economic and  
23 environmental challenges are in turn closely related to the social development in the producing  
24 regions (Vorley and Fox, 2004; Pay, 2009; Winston *et al.*, 2005).  
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32 Coffee industry employs millions of farmers, and export often represent a significant portion  
33 of sales. Coffee prices are determined in the commodity markets, and selling far ahead is considerably  
34 risky (Pay, 2009). Low prices are driving poverty, ill health, unemployment, lack of education and  
35 forced migration, and a risk of increasing crop diversification (Pay, 2009; Winston *et al.*, 2005).  
36 Besides, farmers in producing regions face lack of technical competences for specialty or organic  
37 production that require specific agronomic knowledge to improve yields and quality (Ovalle-Rivera  
38 *et al.*, 2015).  
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42 On the buying side, the demand is strong in many countries, particularly in North America,  
43 Europe and Japan; but the biggest potential is in emerging markets and coffee exporting countries,  
44 e.g., Brazil, Indonesia, India and Mexico (ICO, 2019; Pay, 2009). Mature markets as Europe and  
45 North America observe a higher preference for specialty coffee (ICO, 2019; Pay, 2009; Reinecken *et*  
46 *al.*, 2012; Pascucci, 2018) for which buyers pay premium prices. Small local brands and small roasters  
47 are spreading, in particular for specialty coffee (Pascucci, 2018). Hence, buyers are motivated to  
48 deploy sustainability initiatives mainly to face competition, due to legal requirement and policies,  
49 because of stakeholder expectations, or to get closer to important suppliers or local communities  
50 (Karlsen *et al.*, 2013).  
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55 However, the relationship between traceability and sustainability is not necessarily automatic.  
56 Recently, some authors have started to discuss on how and when traceability and sustainability are  
57 indeed connected (Garcia-Torres *et al.*, 2019), and investigated in other industries, as fashion, the use  
58 of traceability systems in the achievement of sustainability objectives (Marconi *et al.*, 2017; Mejías  
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3 *et al.*, 2019). However, as far as our knowledge, studies aiming at understanding the relationship  
4 between traceability and sustainability for legitimacy seeking in food commodities SCs are scarce.  
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### 7 **Research Questions and Framework**

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9 The implementation of TS is increasingly appealing for companies in search of efficiency,  
10 consistency, differentiation, for ensuring customers the product features advertised (Norton *et al.*,  
11 2014; ITC, 2015; Karlsen *et al.*, 2013; Canavari *et al.* 2010) and reduce foodborne outbreaks too  
12 (Magalhães *et al.* 2019). In some companies, traceability is implemented as a tool to assure and verify  
13 sustainability in their SC; however, only a very small percentage of food commodities are traceable  
14 on sustainability attributes (Kuit and Waarts, 2014; Norton *et al.*, 2014). The implementation of TS  
15 along multiple tiers of a global SC (Marconi *et al.*, 2017; Garcia-Torres *et al.*, 2019), as is the coffee  
16 SC, can provide insights from a wider view of the phenomenon.  
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20 Hence, TfS leads to unexplored opportunities for assuring sustainability and providing sound  
21 evidence for the actual commitment of a company to specific sustainability initiatives, without the  
22 fear of leaving blind spots in their supply base. Moreover, TfS can represent a fundamental step for  
23 improving performances in different SC stages through the systematic collection of sustainability-  
24 related data. These potentially promising developments support the formulation of the first research  
25 question:  
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30 *RQ1: What is the relationship between traceability and sustainability in the coffee supply chain?*  
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34 Furthermore, companies aim at being recognized, accepted and respected according to the market's  
35 expectations and beliefs and might perceive legitimacy in different ways (Ellram and Golicic, 2016).  
36 Several authors agreed that sustainability efforts help to gain and maintain legitimacy (Ellram and  
37 Golicic, 2016; Alrazi *et al.*, 2015; Castelló and Lozano, 2011). Nonetheless, observing the  
38 relationship between legitimacy-seeking purposes and the implementation of traceability and  
39 sustainability could provide additional insights for understanding the motivations and strategies  
40 underlying a global SC as the coffee one. Hence, the second research question in this study is:  
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45 *RQ2: How is legitimacy-seeking influencing the implementation of traceability for sustainability*  
46 *in the coffee supply chain?*  
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50 Our study adopts a SC perspective given that companies in different positions in the coffee SC are  
51 urged by different sustainability challenges (e.g., certifying the sustainable origin of coffee for coffee  
52 roasters, the environmental impact of transportation for the logistics operator) and they are exposed  
53 to different complexities (e.g., coffee traders generally interact with multiple roasters and several  
54 exporters and farmers). Companies can influence the perceptions that the market and other SC actors  
55 have of them, and they might want to gain legitimacy for sustainability as for other performance  
56 dimensions, hence be driven by different legitimacy seeking approaches.  
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60 The research framework representing the main constructs and research questions is depicted  
in Figure 1, where different types of relationships between TS and sustainability are implied by the

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3 bi-directional arrow connected to RQ1. In addition, the legitimacy seeking approaches (RQ2) are  
4 instead depicted as influencing factors for Tfs.  
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## 10 **Methodology**

### 11 ***Method and case selection***

12 Choices regarding traceability and sustainability are tightly interweaved within the context of analysis  
13 in this research. Literature suggests approaching both traceability and sustainability with a supply  
14 chain perspective, given they are both highly influenced by supply chain dynamics. Under these  
15 premises, multiple exploratory case studies in different stages of a supply chain are the chosen  
16 methodology, to be consistent with the tight link between the research objectives and the setting as  
17 well as to increase external validity (Voss et al, 2002). Moreover, multiple cases per supply chain  
18 stage are selected aiming at more robust findings according to a replication logic (Yin 2009) and for  
19 grasping the heterogeneous behaviours that companies in different supply chain stages might have,  
20 and the differences in size and power along the chain. Similar criteria for case selection have been  
21 developed in previous literature on sustainability in food supply chains (León-Bravo et al. 2019;  
22 León-Bravo et al. 2021; Cannas et al. 2020).  
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25 The coffee supply chain, being a global commodity, deals with long geographical distances, the  
26 increasingly relevant need to monitor the quality of coffee and the need to assure and communicate  
27 the sustainability of production, mostly located in developing countries. All these aspects support the  
28 choice of coffee supply chain as the context of our study on traceability for sustainability. For the  
29 aims of this research, case studies are selected on the grounds of their overall strategy for  
30 sustainability reflected in their mission, vision, communication, awards received, etc. The cases are  
31 also chosen according to their interest on traceability as declared in the company statements, website  
32 and industry reports. Cases are companies of different sizes, belonging to different supply chain  
33 stages, and offering different product types (i.e. bulk vs. specialty coffee) but they do not necessarily  
34 buy and sell from each other (See Table II).  
35  
36

37 In two cases in particular, company B and company F, the chains of two product typologies  
38 are analysed. Thus, the two units of analysis within these cases are separated because they adopt two  
39 distinct traceability systems (i.e., in both cases: certification and advanced traceability systems).  
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44 ----- TABLE II HERE -----  
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### 50 ***Data Collection and Data Analysis***

51 Data is collected by means of multiple sources, summarized in Table III. As the table outlines, the  
52 steps in the research process with different research aims, were supported by multiple sources of  
53 information. As reported in Table II, primary information were collected through semi-structured  
54 online and face-to-face interviews performed between January and March 2019 with different people  
55 who hold different roles within their organization, as sustainability and quality managers, as well as  
56 head of projects related to traceability. In the cases of two small enterprises (case A and E), we  
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interviewed the founder of the company and a general manager respectively, both being informants with a transversal and in-depth knowledge of all the processes within the organization.

Primary sources of information were complemented with secondary sources (i.e., internal documents, direct observations, news and press information, technological and industry benchmarks) for ensuring validity and reliability (Yin, 2009).

----- TABLE III HERE -----

As for the collection of primary information, multiple researchers performed the interviews that were outlined in three parts:

- General business aspects: company characteristics (size, product lines, markets), business model and relationships with other supply chain actors.
- Traceability: TS currently in use to collect the information as well as to transmit information to costumers; drivers and barriers connected to their adoption; future perspective toward new traceability systems.
- Sustainability: practices implemented upstream processes are traced, also tested drivers and barriers, and the role of certification, if available.

For the purpose of this study, TS are classified according to three types as defined above: simple, advanced and integrated (Dabbene *et al.*, 2014). Furthermore, according to McEntire *at al.* (2010) and as cited by Stranieri *et al.*, (2017), four elements characterize the level of traceability: breadth (number of attributes), depth (how far upstream or downstream in the SC), precision (how accurately is the attribute characterized) and access (how fast a SC member can visualize the traced information). In this study we focus on the traceability breadth and depth.

For breadth, we will look first at the general product information as origin, composition and nutritional values, secondly to quality and safety information, and lastly, to sustainability practices. Concerning depth, it refers to how far upstream the supply chain the different traceability solutions attempt to reach, and at which granularity level. That is, traceability covers country, region, cooperative (i.e. organised group of farmers) or individual farmer level. In terms of granularity, traceability systems can be applied to all products (all the different product variants that are offered by the company) or only to some variants. Regarding sustainability, the three dimensions, environmental, social and economic, are considered.

For the first research question (RQ1) the coding was performed with an inductive approach. Each researcher shared his/her own results and discussed them in an analytical and interpretive process, so that consistent interpretation of the findings was ensured and their internal validity (Seuring and Gold, 2012). After the first brainstorming session, authors derived some first level codes that subsequently evolved into three main codes, as shown in Table IV, i.e. disconnected, complementary and synergistic. The research team agreed on these codes, directly derived from first level codes or on direct quotations coming from interviews.

----- TABLE IV HERE -----

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Finally, the study is grounded on legitimacy theory for addressing the second research question considering three legitimacy forms: pragmatic, moral and cognitive (Schuman, 1995; Castelló and Lozano, 2011; Alrazi *et al.*, 2015; Ellram and Golicic, 2016). Hence, for RQ2, the coding in the within case analysis was performed on a deductive base and on theoretical constructs. [In the Findings, Table VI provides details about first and second level coding assigned to the legitimacy seeking construct for each of the cases, leveraging most relevant quotations.](#)

Finally, the cross-case analysis per SC tier and for companies sharing the same traceability system and for companies sharing the same legitimacy seeking approach.

## Findings and Discussion

### *RQ1: Traceability Systems implemented in the Coffee Supply Chain*

Aiming at answering RQ1, we split the findings presentation in two parts. First, we describe the current TS implemented in the cases and second, we identify the relationship between traceability and sustainability.

Therefore, thanks to the within case analysis performed with the data collected from the interviews and secondary sources, we identified the TS adopted as well as the different technological solutions selected by the companies under study. In addition, we were able to describe the breadth and depth that these TS allow along with the motives for implementing them, for instance:

- (1) Simple TS: companies as Case E report the product information on the packaging. Besides, they rely on the HACCP standard for the internal traceability and on the documentation provided by suppliers as transportation documents and invoices.
- (2) Advanced TS: This is the case of companies (e.g., Case F1) that rely on certified purchases guaranteed by the third-party certification entities e.g. Organic, Fairtrade, Rainforest Alliance, Utz. The information is transmitted through the packaging, including mandatory information and certification labels. This is complemented by extensive information reported on the company website together with processing methods and sustainability initiatives. Case F1 (trader) requires a guarantee of traceability from the certification bodies.
- (3) Integrated TS: For instance, Case A (Blockchain system) and Case C (Real time monitoring system with GPS). This type of systems allows to reach consumers that in turn are directed to the company website to show the product's journey as well as information about certifications and sustainability practices.

The detailed information about the TS implemented in the set of cases is presented in Table V. Specifically considering traceability breadth, evidence from the cases suggests, on one side, that companies in the coffee supply chain are indeed keener and more experienced in tracing regulatory attributes (product origin, ingredients and nutritional values) and quality and safety information (certifications). As seen in Table V, all cases do this, except Case C with origin information. On the other side, additionally to some mandatory information the traced data include sustainability practices as well. Being consistent with ensuring proper income to farmers is the most cited practice among the cases. In this way, companies practice supply chain responsibility, helping farmers to support

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3 their businesses and ensuring compliance with sustainability requirements. Furthermore, companies  
4 target several different levels of depth, i.e., up to the country, the region, the trader, the producer.  
5 Companies aim mostly to reach producers, or the cooperatives they are part of, for tracing the coffee  
6 (Cases A, B, D, F1).  
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9 Specifically, several cases implemented *Advanced TS* to trace the most complete information  
10 breadth, from origin and quality to sustainability practices (Cases B1, C, D, F1). Moreover, these  
11 companies prefer to invest in a TS that goes as much in depth as possible for all products, i.e., up to  
12 the producer or the cooperative if possible. Instead, the lack of interest on tracing sustainability  
13 practices in Case C could be attributed to the supply chain role, being this company a logistic operator  
14 and thus not having the same sustainability or traceability objectives as the coffee roasters.  
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17 Lastly, in cases B and F, the two units of analysis reflect two different sets of products that  
18 are traced with the same TS for collecting information from the upstream stages, but with different  
19 systems for transmitting the information downstream (e.g., Case F1 adopts UTZ-Rainforest alliance  
20 certification label, while in Case F2 the company adopts an Integrated TS with QR code as  
21 communication technology).  
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24 Notably, the structure of the upstream supply chain influences the level of depth as well as  
25 the type of traceability technology adopted. As Marconi et al. (2017) proposed, in order to use  
26 traceability as a means to collect information about sustainability, it is necessary to model the SC and  
27 identify all the actors involved. Findings in our study indicate that the more fragmented the SC, the  
28 more difficult it is to reach higher levels of depth and granularity. For instance, interviewees from  
29 Company B and Company D both underlined the peculiar features of Brazilian production where  
30 farms are well-established cooperatives of considerable size. This means that working closely with  
31 farmers on sustainability initiatives is easier because roasters can directly buy from them via the  
32 cooperative (without middlemen intermediation). At the same time, given the cooperative's long-  
33 lasting experience and size, it is easier to implement even more expensive and extensive traceability  
34 solutions, such as integrated system and QR code in Case B2. It is important to underline that the  
35 implementation of such solutions would not be feasible with a different configuration of the upstream  
36 supply chain, i.e., with intermediaries or middlemen, as Saberi et al. (2019) explained, when  
37 scalability is a challenge (Rana et al., 2021) or when there is consumer's scarce knowledge and  
38 perception of the technology implemented (Rainero and Modarelli, 2021).  
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46 Lastly, in terms of granularity, findings suggest that TS can be applied to all products (all the  
47 different product variants that are offered by the company) or to just some variants. In particular,  
48 Case A traces every SKU thanks to the blockchain technology adopted, instead, the rest of the cases  
49 mostly trace specific product lines for specific customers.  
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52 Accordingly, for achieving sustainability, especially in global chains where reaching and  
53 assessing supplier sustainability could become unsurmountable (Mejías et al., 2019; Norton et al.,  
54 2014), it is seen that the *Advanced* or *Integrated TS* could be a key factor for reducing such distances  
55 and better collect information and ensure transparency (Marconi et al., 2017; Rana et al., 2021;  
56 Ringsberg, 2015; Saberi et al., 2019). However, findings in this study reflect that different types of  
57 TS with their corresponding breadth and depth will reach different levels of information along the  
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supply chain and not necessarily for sustainability purposes. This will be further analyzed in the following section.

----- TABLE V HERE -----

### *Discussion RQ 1. Relationship between Traceability and Sustainability*

The cross-case analysis allowed to identify certain commonalities in the cases under study regarding the implementation for traceability for sustainability purposes or not. In line with Garcia-Torres *et al.* (2019), companies need to develop specific skills for TfS and in our study evidence showed how companies implement varied TS according to their capabilities and interests, aiming at obtaining multiple benefits, including sustainability. However, companies also explained that they do not necessarily manage traceability and sustainability together, as traceability is mainly required by law and regulation's compliance, whereas sustainability is driven by company values and commitment.

There are cases leveraging on forms of *Advanced TS* (Cases B2, F1) for implementing sustainability in the coffee countries of origin, guaranteed by third-party certification entities which prove origin and guarantee that sustainable practices are carried out by the certified producers (Kuit and Waarts, 2014; DeFries *et al.*, 2017). The three most popular certification schemes in the coffee industry with dedicated traceability solutions are: Fairtrade system (managed by FLOCERT) and the so-called "Chain of Custody" for Rainforest Alliance and Utz. The respective third parties (i.e. Fairtrade, Rainforest Alliance, and Utz) guarantee that sustainable practices are carried out by the certified producers (Kuit and Waarts, 2014; DeFries *et al.* 2017), as for Case B and F1. This type of relationship between traceability and sustainability is also present in Cases A and B1 that adopt instead an *Integrated TS* connected to technological solution. For instance, Case A, one of the smallest companies in the sample, adopts to a blockchain system. This technology ensures transparency and traceability, as several authors explained (Rainero and Modarelli, 2021; Rana *et al.*, 2021 and Saberi *et al.* 2019; Kittichotsatsawat *et al.* 2021), and brings information depth at its utmost. In these two cases traceability appears to be *synergistic* with sustainability. Instead, Case D holds no third-party certifications because managers believe that the certification schemes for coffee industry are overly focused on quality. Hence, they developed a proprietary certification scheme (*Advanced TS*) that appears to be *synergistic* with sustainability too, given the specific focus they put on sustainability and the extension of virtuous sustainable practices to farmers, similar to the case exemplified in Alvarez *et al.* (2010).

*Proposition 1: In the coffee supply chain, a synergistic relationship between traceability and sustainability is developed by companies implementing an Advanced (certification based) TS with sustainability purposes in mind.*

*Proposition 1.1: In the coffee supply chain, a synergistic relationship between traceability and sustainability is developed by smaller companies implementing Integrated TS able to reach higher levels of depth.*

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3 Case G adopts a different approach. The company develops sustainability activities in almost all the  
4 countries where traders source from, adopting a multiple stakeholder approach (Alvarez *et al.*, 2010)  
5 collaborating with NGOs, other roasters, local communities as well as traders. However, the company  
6 is not able to link its efforts of sustainability with traceability. Committed to sustainability, Case G  
7 prefers to carry out these initiatives without linking them to direct purchases, counting on spill-over  
8 effects that over time will spread best practices within the country of origin. Traceability and  
9 sustainability are not related also in other cases, allegedly because certain supply chain tiers are not  
10 concerned with either sustainability or traceability, or both. Case E, one of the smallest companies in  
11 the sample, adopted a *Simple documental TS* without a clear interest in sustainability; they mentioned  
12 that their business is not in charge of ensuring traceability, because their supplier or customer is  
13 responsible for it. In these two specific cases, traceability appears to be *disconnected* from  
14 traceability.  
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17 Furthermore, we could observe that the relationship between traceability and sustainability  
18 for these cases might be also influenced by volumes purchased and company size. As for volume, the  
19 largest company in our sample, which purchases up to four million bags (Case G), has a *disconnected*  
20 relationship between traceability and sustainability because of the complexities of tracing back  
21 upstream to many producers spread around the world. Whereas for Case E, being a smaller company  
22 -compared to other players in the same supply chain- and given the small volume of green coffee  
23 purchased, it requires traceability and sustainability from the player with higher relational power in  
24 the chain: the trader.  
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34 *Proposition 2: In the coffee supply chain, a disconnected relationship between traceability*  
35 *and sustainability occurs when the company is not able to integrate sustainability with traceability,*  
36 *thus not having the means for making claims of sustainability in its supply chain tier, due to company*  
37 *size and product volume.*  
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41 Additionally, two cases with *Integrated TS* approach traceability with an intent that is  
42 indirectly related with sustainability. Case C for example recognizes that a traceability system with  
43 GPS fosters sustainability as the system can monitor conditions related to coffee quality and  
44 preservation (e.g., humidity and temperature), thus contributing to the identification of situations that  
45 could lead to food waste. Similarly, Case F2 with a QR code on the packaging allows to share with  
46 customers the sustainable initiatives implemented with farmers, although this was not the main reason  
47 why they decided to invest in this traceability system. In Case C and F2 traceability can complement  
48 the achievement of certain sustainability objectives and thus support: i) the reduction of food waste  
49 by tracking some key parameters connected to food preservation in real time; ii) the creation of  
50 customer awareness about the value of sustainability initiatives for coffee farmers. In these cases,  
51 traceability solutions can therefore be considered *complementary* to sustainability.  
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59 *Proposition 3: In the coffee supply chain, traceability can complement sustainability in*  
60 *companies that implement TS for monitoring product characteristics and for sharing information*  
*with other actors in the supply chain.*

## ***RQ 2. Legitimacy-seeking Purposes for the Adoption of Traceability for Sustainability***

In order to answer to the second research question, our analysis identified the pragmatic form of legitimacy to be the most common way to attain the validation from consumers in the cases under study, as also reported by Ellram and Golicic (2016). Companies, indeed, attempt to demonstrate the value of their products and processes with *Advanced or Integrated TS*, using different levels of technology and certifications, to reach consumer expectations and communicating them in a practical and efficient manner and in turn influence a conscious decision making as Rainero and Modarelli (2021) analysed. Additionally, companies implement *Advanced or Integrated TS* in order to mitigate the risk of affecting their own reputation, if suppliers do not comply (Mejías *et al.*, 2019). As observed in Table VI, companies A, B, C, F2, G are driven by *pragmatic* legitimacy, since they interpret TS not as a way to collect information that can trigger or favour the implementation of sustainability practices, but as a tool to narrate their stories to the final customers (as Aagerup *et al.*, 2019 studied), while developing different types of relationship between traceability and sustainability.

----- TABLE VI HERE -----

### *Discussion RQ2: Legitimacy-seeking in the coffee supply chain*

The idea of providing a direct benefit to customers in the coffee supply chain is associated with demonstrating accountability for specific sustainability initiatives and this way meeting societal and market expectations with a *pragmatic* approach. For instance, in Case B, traceability is *synergistic* with sustainability and their stakeholders' expectations correspond to the inclusion of ethical values, so that, in the words of the Head of Marketing and Sales "the customers' willingness to pay" is higher and thus sustainability becomes the key performance dimension to gain and maintain market legitimacy in a *pragmatic* manner, as exemplified also by Longoni and Luzzini (2016). Other examples of *pragmatic* approach are cases C and F2 that consistently combine their *complementary* approach to traceability and sustainability, and *pragmatic* legitimacy seeking. Interestingly, these two cases aim at supporting their sustainability practices with their TS, and they both do it in a practical, efficient form. An interesting case of legitimacy-seeking in a *pragmatic* form is Case G. Although this company reports to be committed with sustainability, it also manages traceability in a *disconnected* way, because of the difficulty to trace sustainability practices due to large volumes and a fragmented supply base. Thus, the company implements sustainability initiatives and counts on spill-over effects in the upstream chain.

*Proposition 4: For companies in the coffee supply chain, a pragmatic legitimacy seeking form does not determine the type of relationship between traceability and sustainability, other contingent factors can be considered as influential.*

*Proposition 4.1. When pursuing legitimacy with a pragmatic form, the high product volume and the high fragmentation of the supply base lead to a disconnected relationship between traceability and sustainability.*

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*Proposition 4.2. Pursuing legitimacy with a pragmatic form and setting quality as the priority objective lead to a complementary relationship between traceability and sustainability.*

*Proposition 4.3. Pursuing legitimacy with a pragmatic form for meeting customer sustainability expectations lead to a synergistic relationship between traceability and sustainability*

In another approach, two companies stand out for adopting either a proprietary certification scheme (Case D) or a specific investment in ad-hoc initiatives that go beyond the initiatives connected to standard certification schemes (Case F1). Both cases embody more sustainable and “fairer” requirements for all coffee supply chain partners, thus gaining *moral* legitimacy by doing “the right thing”. These two cases (D, F1) adopt traceability as part of a committed company sustainability culture. They believe their actions will impact on transformation and sustainable development, they have a clear belief on generating positive impact. Case D developed a proprietary certification scheme, grounded on ethics, social sustainability, economic and environmental sustainability. This is validated by an international registrar and classification society. Instead, Case F1 adopts a standard certification, i.e. Utz – Rainforest Alliance. In addition to Utz, some extra initiatives are put into place directly in the coffee producing countries. Hence, in these cases, this *moral* legitimacy-seeking form has led the companies to go beyond the standards, thus allowing to create a *synergistic* long-lasting relationship between traceability and sustainability.

*Proposition 5: For companies in the coffee supply chain, a moral legitimacy seeking form leads to a synergistic relationship between traceability and sustainability.*

Finally, the *cognitive* form of legitimacy-seeking is observed in Case E that works intensively to convince its customers to relate its brand with high quality performance. This company does not intend to extend its already gained legitimacy to sustainability, because it is convinced that its differentiation value relies exclusively on quality. Case E adopted a *Simple TS* in order to protect some “taken for granted assumptions” that customers have about them. As Case E’s owner explained: “We have to put quality first, this is what customers expect from a specialty, good quality coffee”. Hence, in this case, the relationship between traceability and sustainability is *disconnected* because traceability is not intended for sustainability, but for quality objectives.

Our findings led to a series of research propositions depicted in Figure 2 in a comprehensive framework as explained in the previous paragraphs.

----- FIGURE 2 HERE -----

## Conclusions

This study aims at identifying the traceability systems (TS) implemented along the coffee supply chain, at studying the type of relationship between the TS implemented and sustainability, and, at investigating how the implementation of traceability for sustainability (TfS) responds to legitimacy-

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3 seeking purposes. Grounded in legitimacy theory and with the analysis of nine cases in the coffee SC,  
4 this study identified the TS implemented, deriving three types of TfS. Moreover, we investigated the  
5 impact of the three different legitimacy-seeking forms (i.e., pragmatic, moral and cognitive) on the  
6 choice of the different types of TfS.  
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### 10 11 **Research contributions**

12 With the present work we contribute to the literature by identifying three types of TfS adopted in the  
13 global coffee SC, along with their corresponding levels of information breadth and depth. Thus,  
14 extending research by including companies in different SC tiers, the different elements of traceability  
15 and the technology adopted.  
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18 In particular, our study contributes to three main streams in the literature. First, we contribute  
19 to the debate regarding the relationship between traceability and sustainability (e.g., Garcia-Torres *et*  
20 *al.*, 2019) by characterizing three types of relationships: disconnected, complementary and  
21 synergistic; these are influenced by the company size, volume and product type, and the legitimacy-  
22 seeking form. The approaches adopted in the coffee supply chain are mixed, from real sustainability  
23 ‘believers’ spreading their moral values in a synergistic way, to pragmatic companies acting mainly  
24 for communication purposes. Alternatively, legitimacy can be pursued in a cognitive form when  
25 highlighting the product quality as a competitive advantage, with no necessary connection with  
26 sustainability.  
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29 A second contribution regards this study being grounded on legitimacy theory for explaining  
30 the legitimacy-seeking forms for implementing traceability and sustainability in a global commodity  
31 SC. In this vein, we are also contributing to literature on legitimacy theory, as Ellram and Golicic  
32 (2016) did for transportation practices, and in particular, we extend the approach to analyse the role  
33 of traceability practices for sustainability purposes.  
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36 Thirdly, the focus on multiple stages of the coffee supply chain, responds to the call by Mejias  
37 *et al.* (2019) and Bashiri *et al.* (2021), who underline how a multi-stage focus for the implementation  
38 of sustainability practices, measurement of sustainability performance, addressing sustainability risks  
39 are areas still under-developed, especially for global and complex supply chains as the coffee chain.  
40 Moreover, they identify traceability management system as one of the best practices for improving  
41 the commitment of suppliers to be aligned with sustainable principles. We add to that research by  
42 highlighting that this depends also on the strategic importance of sustainability and the legitimacy  
43 seeking approach of the company who is the main proponent of the traceability system.  
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### 51 **Interest for managers**

52 Findings in our study are of interest for practitioners as well as for identifying the needs and  
53 potentialities of traceability according to their technological capabilities. Moreover, managers can  
54 find in our study a guidance for the choice of different strategies for TfS depending on their legitimacy  
55 seeking purposes and the different needs to connect traceability with sustainability. Accordingly, this  
56 would allow managers to implement further developments, ranging from the possibility to  
57 demonstrate their commitment towards a sustainable supply chain, to the feasibility to enhance the  
58 use of TS systems to collect data in order to systematically analyse the sustainability impacts. In  
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3 particular, we believe that managers can benefit from our study by considering three equally  
4 important and correlated aspects when evaluating TfS.

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6 First, we suggest considering the role of sustainability in the company strategy and to evaluate  
7 if: i) sustainability is intended as the main competitive priority addressing a specific market segment  
8 with high willingness to pay with respect to sustainability, ii) sustainability is important but  
9 subordinated to other competitive factors or ii) the creation of sustainable value is of equal importance  
10 to the creation of economic value.

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13 Second, we believe that managers would benefit from an understanding of the type of  
14 legitimacy seeking approach fitting their needs. In these regards, our findings underline that a  
15 pragmatic approach is a not-sufficient condition to obtain a synergistic relationship between  
16 traceability and sustainability and thus managers cannot count on traceability solutions to achieve  
17 sustainability objectives. Synergistic relationship between traceability and sustainability can be  
18 achieved when pragmatic legitimacy seeking approach is combined with sustainability intended as a  
19 key competitive factor to obtain differentiation in the market. When instead a company seeks a moral  
20 form of legitimacy and sustainability intended as “doing the right thing” is equally important to  
21 economic objectives, our finding suggest that traceability solutions can support sustainability  
22 objectives.

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25 Third, by devising three possible relationships between traceability and sustainability, we are  
26 pointing out that managers investing in traceability solutions might decide to devote a different  
27 amount of resources to include sustainability. In the cases where traceability and sustainability are  
28 *synergistic*, Advanced TS are conceived ad-hoc to achieve sustainability objectives. Managers of  
29 companies approaching sustainability as a key strategic goal might be find their company fitting with  
30 this profile and they might invest a considerable amount of resources in this synergistic direction. As  
31 the collection of sustainability information becomes systematic, we see significant potential for  
32 companies to measure performance and report reliable data on sustainability performance.

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35 When instead traceability is *complementary* for sustainability, the TS might be intended to  
36 satisfy other strategic objectives, as product quality. In these cases, impact on sustainability comes as  
37 a “positive externality” (e.g., monitoring food preservation conditions through real time traceability  
38 systems enables food waste prevention). In these regards, managers of specialty coffee companies, in  
39 which product quality is a cornerstone for their strategy, might wish to invest additional resources to  
40 let the effects on different dimensions of sustainability to emerge clearly.

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43 Finally, when traceability and sustainability are *disconnected*, the reasons for this detachment  
44 are to be sought in some contingent factors that deal with company size and product volume, that  
45 force the company to rely on a longer supply chain along which is yet too difficult to develop  
46 traceability through integrated or advanced solution.

### 56 ***Future research avenues***

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58 Further research in this topic could address the main limitations in this study regarding the specific  
59 industrial context and geographical locations, and extend research to a larger sample involving other  
60 commodities and other industries or to delve into the contingency variables that determine the

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3 adoption of certain traceability system and their relationship with sustainability. Moreover, despite  
4 the contribution of the paper in investigating different stages of a food commodity supply chain, there  
5 are some limitations triggering future studies connected to the scope of the study. We suggest that  
6 future studies might focus on different stages of a single supply chain, as the study proposed by  
7 Bashiri et al. (2021), considering companies that buy and sell from each other, and research could  
8 expand the observation to three or more stages in a supply chain. This scope would enable the  
9 investigation of the effects of different legitimacy seeking purposes across different stages of a supply  
10 chain and the consequent effect on sustainability performances. Along a supply chain there is usually  
11 on main proponent of a traceability project, involving other supply chain partners and cascading  
12 requirements and constraints with a more or less collaborative approach. Failure to effectively transfer  
13 these requirements might be affected by the legitimacy seeking purpose adopted by the proponent of  
14 the traceability project but can also be dependent on a different use of power. In these regards, we  
15 believe that new theoretical lenses on the challenge of power balance (e.g., Touboulie et al., 2014)  
16 might well integrate our findings on traceability for sustainability in modern supply chains.  
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Figure 1. Research Framework

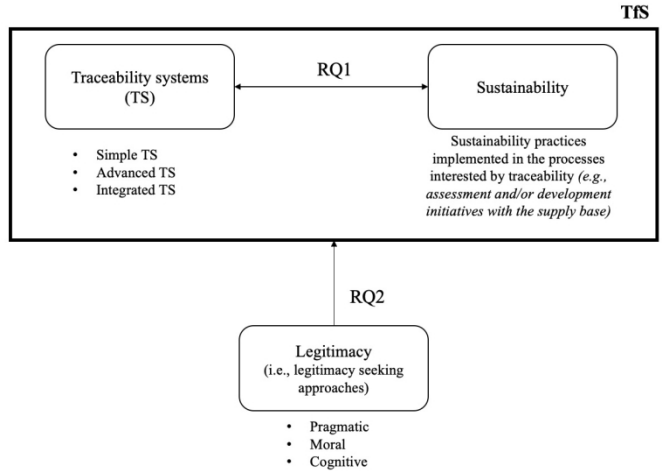


Figure 1. Research Framework

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Figure 2. Comprehensive framework with research propositions

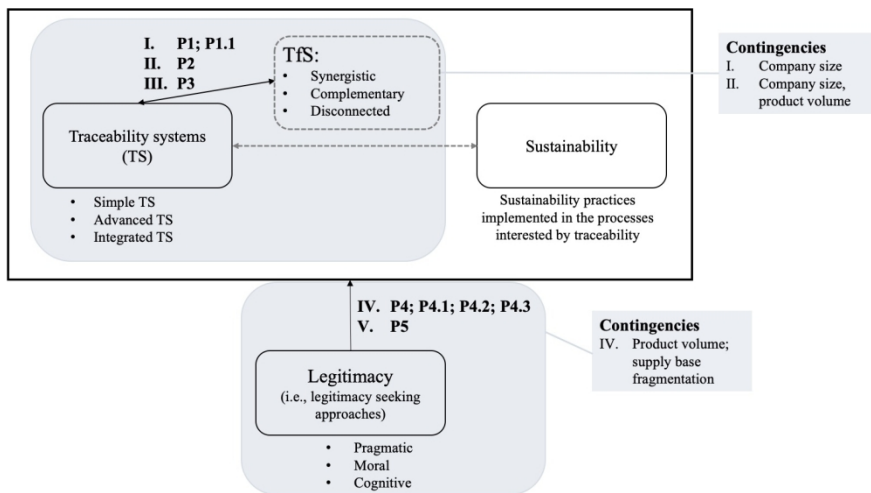


Figure 2. Comprehensive framework with research propositions

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Table I – Main constructs from literature applied in the study

Concept	Concept	Reference
Traceability	<p>“the ability to follow the movement of a food through specified stage(s) of production, processing and distribution”</p> <p>“the ability to trace and follow a food, feed, food producing animal or substance intended to be, or expected to be incorporated into a food or feed, through all the stages of production, processing and distribution”</p>	<p>Codex Alimentarius, 2006</p> <p>European Commission, 2002</p>
Traceability for sustainability	“ability to combine SC information sharing and visibility [...] for operational reasons and to ensure the reliability of sustainability claims”	Garcia-Torres <i>et al.</i> , (2019)
Simple Traceability systems	Includes operational information and product information that is traced by means of documentation	Canavari <i>et al.</i> 2010; Dabbene <i>et al.</i> 2014
Advanced traceability systems	involve operational and strategic information. Tracing and tracking is recorded in databases developed by the companies themselves or by external organizations. E.g., certification entities	
Integrated traceability systems	involve operational and strategic information. System that allows all the actors in the supply chain to input information into a common platform. An administrator is appointed for keeping consistency and control	
Legitimacy	<p>“generalized perception or assumption that actions or an entity are desirable, proper or appropriate within some socially constructed system of norms, values, beliefs and definitions”</p> <p>Legitimacy exists whenever an organization’s actions are in accordance with societal expectations</p>	<p>Schuman, 1995, p.574</p> <p>Alrazi <i>et al.</i>, 2015.</p>
Pragmatic legitimacy	It refers to the exchange between companies and their stakeholders as long as stakeholders receive direct or indirect benefit.	Schuman, 1995; Castelló and Lozano, 2011; Alrazi <i>et al.</i> , 2015
Cognitive legitimacy	It refers to an organization being consistent with stakeholders’ expectations. It is the most powerful source of legitimacy and the most difficult to influence.	
Moral legitimacy	It refers to the ‘right thing to do’ as judged by the stakeholders’ belief. This form of legitimacy is considered to be more resistant to manipulation than pragmatic legitimacy.	

*Table II – Cases analysed in this study*

Company	Location	Product analyzed	Role in the SC	Interviewees	Type and number of interviews
A	Italy	Specialty coffee	Artisan roaster	General Manager	1 online interview
B1	Italy	Certified coffee	Retailer and distributor	Head of Marketing	1 face -to-face interview
B2		Coffee traced with digital technologies			
C	Germany	Coffee transported on GPS-tracked cargos	Logistic carrier	Senior manager and Project Lead Smart Container	1 online interview
D	Italy	Coffee	Roaster	Quality director	2 online interviews
E	Italy	Specialty Coffee	Artisan roaster	Owner	1 online interview
F1	Switzerland	Certified coffee	Trader	Sustainability manager	1 online interview
F2		Coffee traced with digital technologies			
G	Italy	Coffee	Roaster	Chief Purchasing Officer Coffee Buying Department Director Environmental Sustainability & LCA Team	2 face-to-face group interviews

Table III –Sources of data collected for the different RQs

Steps in the research process with reference to research aims	Source and type of data collected for case studies
<b>RQ1- Traceability systems in the coffee supply chain</b>	<p><u>Source 1 (Primary) - Interviews</u> Face-to-face and/or phone interviews on general business aspects, types of traceability solution(s) for data collection and data communication, drivers, barriers in the adoption, expected benefits and future traceability perspectives</p> <p><u>Source 2 – News and press</u> Up-to-date preliminary information on the companies' traceability systems through a google search on re-known traceability projects.</p> <p><u>Source 3 – Technological and industry benchmarking</u> Certification schemes and standard information traced, general information of traceability solutions and modes of adoption in the coffee industry.</p> <p><u>Source 4 - Direct observations</u> Product direct observations for the traceability information communicated to the final customer.</p>
<b>RQ1- Relationship between traceability and sustainability</b>	<p><u>Source 1 (Primary) - Interviews</u> Face-to-face and/or phone interviews on drivers, barriers in the adoption of traceability solution(s), expected benefits, future traceability perspectives, sustainability initiatives and certification, their relationship with quality and traceability.</p> <p><u>Source 5 – Internal documents</u> Company websites, sustainability reports/ethic codes, corporate presentation on specific sustainability initiatives.</p>
<b>RQ2 – Legitimacy seeking approach</b>	<p><u>Source 1 (Primary) - Interviews</u> Face-to-face and/or phone interviews on drivers, barriers in the adoption of traceability solution, expected benefits, future traceability perspectives, sustainability initiative and certification, their relationship with quality and traceability.</p>

*Table IV – Definition of inductive codes for RQ1*

<b>Coding labels: TfS</b>	<b>Explanation in relation to first level codes</b>
Synergistic	Traceability and sustainability are tightly related for achieving sustainability-related goals and also to demonstrate accountability for specific sustainability initiatives, while keeping transparency along the chain.
Complementary	Traceability complement the achievement of certain sustainability objectives and thus, sustainability arises as a positive “consequence” of the traceability efforts. Traceability helps at sustainability goals but “not as a main purpose, although relevant”.
Disconnected	Traceability and sustainability initiatives are managed separately, each one with its own technology and procedures, often following different objectives.

Table V – Traceability systems implementation in the cases under study

Case	Role in the supply chain	Traceability system (type)	Technology to transmit information to customers	Information breadth			Information depth	
				Regulatory (origin, ingredients, basic safety information)	Additional: quality and safety information	Sustainability practices	Granularity level	How in depth upstream?
A	Roaster	Blockchain-based (Integrated)	QR code on the packaging	X	X	Proper income to farmers	Single SKU: blockchain based traceability	Producers
B1	Retailer	Integrated management system (Integrated)	QR code on the packaging	X	X	Proper income to farmers, helping farmers in keeping up their businesses	Two SKUs	Producers (generally organized in cooperatives)
B2		Third party certification (Advanced)	(proprietary) certification label on the packaging	X	X		Most of the product lines	Producers
C	Logistic operator	Real time monitoring system (Integrated)	N/A	/	X	/	Specific product lines (specific customers)	Real time position from exporting countries to western roasters and product parameters
D	Roaster	Documental (Simple)	(proprietary) certification on the company website	X	X	Responsible supply chain practices	All product lines	Producer in Brazil, cooperatives in Colombia, exporters in Africa and South-East Asia
E	Roaster	Documental (Simple)	Basic information on the packaging	X	X	Sustainability is delegated to first tier supplier	All product lines	Supplier 1 tier upstream

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F1	Trader	Third party certification ( <i>Advanced</i> )	Certification label	X	X	Proper income to farmers, farmers to be compliant with social and environmental standards	Specific product lines (specific customers)	Producers
F2		Integrated management system ( <i>Integrated</i> )	QR code on the packaging			Information about the "family behind the farm" and quality standards	Specific product lines (specific customers)	Region /cooperative (depending from where)
G	Roaster	Third party certification ( <i>Advanced</i> )	Certification label	X	X	Proper income to farmers, farmers to be compliant with social and environmental standards	Specific product lines (specific customers)	Traders (1 tier upstream)

British Food Journal

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Table VI – Legitimacy seeking purposes driving the implementation of traceability and sustainability

Case	Most significant quotation on legitimacy seeking purposes	First level coding	Second level coding: Legitimacy form	Sustainability practices included in the traceability processes	Traceability for sustainability
A	<i>"it is not a traditional coffee, it is a speaking product, communicating to customers additional information that they want to know"</i>	Focus on direct benefits (i.e., more informative contents) for customers	Pragmatic legitimacy	Collaboration with NGOs for the provision of facilities and development projects aimed at increased farmers independency, with own and sufficient income sources from coffee cultivation	Synergistic
B1, B2	<i>"In addition to the operative benefits that connects to a better monitoring of the chain, we can use both traceability systems (both QR-code and certifications) to better communicate with final costumers that the product incorporates ethical values, in this way the customers' willingness to pay is higher"</i>	Demonstrating the ethical values of the company to customers to charge an higher price	Pragmatic legitimacy	Coffee producers are paid a fair price plus a quality premium. Continuous farmer training about sustainable agronomic techniques and about risk prevention.	B1: Synergistic B2: Synergistic
C	<i>"it (i.e., the technology) allows us to track the localization of the truck to assure quality. For us quality means a transportation in the right time, in line with the costumer request"</i>	Focus on direct benefits (i.e., quality and service level) for customers	Pragmatic legitimacy	The GPS tracking system allows to monitor parameters like temperature and humidity in the storage. The timely indication of critical values in these parameters can support food waste prevention.	Complementary
D	<i>"Despite at that time there were several certifications, they were all at the expenses of the producers... Instead our proprietary certification does not create any extra expenses for the farmers"</i>	Promotion of farmers wellbeing justify ad-hoc certification effort	Moral legitimacy	100% of farmers are audited. Farmers' continuous development and sustainability: training on good agricultural practices, incentives and rewards systems, continuous monitoring, social initiatives.	Synergistic

				A higher price paid to guarantee an adequate income.	
E	<i>"We have to put quality at the first place, this is what customers expect from a specialty coffee, that is, good quality"</i>	Sustainability and quality are taken for granted by customers	Cognitive legitimacy	All the sustainability initiatives are required to first tier suppliers. No standard certification schemes are adopted because they are not compatible with Company E's quality standards.	Disconnected
F1, F2	<i>CERTIFICATION (F1): "we wanted to go further than only certifications, it has been a good start for a couple of years but we need to be able to respond to what farmers need and so to develop our own responsible sourcing program" QR CODE (F2): "The more you can target the information that you communicate to individuals, the better the identification of consumers with the actual farmers ...That means moving to data collection to story-telling".</i>	F1: Promotion of farmers wellbeing justify ad-hoc traceability effort  F2: Focus on direct benefits (i.e., storytelling) for customers	F1: Moral legitimacy F2: Pragmatic legitimacy	Cross-sectoral partnerships with NGOs and certification bodies to reach the farmers and implement development initiatives: improve farmers' welfare, transfer of entrepreneurial skills. Sustainable initiatives differ depending on the different challenges of the specific geographical or social context.	F1: Synergistic F2: Complementary
G	<i>"The certified coffee supply chain has clear labels which might trigger customers' interest. The percentage of certified coffee is however low, because generally the market does not pay the cost of certification"</i>	Demonstrating the ethical values of the company if "the market pays the cost"	Pragmatic legitimacy	Cross-sectoral partnership with NGOs and certification bodies to reach the farmers and implement development initiatives. Other initiatives are delegated to the trader.	Disconnected

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Traceability for Sustainability: Seeking Legitimacy in the Coffee Supply Chain

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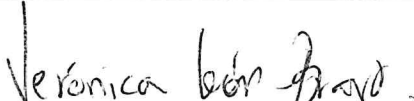
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