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Assessing the performance of sustainability practices in an Italian food supply chain

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Abstract

Purpose – Managerial practices are essential for activating the potential sustainability transition of the food supply chain. Therefore, the purpose of this paper is to contribute to the existing literature on the assessment, reporting, and disclosure of value in the food supply chain through a multiple-case study.

Design/methodology/approach – The present study proposes an assessment tool that can disclose the real impact of managerial practices with an innovative application of the SAFA Food and Agriculture Organization (FAO) framework within the context of the Italian meat production supply chain and, thus, enable producers to orient the transition process.

Findings – The multiple-case study analyzes and discusses three years of data (2019–2021) for three medium and large Italian companies operating in the meat production supply chain. The discussion includes the comparison of results based on the set of 17 themes and 80 proposed sustainability indicators.

Practical implications – This paper has both theoretical and practical contributions to the current discussion. This work extends the literature on the propensity to measure and report sustainability' performances.

Social implications – This paper fosters the promotion of sustainable managerial practices and expands the literature on managerial tools to disclose sustainability' performance.

Originality/value – The supply chain due diligence theoretical background has been adopted to investigate the (outside-in) supply chain transparency. In addition, the institutional legitimacy theory has been applied as (inside-out) perspective on how companies address their contribution to the production systems transition.

Keywords Value distribution, Sustainability assessment, Supply chain, Food, Meat production, EFRAG, FAO

Paper type Research paper

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1. Introduction

Two of the areas in which the principles of sustainability are increasingly applied are the management of supply chains (SCs) (Carter and Rogers, 2008; Ashby *et al.*, 2012; Caccialanza, 2022) and the analysis of the sustainability performances of SC managerial practices (Asif *et al.*, 2020; Khalid *et al.*, 2015). Agricultural food production and supporting operations (the agrifood sector) are one of the most emblematic cases of SCs that needs to adapt to climate change challenges, since the sector is exposed more than others to climate change effects (Bonisoli *et al.*, 2018, 2019; Bremmers *et al.*, 2007; Filippi and Chapdaniel, 2021; Tchonkouang *et al.*, 2024). Nevertheless, the need for an effective assessment of sustainability performance in agrifood SCs is still debated, and several solutions have been tested to find an effective approach (de Carvalho *et al.*, 2022; Hens *et al.*, 2018; Kumar *et al.*, 2022). This study fosters the discussion proposing an extensive self-assessment tool for the evaluation of sustainability performance encompassing 17 themes and several managerial practices. To do so, an operationalization of the Sustainability Assessment of Food and Agriculture (SAFA) proposed by the Food and Agriculture Organization (FAO) has been developed, proposed and validated in three medium-to-large food firms. In fact, within the agrifood sector, prior studies highlighted extensive heterogeneity and notable differences within the drivers of sustainable innovation and sustainable targeted performance of food production SCs (Caccialanza and Torelli, 2024; Galli *et al.*, 2023; León-Bravo *et al.*, 2019). Due to the heterogeneity of food product categories, therefore, a focus is required on a singular product category. This study opted for the analysis of the meat production SC as this context represents a balance between innovative trends and more traditional approaches (Ferronato *et al.*, 2021), the promotion of local and guaranteed SC production (Bava *et al.*, 2017; Bragaglio *et al.*, 2018; León-Bravo *et al.*, 2019) and sustainable orientation evolution (Taylor, 2005; Hoek *et al.*, 2021). In addition, there are several reasons behind the focus on the meat SC, considering the extent of the concept of sustainable supply chain management (SSCM) (Seuring and Müller, 2008; Sarkis *et al.*, 2011; Beske and Seuring, 2014; Brandenburg *et al.*, 2014) and the attempted multidimensional approach to the assessment of sustainability performances (Negri *et al.*, 2021; Stindt, 2017). Finally, the meat production SC also involves the ethical dimension of livestock management (Allievi *et al.*, 2015) and animal welfare (Akaichi *et al.*, 2019), as well as the valorization of coproducts and by-products in food SCs (Reisch *et al.*, 2021).

Considering the abovementioned elements, managerial practices activate the potential of food SC sustainability transition (Beske and Seuring, 2014; Fellegara *et al.*, 2023). Consequently, this multiple-case study contributes to the existing literature on the assessment, reporting and disclosure of value in agrifood SCs (Arulnathan *et al.*, 2020; Bennett and Grabs, 2024; McElroy and Thomas, 2015; Porter and Kramer, 2011). Research gaps exist in the comprehension of the impacts of managerial practices, specifically, on the effective assessment and disclosure of the impacts generated on different categories of SC stakeholders (Rialti *et al.*, 2022). The impacts of managerial practices can indeed be studied using two complementary perspectives. On the one hand, internal performance assessment is driven by various endogenous factors, which provide opportunities for continually improving sustainability performance. On the other hand, exogenous factors drive the need for greater transparency in the company's activities, thus requiring disclosure of the performance of implemented managerial practices. Depending on the perspective adopted, it is possible to identify categories of stakeholders who are most likely to request performance assessments and evaluations of generated impacts, either from inside (e.g. shareholders, members of the sustainability committee) or from outside (e.g. regulators, trade unions, associations and final product distributors). This specific interpretative theoretical

framework adopted for each perspective can clarify the peculiarities of the different types of endogenous and exogenous factors. Therefore, a combined adoption of SC due diligence theory and institutional legitimacy theory is applied. The SC due diligence framework has been used as a holistic approach to foster the outside-in SC transparency (Adams and Larrinaga, 2019; Chamas *et al.*, 2021; Caccialanza *et al.*, 2023a, 2023b; Hofmann *et al.*, 2018), in association with the institutional legitimacy theory as an inside-out perspective on how companies address their contribution to a sustainable transition (Cheng, 2010; Crossley *et al.*, 2021; Do *et al.*, 2024; Silva, 2021). The spread of more sustainable managerial practices, therefore, contributes to the legitimation of SC operating companies and to the overall respect of planetary and social boundaries (Persson *et al.*, 2022; Rockström *et al.*, 2009, 2021).

In particular, this three-year study (2019–2021) directly engaged the companies involved in a data collection and reporting process that used a multiple intervention-research approach, thus integrating other studies conducted under similar conditions (e.g. Bebbington *et al.*, 2017; Taïbi *et al.*, 2020). Moreover, this study is part of the debate on how to build a new tool to collect data, manage data and finally report to internal or external stakeholders the impacts of food production in accordance with a multidimensional accounting models perspective (Antonini and Larrinaga, 2017; Azadnia *et al.*, 2015; Bebbington *et al.*, 2007, 2017, 2019; Dillard, 2015; Taïbi *et al.*, 2020).

The following section reviews previous contributions in the literature, and then presents the analyzed context of the meat SC in Italy. This paper is structured in four additional sections dedicated, respectively, to the presentation of the methodology adopted, the presentation and discussion of general results of the three case studies, the illustration of contributions and concluding considerations on the assessment of sustainability performances in meat SCs.

2. Literature review

2.1 Sustainable supply chain performance

Several previous papers have highlighted both the centrality of the issue of sustainability of the meat SC and the need to be able to conduct performance assessments achieved by individual categories of stakeholders, as well as by the SC as a whole. As discussed extensively by Caccialanza *et al.* (2023a, 2023b), there are several types of managerial practices that have been addressed over time in the meat SC that can contribute to the mitigation of climate change effects. Specifically, they emphasize that various practices originate both from efforts to enhance SC coordination and efficiency, as well as from the promotion of proactive measures to reduce impacts.

Though improvement per se is already a first and substantial step in the process of transitioning production processes, it also has been stressed that it is important to report and talk about companies' walk (Schoeneborn *et al.*, 2020), and thus communicate and disclose the real effort and managerial practices adopted. In Italy's meat SC, distinctive dynamics have already been identified, warranting further transdisciplinary and multilevel investigation (Fellegara *et al.*, 2023). In particular, Galli *et al.* (2023) analyzed the links and potential limiting and supporting factors between sustainability actions and sustainability reporting, thanks to a comparative approach between companies involved in sustainability actions and those whose reporting practices lack a formal performance assessment or reporting systems (Ghosh and Shah, 2012; Korca *et al.*, 2023). Their analysis pointed out the phenomenon of "greenhushing" in the form of "the deliberate choice to omit or only partially provide information on one's effective sustainability practices to avoid creating problems for one's own sector, collaborating companies or clients" (Galli *et al.*, 2023, p. 15).

This evidence was also confirmed by empirical examination of the focal firms' propensity to disclose sustainability reports in the transformation step of this SC (Caccialanza and Marinoni, 2023; Fiandrino *et al.*, 2019). The lack of disclosure regarding value distribution within the SC, along with the assessment of its financial and nonfinancial impacts, hinders a proper understanding of the efforts and challenges faced by specific stakeholder groups (Adams, 2017; Barter, 2015; Grabs *et al.*, 2024; Martinelli *et al.*, 2020). These prior studies highlighted the need to enhance performance awareness and improve the visibility of reporting, driven both by competitive pressures (Gracia *et al.*, 2011; Kumar *et al.*, 2022) and by additional external pressures. In this context, at least two external factors – particularly institutional and regulatory ones – are expected to drive an urgent transition. First, the Corporate Social Responsibility Directive (CSRD) obliges an increasing number of companies to report on their performance, including dimensions that are not strictly economic-financial [Directive European Union (EU) 2022/2464). Second, the European perspective pushes for an impact assessment perspective throughout the whole production SC, as demonstrated by the associated implementation guidance "DRAFT European financial reporting advisory group (EFRAG) IG 2 – Value Chain" by EFRAG or the Corporate Sustainability Due Diligence Directive (CSDDD) approved in July 2024. Additionally, examining production sectors, the agrifood sector is among the most closely monitored and is the subject of greater production and investment constraints being imposed in the planning of the Green Deal, specifically in the Farm to Fork strategy. These aspects further emphasize the need to investigate the performances of business processes to mitigate the impacts generated at the SC level.

As Schaltegger *et al.* (2023, p. 3) suggest, one approach to examining these dynamics is to adopt a company-level perspective on sustainability transformations and transitions, and to develop management implications that can be effectively implemented at the company level. This opportunity is combined with the need to integrate, according to a holistic approach, different interrelated concepts: sustainability assessment, management accounting, control and reporting (Maas *et al.*, 2016). Consequently, this study aims to increase the awareness of these enterprises that often have already implemented sustainability managerial practices, but do not disclose or communicate their sustainability performance (Galli *et al.*, 2023). As a consequence, this may directly reduce the phenomenon of 'greenhushing' already demonstrated as diffused in this sector.

2.2 Theoretical perspective and theoretical framework

The discussion of the promotion of sustainability accounting and performance in management studies has given rise to a long and varied debate on the study of the interaction between accounting, natural resource boundaries and social dimensions (Adams and Larrinaga, 2019; Bebbington and Larrinaga, 2014). Following this debate, in this study a combined approach of theoretical perspectives is applied, namely, the SC due diligence (Hofmann *et al.*, 2018) in association with the institutional legitimacy theory (Rendtorff, 2020; Silva, 2021). Following legitimacy theory there is a close connection between business legitimacy, corporate social responsibility, stakeholder management and sustainability. With the focus on the SC in CSRD regulation legitimacy is based on the due diligence reporting efforts of the company. Recently, legitimacy theory has been combined with the theory of relational economy, where business ethics and CSR creates business legitimacy through stakeholder relations (Rendtorff *et al.*, 2024; Rendtorff, 2025). Value-creation is based on dynamic interactions between firms and their environments where networking, stakeholder management and relational contracts constitutes the formation of business legitimacy in the firm. The increasing normative pressure for alignment of values and compliance with

sustainability is formed on the basis of this integration of the firm in a relational network that determines sustainability and social responsibility.

SC due diligence is increasingly gaining relevance in SSCM studies, due to the increasing normative pressure and the attempt to include the ensuring of profit with the integration of sustainability principles in corporate purposes (Ventura, 2023). Initially, normative pressures and mandatory disclosure requirements targeted the focal companies within SC. Focal companies were expected to drive improvements in the social and environmental performance of suppliers due to their role in governing the SC, their ability to manage upstream and downstream relationships and their responsibility for designing the final product (Seuring and Müller, 2008, p. 1). After also focal food businesses failed to achieve the zero-deforestation goal by 2020, several national (i.e. the UK, Germany, Japan, South Korea, Canada) and international (i.e. European) regulators imposed forms of mandatory SC scrutiny for importers dealing with commodities such as meat, leather, soy, oil palm, coffee, cocoa and rubber (Alexander *et al.*, 2024). In the perspective proposed by previous authors in reference to food SCs (e.g. Velte, 2023; Ollivier de Leth and Ros-Tonen, 2022), we believe that an effective sustainability accounting and reporting system can mitigate exogenous demands for outside-in transparency regarding corporate managerial practices and performance. More specifically, this assessment tool can increase the accountability and propensity for reporting these managerial impacts.

On the other hand, with an inside-out perspective, it is shown that businesses look for a legitimization of their operations and an improvement of sustainability performance (Rotter *et al.*, 2014; Silva, 2021). Accordingly, Cheng (2010) confirms that there are adaptive strategies that members of a SC implement to gain legitimacy in their network and modify their business model. Moreover, businesses engage in sustainable social and environmental practices to strengthen their reputation and image (Crossley *et al.*, 2021; Müeller *et al.*, 2009), while Do *et al.* (2022) stress the establishment of a "Legitimacy-embedded efficiency" logic, wherein economic growth is attained while simultaneously safeguarding the environment through the optimal utilization of resources.

Therefore, Figure 1 displays the research framework adopted and attempts to combine the several streams of literature that contributed to the definition of the proposed assessment tool, as well as its positioning according to prior research conducted by Maas *et al.* (2016), Galli *et al.* (2023) and Caccialanza and Torelli (2024). Consequently, we believe that the combined adoption of the theoretical frameworks may shed light on the perception of the complexity involved in the inside-out (solid down arrows in Figure 1) and outside-in (dotted up arrows in Figure 1) perspectives involved.

Furthermore, we propose, discuss and validate the proposed assessment tool in the field to address the inside-out and outside-in tensions that arise, aiming to prevent "greenhushing" practices and to transparently disclose the true impacts of firms' managerial practices on SC stakeholders. In line with this purpose, this study includes a review of the main features of existing tools and models in the context of other food product categories (see also Section 3.1).

2.3 Assessment tools for sustainable food supply chain management performance

Several key elements have been included into the theoretical framework, and operationalized in the assessment tool, by integrating the perspectives of institutional legitimacy and SC due diligence. This approach enables the model to be applied to a wide audience within the reference network, fostering discussion on the transition of business models in the context of the meat SC (Fellegara *et al.*, 2023; Hübel and Schaltegger, 2022; Kumar *et al.*, 2022). Accordingly, Cagno *et al.* (2023) pointed out that an effective assessment framework in

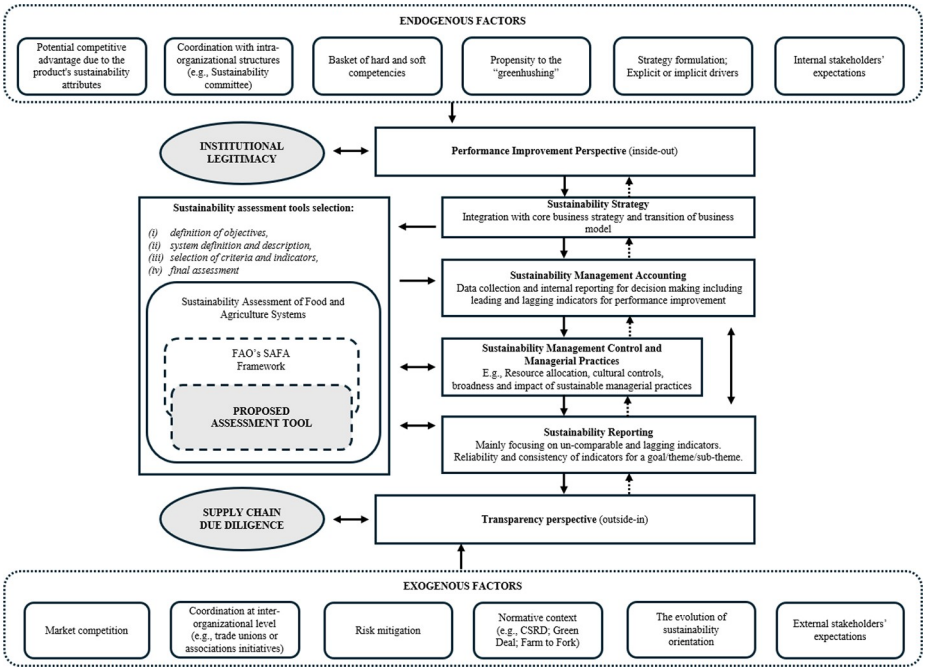

Figure 1. Theoretical model
Source: Adapted from Maas *et al.* (2016); Galli *et al.* (2023); Caccialanza and Torelli (2024)

manufacturing systems can be promoted thanks to: the integration of different paradigms; the possibility of its application at different levels; and its adaptability to firms' characteristics with scalable systems. First, in line with the concept of integrating multiple paradigms, McElroy and Thomas (2015, p. 427) underscore that natural resources are part of a broader natural capital – air, land, water, flora, fauna, ecosystems and other biophysical resources – all of which are incorporated into this assessment tool (see Section 3.1). Second, the idea of the applicability of the assessment tool to different levels of the SC is confirmed since we rely on prior studies that analyze the drivers of sustainability reporting in this context at firm (Galli *et al.*, 2023; Hübel and Schaltegger, 2022) and meso level (Caccialanza and Torelli, 2024). Third, the adaptability and scalability of the system is ensured thanks to the qualitative approach (Do *et al.*, 2024; Filippi and Chapdaniel, 2021) and scoring methodology adopted (see Section 3.3 for details).

Within the specific debate on assessment tools for sustainable food SC management (e.g. León Bravo *et al.*, 2021; Yakovleva *et al.*, 2012) proposed several initiatives to improve the food SC performances with reference to social, environmental and ethical issues. In fact, prior research deepened the comprehension of other peculiar categories of products – i.e. fisheries (Ingrao *et al.*, 2016), forestry (Tröster and Hiete, 2018), coffee (Bennett and Grabs, 2024) or soy (Knudsen *et al.*, 2010) – or stages of local economic development (Asif *et al.*, 2020; Ghisellini *et al.*, 2016; Ghosh and Shah, 2012). Several impacts and associated sustainable managerial practices have been identified for the transition to cleaner food production models (McMichael *et al.*, 2007; Smith and Gregory, 2013). However,

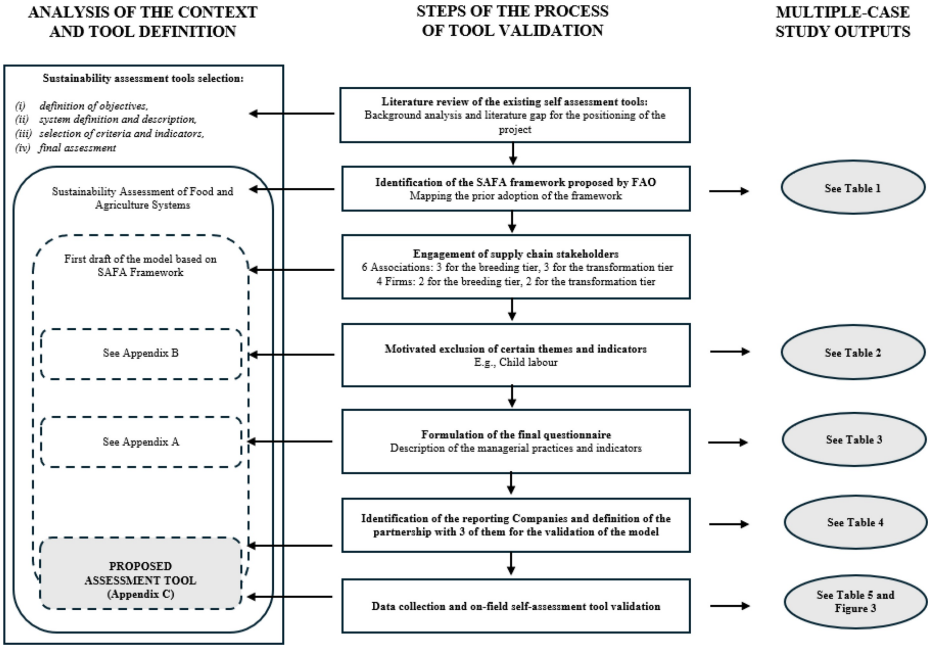

Figure 2. Methodology adopted for the validation of the tool
Source: Authors' elaboration

considering the debate conducted by scholars (e.g. Caccialanza *et al.*, 2023a, 2023b; Demartini *et al.*, 2016; Golini *et al.*, 2017; Hübel and Schaltegger, 2022; Kumar *et al.*, 2022), not enough evidence emerges to apply any existing effective assessment in the specific context of the meat SC described below. According to Demastus and Landrum (2024) none of the currently available sustainability schemes support an effective transition of production models. This study further supports our attempt to validate this context-specific model. More specifically, this gap in literature justifies the study and suggests the promotion of the on-field implementation of a tool especially useful to small and medium-sized enterprises (SMEs), which are not yet directly involved in the sustainability performance disclosure obligation [e.g. see CSRD or Voluntary Sustainability Reporting Standards for nonlisted SMEs (Voluntary sustainability reporting standard for non-listed SMEs VSME) published in December 2024 by EFRAG]. On the other hand, these smaller enterprises might be indirectly involved in the reporting process if they are part of the SC procurement with focal actors who harbor ambitions in the development of sustainable procurement policies or due to the reporting obligation to which larger companies are subjected (Caccialanza, 2022, 2023b). It therefore emerges how this tool can also benefit them in relation to external requests for sustainability (performance) reporting in negotiations and at the stage of their evaluation as suppliers to large firms. Here we refer to the concept mentioned in the theoretical framework of potential competitive advantage due to the product's sustainability attributes gained by companies adopting the framework. These ambitions might be limited on the other hand by a limited basket of soft and hard skills of SMEs entrepreneurs and managers, as well as by the creation or coordination of substructures or resources internally. The urgency for the

adoption of the assessment tool, and the satisfaction of the disclosure requirements, is further reinforced if we assume an expected growth of alternative proteins' market-share that are positioned as "sustainable" (Allegretti *et al.*, 2018; Verneau *et al.*, 2016) and "cruelty-free" protein sources (Whelan and Kronthal-Sacco, 2019). Evidence of this growth has been already demonstrated in other European countries (Collier *et al.*, 2021), thus representing a further source of risk that might be partially mitigated.

2.4 The case of Italian meat and cured meat supply chain

Several studies have previously highlighted the importance of the cultural background and national context in the assessment of food sustainability perception (e.g. Allievi *et al.*, 2015; Leroy and Praet, 2015), and adoption of sustainable meat production SC practices (e.g. Caccialanza *et al.*, 2023a, 2023b; Neo and Emel, 2017). Transdisciplinary research conducted by Almiron and Zoppeddu (2015) and Fellegara *et al.* (2023) on this SC confirms that the Italian scenario makes no exception, leaving room for research on the better understanding of this context. Additionally, the hypothesis of the monetization of the external costs already has been evaluated by other scholars (e.g. Antheaume, 2004; Unerman *et al.*, 2018), and Nguyen *et al.* (2012) estimates that 1.9€/kg is the environmental cost for EU pig meat products. In addition, the Italian case represents a unicum in terms of application of European legal requirements, environmental and biodiversity protection and propensity for the export of meat-based products [e.g. EU, COM (2018)181; Leone, 2021]. Accordingly, Amicarelli *et al.* (2021) estimate that in 2018 the Italian meat industry processed more than 4.9 million tons to produce approximately 2.0 million tons of fresh meat, about 15% of the domestic agrifood sector value. However, Arrigoni *et al.* (2023) estimate that in 2018 the external cost of meat consumed in Italy potentially generated a cost to society approximately equal to €36.6bn. Therefore, this may represent a great opportunity to increase the transparence of the sustainability performances of current managerial practices and foster the transition of production systems thanks to the sustainability reporting propensity and SC's multidimensional and multitier perspective (Pérez *et al.*, 2019). As supported by Anestis *et al.* (2020), the dietary composition in the breeding phase is one of the impactful issues to determine the environmental footprint, so that the traditional heavy Italian pig is the best candidate case for the validation of a specific assessment tool (Bava *et al.*, 2017). An additional indication of a greater propensity to measure the best environmental impact is also suggested by the prevalence of quality certifications achieved at the transformation step of the SC (Caccialanza *et al.*, 2023a, 2023b). Furthermore, a peculiar valorization of complementary products and systems (Bragaglio *et al.*, 2018; Ruviaro *et al.*, 2015) or valorization of by-products (Nguyen *et al.*, 2012; Vergé *et al.*, 2018) may significantly impact the overall sustainability performance evaluation, since no effective data-driven evaluation can be carried on by practitioners without a valid self-assessment tool (Castellini *et al.*, 2012; Kamble *et al.*, 2020). Therefore, this exploratory multiple case study contributes to fill the research gaps that exist in the comprehension of mechanisms of sustainability performance disclosure involving SC stakeholders and SC managerial practices in the Italian context.

3. Methodology

To validate the self-assessment tool, a qualitative methodology (Barrat *et al.*, 2011) is adopted to discuss the key SC dimensions and theme in relation to the ability of companies to measure actual performance in the achievement of transition of production systems (Arulnathan *et al.*, 2020; Stindt, 2017; Fellegara *et al.*, 2023). To do so we propose an exploratory multiple-case research design (Crossley *et al.*, 2021; Eisenhardt, 1989; Yin,

2018) to validate a self-assessment model, similar to the approach adopted by previous scholars for the evaluation of multitier SCs (Do *et al.*, 2024; Gold *et al.*, 2010; Perez *et al.*, 2010). In fact, as highlighted by Do *et al.* (2024, p. 4), a case study approach is suitable for abductive reasoning and to allow a general theory to be reconciled with the "contextual idiosyncrasies" that may emerge from the cases (Gibassier and Schaltegger, 2015; Ketokivi and Choi, 2014). In addition, a multiple-case design is preferable since it leads to more grounded, robust and generalizable results if compared to single cases (Yin, 2018).

The choice of the FAO's SAFA existing framework within the existing frameworks (FAO, 2013a, 2013b, 2014, 2015), the adaptations proposed, and the selection of the case studies for the on-field validation of the tool are introduced in the next three sections and anticipated in Figure 2. More specifically, Figure 2 has several functions, since position our tool in the current debate, exploding our contribution with refers to the theoretical framework proposed in Figure 1 and according to the selected Italian food manufacturing context (see left part of both figures and Appendix A, B and C in the supplementary material). The implementation and validation of this self-assessment model has been conducted in different phases (van Cauwenbergh *et al.*, 2007). As proposed by Deytieux *et al.* (2016) and lately by Havardi-Burger *et al.* (2021), we follow four main phases: (i) definition of objectives, (ii) system definition and description, (iii) selection of criteria and indicators and (iv) final assessment. Second, Figure 2 visualizes the steps followed for the process of tool definition and validation; thus, allowing higher transparency of the procedures and logical steps followed. Third, the right part of Figure 2 provides an additional callout for each step for the specific outputs of the multiple-case study.

3.1 Definition of objectives and the selection of the sustainability assessment of food and agriculture framework

There have been several attempts in the literature over time to formulate models and frameworks with the potential to be applied in different agrifood contexts as discussed priorly in the background section. Proposals have differed in the level of detail and the span of the dimensions involved (de Olde *et al.*, 2017) or the production system adopted (de Olde *et al.*, 2016). Previous attempts to systematize existing assessment systems have further emphasized this need for this specific production SC (Demartini *et al.*, 2016).

Following Taylor (2006), we adapted the structure of the value stream to the present research considering the three main tiers involved in the meat production SC: the farm step, the transformation step and the distribution and consumption step. Each SC tier has been associated with well-defined categories of stakeholders (Lees *et al.*, 2020; Caccialanza *et al.*, 2023a, 2023b) that have been considered as final users of the proposed framework: the breeders and farmers; the slaughterers and processors, and the distributors and consumers. Arulnathan *et al.* (2020) highlight how the choice of an effective sustainability assessment tool by practitioners is crucial to pursue an effective transition to cleaner production systems, as well as being introduced to sustainability performance metrics (Hassini *et al.*, 2012). They show that it is not possible a priori to define the best framework to apply and how a complementary bottom-up and top-down approach is necessary in this process. To estimate production-related impacts, the tool was designed considering the companies of the farm step and the transformation step of the SC as the main adopters and implementers of the model, as the production phases account for most of the overall impacts according to prior studies (e.g. Arrigoni *et al.*, 2023). The distribution and final consumption stage is thus to be considered as well as the final users of the output of the model and estimators of the different performances that competing SCs produce in light of this integrated evaluation system that allows comparability of the performance among producers (Adams, 2017; Ghosh and Shah, 2012;

Grabs and Carodenuto, 2021; Korca *et al.*, 2023). Consequently, this model considers these relevant tiers of the SC as adopters and final users, thus aiming to maximize the stakeholders' engagement with the model (Adams and Larrinaga, 2007; Bebbington *et al.*, 2017; Correa and Larrinaga, 2015). Indeed, we proceed to define the more suitable existing framework to adapt it to the peculiarities of this SC.

Despite its embedded limitations, Schader *et al.* (2014) apply the FAO SAFA framework after having analyzed 35 sustainability assessment tools in an attempt to find the most comprehensive in terms of dimensions, themes and indicators involved, as well as a well-established application in literature. Similarly, Bonisoli *et al.* (2019) apply the SAFA framework to the context of the banana SC in Ecuador. The interest in this framework has been extensively acknowledged in literature regarding its flexibility in different contexts, high credibility, user-friendliness, comprehensiveness and compatibility with other frameworks (Bonisoli *et al.*, 2019). Lately, Havardi-Burger *et al.* (2021) implemented a theoretical framework based on SAFA to the flowering potted plants SC in Germany for its cost-effectiveness rationality.

Previous operationalizations of the SAFA framework are mapped according to the scheme presented in Table 1, and these applications are compared based on various factors, including the products analyzed, geographical focus, scope of analysis and categories of stakeholders engaged in SC-specific contexts.

Given its extensive prior applications and adaptations, the SAFA (FAO) framework – originally conceived as a broad, farm-oriented tool – raises few specific constraints when applied to a European meat-supply-chain study. In particular, its 327 indicators exceed the practical needs of the context analyzed, its global thresholds do not necessarily align with Italian rules and standards, and part of its scoring relies on self-reported data. We therefore adapted the indicator set for this sector, adjusted thresholds to national standards or documented best practice, triangulated self-assessments with site visits and third-party evidence, and built a three-year (2019–2021) data series to capture performance trends over time. The indicator-selection procedure is detailed in this methodological section, while the residual limitations of our adaptation are discussed in the concluding section.

3.2 System definition and description

In accordance with prior studies summarized in Table 1, we proceed with the comparison of the themes proposed in each of the four dimensions of the SAFA model: governance, environment, economy and social. Prior analysis on meat SCs was applied mainly in the contexts of developing countries (Gayatri *et al.*, 2016), so that a reprioritization of material themes occurred to provide an effective context-specific tool (Fernández-Ferrín *et al.*, 2021) and the definition of the objectives (Sala *et al.*, 2015). This reconfiguration became necessary with the prospect of including most small and SMEs in the sector that are currently interested in sustainability issues, but feel they are too small to be able to implement significant investments toward this strategic orientation (Baumgartner and Ebner, 2010; Jansson *et al.*, 2017). More recently, scholars (Petit *et al.*, 2018; Martinelli *et al.*, 2020) confirm that in food systems and meat transformation SMEs the sustainability orientation is differentiated. Moreover, Bonisoli *et al.* (2018) find that FAO's SAFA tool is also validated with the purpose of assisting SMEs of the production SCs to improve their processes for a more performance-oriented perspective.

Second, a literature analysis of the compatibility and significance of the subthemes and indicators for this specific production SC is completed, according to the approach adopted by other scholars (e.g. Alexander *et al.*, 2024; Hassini *et al.*, 2012).

Table 1. References applying SAFA framework, focus and span of analysis

Group	References	Countries	Focus	Category of the stakeholders involved: Breeders and famers (transformation step of the supply chain)	Slaughterers and processors (transformation step of the supply chain)	Institution or policy maker
Complete sustainability assessment using SAFA	Gayatri *et al.* (2016)	Indonesia	Beef meat in small producers supply chain	x		
	Ssebunya *et al.* (2016)	Uganda	Coffee supply chain	x		
	Landert *et al.* (2017)	Switzerland	Urban food systems			x
	Butti Al Shamsi *et al.* (2018)	United Arab Emirates and Italy	Organic products	x	x	
	Cammarata *et al.* (2021)	Italy	Agroecology and organic farming in sicily	x		
	Pérez-Lombardini *et al.* (2021)	Mexico	Compares three types of production systems			
Partial sustainability assessment using SAFA	Theurl *et al.* (2017)	Austria and Italy	Winter vegetables	x		x
	Bonisoli *et al.* (2019)	Organic and conventional bananas	Brazil	x	x	
Sustainability assessment using	Hřebíček *et al.* (2013)	Czech republic	Czech food products	x		
	Kassem *et al.* (2017)	Czech republic	Czech agriculture companies	x		
	Gaviglio *et al.* (2017)	Italy		x		

(*continued*)

Table 1. Continued

Group	References	Countries	Focus	Category of the stakeholders involved: Breeders and famers (transformation step of the supply chain)	Slaughterers and processors (transformation step of the supply chain)	Institution or policy maker
some of the SAFA indicators			Evaluation of farm assessment tools			
SAFA applied in synergy with other frameworks	Hřebíček *et al.* (2013)	Czech republic	Analysis of determinants for the application of GRI and SAFA frameworks			
	Gasso *et al.* (2015)	Germany and Denmark	Biogas sustainability assessment	x	x	
	Dabkienė (2016)	European countries	Scope of farms sustainability using FADN data	x		
	Soldi *et al.* (2019)	Paraguay	Assessment of different classes of agricultural systems	x		
	Havardi-Burger *et al.* (2021)	Germany	Flowering potted plants supply chain	x	x	

Source(s): Authors' elaboration

An initial version of the questionnaire was drawn up following the comparison with a first draft of significant subthemes and indicators proposed by these studies. This phase included the receipt of feedback thanks to online meetings with six associations (three for the breeding tier, three for the transformation tier) and four firms partnered for the research project (two for the breeding tier, two for the transformation tier). This phase ensures that the issues and metrics were understood and shared by SC stakeholders (Bremmers *et al.*, 2007; Hassini *et al.*, 2012) and that the process of validation of the tool was performed in conformance with the logic of coconstruction of the sustainability accounting tool (Taïbi *et al.*, 2020, p. 1222). The exclusion of some subthemes has never been motivated by the necessity of synthesis of the assessment tool but is due to the inconsistency compared to the context of this specific production SC (e.g. exploitation of child labor). A complete list of excluded indicators in the final version of the assessment tool, along with the rationale for their exclusion, is provided in Appendix B, supplementary material. These indicators from the original SAFA model were omitted from the assessment model for various reasons. First, some indicators relate to compliance with regulations that are either specific to developing countries or low-institutional-quality contexts, making them irrelevant or at least not material issues for a Western European country like Italy. Redundant indicators were omitted, particularly in areas where companies were not directly measuring related metrics, and only the most efficiency-led indicators were retained. Moreover, certain indicators were irrelevant to the animal-based SC being analyzed (i.e. "hazardous pesticides" indicators that refer mainly to cereal-based SC production). Finally, issues like "child labor" or "health coverage and access to medical care" were excluded as they are already adequately addressed by Italian constitutional regulations.

3.3 Selection of criteria and indicators

This subsection describes the process for selecting themes, subthemes and indicators, the type of indicators, the scale adopted for scores, and the management of feedback received in the field test phase and during the analysis of the three multiple case studies proposed. Table 2 proposes a comparison between the width of the SAFA model in terms of themes, subthemes and indicators covered, compared to those selected for this assessment model.

At this stage, additional feedback was collected for the drafting of the sections of the document aimed to be used as an operational guideline. This document, that is the final outcome of the whole project, has as final users and target audience the practitioners of this SC (copy of the Italian version of the guidelines is provided in Appendix C, supplementary material). In this phase we add definitions for the dimensions involved, and a list of good and bad practices for each subtheme, as well as practical explications of

Table 2. Comparison within SAFA and the present model

	SAFA framework			Proposed framework		
Dimension	Themes	Subthemes	Indicators	Themes	Subthemes	Indicators
Good governance	5	14	19	3	5	9
Environmental integrity	6	14	52	6	9	31
Economic resilience	4	14	26	4	11	29
Social well-being	6	16	19	4	5	11
Total	*21*	*58*	*116*	*17*	*30*	*80*

Source(s): Authors' elaboration

how to calculate the required performance indicators. As detailed in Appendix A in the supplementary material, which contains the full list of adopted indicators, the document provides a granular overview of the data structure related to the indicators' collection process, as well as their aggregation into subthemes and themes for each dimension. This type of evaluation criteria is shared and adopted in the literature and in previous studies on the validation of new methodologies of assessment (Singh *et al.*, 2009). For example, within the "G-Governance" area, the disclosure of the "G.1 Company commitment (mission)" theme is addressed. Accordingly, the subtheme "G.1.1 Statement of Intent" measures this commitment through three indicators, including the practice indicator "G 1.1.1 Explicit commitment." This indicator asks in the questionnaire what activities and practices the company has implemented to ensure that the commitment to sustainability is present in all company documentation and understood by all managers and employees. The activities and practices implemented by Company B (see Section 3.4 for details on this company) in response to this indicator are as follows and have enabled them to achieve a score of 2 out of 2 on that indicator:

- appointment of a "sustainability delegate" on the board of directors;
- presentation and approval of the "sustainability plan" by the board of directors as part of the company's strategic plan;
- a broad engagement process involving all company departments to define the contents of the Company B's sustainability plan;
- participation of the CSR or sustainability manager and the sustainability delegate in the monthly management meetings and in the working group for the development of new products; and
- regular articles in the company newsletter on the topic of sustainability.

Like the SAFA model, this self-assessment model has three types of indicators: *target*, *practices* and *performance*. When selecting the type of indicators, the identification and importance of the topic in terms of materiality for the organization has been considered through the *target indicators*. The actual development and implementation of practices in business processes has been enhanced with *practice indicators*. Finally, the quantitative measurement of impacts has been enhanced by *performance indicators*. The three different types of indicators did not change during the three years of observation to guarantee the comparability over the time of results obtained and the homogeneity of the metrics (Ghosh and Shah, 2012; Korca *et al.*, 2023).

Direct impact measures are considered by far the best to define the effective impact of a firm's activities both for internal users and for external stakeholders (Gwiriri *et al.*, 2019; Hassini *et al.*, 2012). On the other hand, Dabkienė (2016) suggests the use of a common data set of comparable data to assess the sustainability impact of farms in Europe. However, previous studies on the propensity for disclosure and accountability in this specific production SC have noted how a systemic approach to sustainability is reduced to a few SMEs (Caccialanza and Marinoni, 2023; Fiandrino *et al.*, 2019), albeit comparability of sustainability metrics and reports is crucial (Ghosh and Shah, 2012; Korca *et al.*, 2023). This is despite the fact that the SMEs constitute the vast majority of producers and have a significant impact both on sustainability performance and prospective competitive advantage (Gracia *et al.*, 2011; Zhu *et al.*, 2018). In accordance with van Cauwenbergh *et al.* (2007), the introduction of an indicator-based tool can be considered a considerable step in the promotion of this sustainability-oriented strategy. This approach, moreover, responds to the need emphasised by Kaur and Garg (2019) for a holistic analysis of the sustainability

Table 3. Proposed model' scoring methodology

	Typology of the VIS model indicator		
Rating	Target	Practice	Performance
0	No specific targets	No specific practices	No specific indicator
1	One specific target	Reference to a managerial practice is described	There is a nonquantitative proxy or another indicator
2	Target is associated with an indicator	Are described more managerial practices and evidence is provided for statements (e.g. certification)	There is the indicator for at least one year

Source(s): Authors' elaboration

performance of agrifood production systems. This need is even more pressing when included in the development phase of performance measurement systems. For this reason, Table 3 proposes an outline of the incremental qualitative scoring methodology adopted in this self-assessment model for each of the types of metrics implemented: target, practices and performance.

To constitute a first time-series of data at the first compilation, we used data on performance of the previous three years (timespan 2019–2021). This approach has been implemented for model performance indicators only. See also Appendix A in the supplementary material for the final version of the full questionnaire and the full list of data and information collected.

3.4 Selection of case studies and final assessment of the tool

As a prior analysis in the Italian meat production SC suggests (Caccialanza *et al.*, 2023a, 2023b), only nine companies publish a sustainability report, including two as part of groups obliged to publish to conform with the European requirements [Directive (EU) 2014/95]. For all the others an external stakeholder may find some sustainability-focused communication on the institutional website and off-print journals (Almiron and Zoppeddu, 2015; Caccialanza *et al.*, 2023a, 2023b), confirming the highly differentiated approach in this SC (Jansson *et al.*, 2017). Within this scenario, as expected by the application of the most recent CSRD Directive (2022/2464), several firms are expected to produce and publish a sustainability report and implement a more detailed nonfinancial performance measurement system. Consequently, by 2024, practitioners will face an expected increase of external-institutional pressures for formal sustainable performance disclosure. Consequently, this tool is expected to help practitioners to face this demand-lead disclosure (Filippi and Chapdaniel, 2021). In view of the high fragmentation of the propensity to publish sustainability reports in this context (Caccialanza and Marinoni, 2023), we differentiate the assessment of performance with respect to differing degrees of orientation toward the disclosure of sustainability performance (Nguyen and Kanbach, 2024) and adopted approaches (Ketokivi and Choi, 2014).

As mentioned above, nine firms were producing a sustainability report at the time the model was disseminated in the Italian meat production SC (Caccialanza and Marinoni, 2023), of which eight were publishing it annually on their website. The ninth firm did not publish its sustainability report precisely because of the "greenhushing" logic mentioned above (Galli *et al.*, 2023). Thanks to the partnership with the relevant trade association for the processing phase the Italian meat and cured meats industry association (ASSICA[1], and given their role in raising awareness of sustainability issues (Caccialanza and Torelli, 2024),

we obtain research membership and confidential access to two of these firms (two of nine, response rate around approximately 22%). A third firm was willing, as directly signaled to us by ASSICA, to undertake awareness-raising and was added as an additional case study to saturate the marginal theoretical and applicative contribution of the differentiated propensities for integrating the strategic orientation to sustainability. The engagement process involves three phases. The first one is a formal request to participate in the analysis to nine firms that were already producing sustainability reports, reminding them of our partnership with ASSICA. The request was sent via e-mail to the respective chief executive officers and/or board members, as well as to the CSR managers or delegates. This request allowed for formal tracking of collaboration requests for the project and formally engaged the internal company representatives. Second, for those who accepted a videocall was organized to present the whole project and the self-assessment model as presented in Appendix A, supplementary material. This second phase ensured that all members involved in the data collection and reporting process within the companies were aligned on the prescribed methods of data collection through a written questionnaire. This questionnaire included both the indicators from Appendix A in the supplementary material and the guidelines for their calculation. The companies completed the questionnaire at a later (offline) stage, involving various internal figures in the process, as discussed in similar studies that emphasize the need for internal coordination of activities (e.g. Ashby *et al.*, 2012; Beske and Seuring, 2014; Martins *et al.*, 2017). Third, of the seven remaining firms, four refused to disclose their data due to the "greenhushing" propensity, and three indicated they were not interested in further analysis. These response rates are in line with the findings of other similar analyses on multiple-case studies in similar (Cagno *et al.*, 2023; Perez *et al.*, 2010; Petit *et al.*, 2018) or comparable (Knudsen *et al.*, 2010; Ollivier de Leth and Ros-Tonen, 2022; Ruviaro *et al.*, 2015) food SCs.

Consequently, in the selected case studies of the three engaged firms, Company A has been publishing sustainability reports for two years, Company B was preparing its first sustainability report (the ninth company mentioned above that did not already publish it on the official website), and Company C was planning to produce it soon and therefore decided to participate in the study. This sampling therefore has the merit of representing three different stages of awareness and development of sustainability performance assessment and disclosure issues (Baumgartner and Ebner, 2010). Moreover, the focus on these companies would provide a useful baseline for understanding which practices and best practices are widespread among firms with greater accountability in the meat SC, and for understanding transparency in resource allocation (Adams and Larrinaga, 2019; Chamas *et al.*, 2021; Caccialanza *et al.*, 2023a, 2023b). Participants agreed to be included in the study on the condition that anonymity would be maintained, since it involves the disclosure of sensitive data associated with company performance, as has been the case in other similar studies (Galli *et al.*, 2023; Hübel and Schaltegger, 2022). Once the questionnaires containing the responses to the questions in Appendix A in the supplementary material were collected, the entire research team discussed the answers to assign the correct score to each indicator according to the guidelines previously discussed in Table 3.

Table 4 summarizes the main features of these companies pertaining to the Italian meat SC context. Since all three of the organizations have the role of focal companies for their respective supply and distribution chains, we verified that all three also have similar SCs structure and customers and distribution characteristics (Sala *et al.*, 2015; Seuring and Müller, 2008). This verification improves the internal homogeneity of the case studies selected and minimizes the impact of external influencing factors on the evaluation of the goodness of fit of the framework (Carter and Rogers, 2008). Furthermore, in addition to size

Table 4. Sample features

Features	Group A	Group B	Group C
Dimension	Medium	Large	Medium
Employee (range 2019–2021)	130–140	2,200–2,350	550–650
Total asset	48–53 mln €	620–680 mln €	120–135 mln €
Turnover	47–60 mln €	1'000–1'300 mln €	110–135 mln €
Production	Meat and meat-based products; plant-based alternatives; organic meat	Meat and meat-based products; cheese	Meat and meat-based products
B-Corp	Yes	No	In progress – expected by 2023
Certifications	IFS; BRC; Carbon Footprint; ISO 22005; ISO 50001 in progress	IFS; BRC; ISO 14001; ISO 45001	BRC; ISO 22005:2008; ISO 14001
Sustainability report	Yes – with also two prior editions	In progress – first edition in 2023	Implementation planned for 2024 – first edition in 2024
Top management team members and responsible for the data collection	CEO and two supporting secretaries (80 min. of online meeting)	Board member and CSR manager (90 min. of online meeting)	President and supporting secretary (75 min. of online meeting)

Note(s): Acronyms – ISF = International Food Standard; BRC = British Retail Consortium
Source(s): Authors' elaboration

characteristics and the number of published editions, it is highlighted that certifications achieved (Bonisoli *et al.*, 2019; Marshall and Standifird, 2005; Tröster and Hiete, 2018) and the obtaining of B-Corp certification (Marchini *et al.*, 2023; Romi *et al.*, 2018) were also mapped because they are highlighted in previous literature as characteristics that potentially have a positive impact on sustainability performance. Table 4 also provides an overview of the top managers involved in the project from an initial and institutional perspective, as well as the support roles that were assisted by the research team during the data collection phase.

Consequently, this multiple-case study allows us to set a benchmark for the further presentation of validated managerial practices in the context of meat SC. This approach also lays the groundwork for future quantitative analyses on larger number of observations, which may enhance the external validity of these findings.

4. Results and discussion

In this section, we discuss the results obtained in the data collection of the three case studies and discuss them through the lenses of the due diligence and the institutional legitimacy theories. With reference to the commentary on indicators, it is also evident that the different case studies analyzed have a highly differentiated ability to provide reporting and potential disclosure. Particularly, Table 5 and Figure 3 display a differentiation that does not refer to the breadth of areas or issues involved in their own reporting and disclosure, but rather the ability to effectively report those dimensions and measure them with indicators. A preliminary analysis of the scores obtained in relation to the level of disclosure across different sustainability dimensions, and reported in Table 5, reveals that companies still tend to prioritize the disclosure of their economic and financial performance. This is followed by a

Table 5. Performance by group

Features	Group A	Group B	Group C
Score (2021 data) – max 162	133	82	85
N. AREAS monitored – max 4 (at least one theme monitored)	4	4	4
N. THEMES monitored – max 17 (at least one subtheme monitored)	14	14	13
N. SUBTHEMES monitored – max 29 (at least one indicator monitored)	25	22	22
N. of monitored indicators – max 80	61	50	54
Sum of the scores in the governance dimension	23	12	6
Sum of the scores in the environmental dimension	42	25	18
Sum of the scores in the economic dimension	49	32	42
Sum of the scores in the social dimension	19	13	19

Source(s): Authors' elaboration

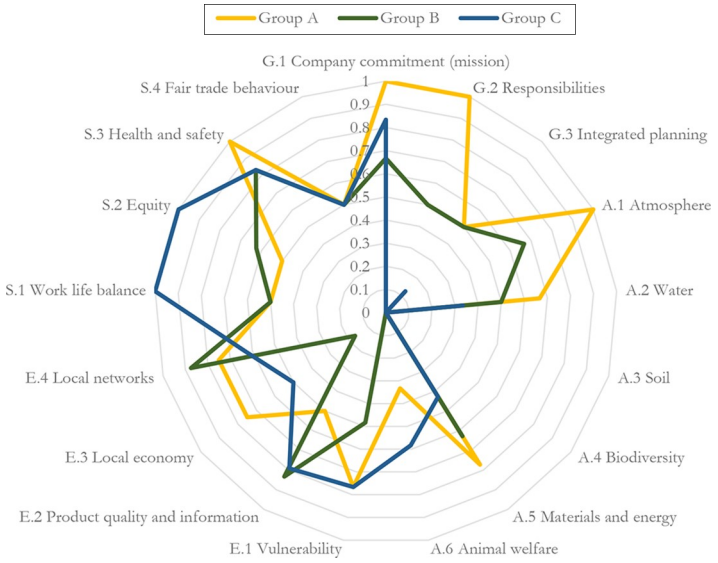

Figure 3. Radar performance of the 17 themes
Source: Authors' elaboration

focus on environmental impacts, with a more limited communication regarding governance and social dynamics. Reasoning particularly on the different firm dimensions, it emerges, contrary to previous studies (Fiandrino *et al.*, 2019), that the smallest in size has the best potential sustainability orientation in this regard (Baumgartner and Ebner, 2010). In this multiple-case study it is especially true for medium-sized enterprises compared with the case of the large enterprise. This observation, though limited to the selected case studies and thus lacking external generalizability, further opens up the possibility of applying the model to the many medium-sized enterprises in the context of the meat SC in Italy. A following section has been dedicated to each of the four dimensions involved, while the full list of data and information collected are available in Appendix A, supplementary material for synthesis needs.

4.1 Governance dimension

The general formalization of the firm's commitment has been found in all the analyzed firms and it also has been associated with a detailed description of managerial practices that demonstrate this effort. However, the governance also in the SC context must consider the engagement of different categories of stakeholders and with the commitment and endorsement toward sustainability issues at various levels of corporate organization (Demartini *et al.*, 2016; Heikkurinen and Forsman-Hugg, 2011). Within the three firms only Company A has been able to describe and formalize its stakeholder engagement process. Moreover, these themes in this model have been associated with monitoring and evaluating responsibilities as well as with an integrated planning propensity (Adams, 2017). The first one exposes the firm to the external legitimation to operate (Müeller *et al.*, 2009; Spence and Rinaldi, 2014), confirming in this case study a higher transparency of reporting Companies A and B. Additionally, the propensity to evaluate performance periodically is limited to Company A that reported in the previous two years. Particularly noteworthy is how this integrated, goal-oriented approach also occurs in correspondence with cumulative experience from multiple editions of sustainability reports. This consideration ties back to the theoretical model presented in Figure 1, where the integration of sustainability at the core of the strategic formulation process is associated with an improvement in internal performance. It is therefore consistent with expectations that a Company (A) particularly focused on sustainability would be the one most capable of effectively responding to requests for data disclosure and analysis of internal decision-making processes (Asif *et al.*, 2020; Cheng, 2010; Crossley *et al.*, 2021). This helps to understand how well the managerial practices, and the related practice indicators, measure these performance improvements (Bonisoli *et al.*, 2018). Considering the social and environmental dimensions in this holistic thinking, on the cost configuration side, none of them are considering implementing a full costing approach (Antheaume, 2004). This consideration is in line with similar studies on the governance structure of the meat production SC (Fernández-Barcala *et al.*, 2017; Martins *et al.*, 2017). The risk associated with the avoidance of the inclusion of these dimensions at the governance level is the exclusion of mechanisms to protect the unique attributes of the product and organization itself in the long-term (Ghozzi *et al.*, 2016; Van der Merwe *et al.*, 2019). This evidence also supports the literature on the role of corporate governance as an effective enforcement of the overall inside-out transparency, increasing the external stakeholders' accountability (Bremmers *et al.*, 2007). Moreover, analyzing the propensity for disclosure compared to the governance area, it becomes clear that sustainability disclosure serves as a market legitimization element, although a formal approach to identifying structures and figures in charge is now an accepted awareness (Crossley *et al.*, 2021), particularly if also related to the efficiency of processes (Do *et al.*, 2022). In this sense, and in light of the results obtained, we believe that exogenous pressures such as institutional factors may have a greater impact than endogenous factors in formalizing and systematizing impact assessment for this context (see also Section 5.3 policy contribution).

4.2 Environmental dimension

The environmental dimension has been estimated including all six SAFA themes: atmosphere, water, land, biodiversity, materials and energy and animal welfare (see Appendix A in the supplementary material for full list of subthemes and indicators). In this context differences are observed between the two reporting Companies (A and B) and the company that does not. Accordingly, data on the estimated emissions in the atmosphere were available only for Companies A and B, while for animal welfare only Company C was committed with declared controls upstream in the SC. This also suggests that communication

on "green" practices is influenced by the limited perspective that focuses on few material topics for the reporting company (Galli *et al.*, 2023), instead of a multithematic and systematic approach at least on environmental issues (Florindo *et al.*, 2018). On one hand, themes like water, materials and energy use are mapped by all three companies and associated with at least one performance indicator. On the other hand, a confirmation of this limited approach it can be seen in the neglected soils and biodiversity themes that none of the companies are mapping. This consideration is highly relevant for understanding the dynamics within the agri-food sector (e.g. Hübel and Schaltegger, 2022; Kumar *et al.*, 2022). Although the company may potentially impact these areas, it has not voluntarily developed metrics or sustainability management control systems to monitor the broadness and impact of these undisclosed managerial outcomes (e.g. Morioka and Carvalho, 2016a, 2016b). This partial disclosure, limited to abovementioned themes, highlights the constraints and limits of endogenous factors in expanding disclosure beyond current expectations or internal stakeholder, mainly shareholders, requirements. These reflections align with a stream of discussion surrounding "material legitimacy," as concept that blends strategic legitimacy (what is important to the organization) with institutional legitimacy (the key concerns of its key stakeholders, e.g. Dumay *et al.*, 2015). This approach outlines how companies strive to pursue a higher performance in this transition path to ameliorate the outcomes for the organization itself and their impacted stakeholders (Arvidsson and Dumay, 2022). The challenge, however, lies in determining which issues are deemed "material" and should be disclosed. From this perspective, increasing regulatory pressure for transparency (outside-in) emerges as a viable solution, promoting greater uniformity and consistency in the disclosure of topics. This would enhance the comparability of impacts across the SC, moving closer to the ideal of SC due diligence as theorized in this model. Simultaneously, it clearly indicates two areas where business activities might generate unmeasured impacts, suggesting that only an exogenous regulatory intervention (such as the CSRD) could effectively promote a systematic assessment of these issues, especially in the light of the European Sustainability Reporting Standards (ESRS). Therefore, we believe that greater transparency on these (environmental) issues could be achieved from a transparency perspective through increased regulatory pressure, which is one of the most influential exogenous factors capable of shaping internal reporting processes in food SCs (Alexander *et al.*, 2024; Caputo *et al.*, 2021; Velte, 2023; Ollivier de Leth and Ros-Tonen, 2022). As a final consideration, corporate waste management is addressed both from the perspective of volume reduction (per unit of product) and as an overall quantity of materials sent for recycling. This consideration makes the promotion of a model that advocates an integrated view of the various dimensions and the sensitive and material issues for the sector even more useful (Azadnia *et al.*, 2015; Cagno *et al.*, 2023; Hamad *et al.*, 2023; Maas *et al.*, 2016); this concept also emerged from the context-specific preliminary discussion at the meso (Caccialanza and Torelli, 2024) and micro levels (Galli *et al.*, 2023). In fact, reporting has helped companies to evaluate their management practices more systematically and to identify appropriate performance indicators at least on one theme, as noted in prior studies (Gibassier and Schaltegger, 2015; Harding *et al.*, 2017; Steffen *et al.*, 2015).

The effort on environmentally friendly managerial practices therefore seems justified primarily by the search for internal (economic) efficiency and, secondly, by the opportunity to develop communication and reporting on sustainability issues at both the product and company levels (Thomson, 2020). This leads to the conclusion that those issues not strictly correlated with direct economic impact are under-estimated in the long-term resource allocation and constitute a barrier to the transition to cleaner production systems (Miemczyk *et al.*, 2012). This evidence has been pointed out previously within the context of logistics in

short food SCs (Paciarotti and Torregiani, 2021). In this sense both the full costing approach and the sustainability reporting processes may facilitate the assessment of real impacts in this food SC at the level of its different steps (Vachon and Klassen, 2006; Golicic and Smith, 2013).

4.3 Economic dimension

This dimension is evaluated in terms of the impacts on economic vulnerability, product quality and information and local economy.

Economic vulnerability shows similarities for the overall market stability, as all the companies are influenced by the same structural SC effects. However, variabilities can be found depending on their SC stability and, as direct consequence, on liquidity. These differences enhance the integrated approach to SC and partner stability, with indirect benefits for the other two themes as well. Moreover, they integrate the SC dimension in the mechanism of value and product creation along the SC (Adams, 2017; Negri *et al.*, 2021).

From the point of view of the communication of product quality and information, a large part of the focus is on the definition of more loosely defined targets in the context of actual managerial practices. However, the issue of associating performance indicators with these targets, especially for Companies A and B, remains to be further explored in terms of external stakeholders' communication. In line, Chekima *et al.* (2017) have previously discussed the role of product labels as instrumental to disclose and communicate products' attributes such as differentiation based on quality or premiumness of perceived more sustainable products. Moreover, this disclosure seems to affect consumer loyalty (Fernández-Ferrín *et al.*, 2021). Therefore, we are surprised by the lack of a quantitative approach to this theme, considering its importance. This imbalance, however, on the narrative nature of communicating product quality and promoting sustainability practices at the SC level denotes an informality in the integration of sustainability principles (Baumgartner and Ebner, 2010), even for the Italian context (Caccialanza and Marinoni, 2023; Caccialanza *et al.*, 2023a, 2023b). This logic is also justified by the traditional perception of legitimacy in the market with product quality (Lees *et al.*, 2020; León-Bravo *et al.*, 2019), which in this scenario of transition of production models must necessarily be integrated with a legitimization of demonstrated and disclosed sustainability performance (Crossley *et al.*, 2021; Do *et al.*, 2024; Fellegara *et al.*, 2023).

Local economy is another key element in the evaluation of the valorization of local workforce, local procurement, and the development of networks with universities and research centers. In particular, all the companies have identified targets with reference to the inclusion of a local workforce, and Companies A and C also quantitatively defined their targets and performance indicators. However, surprisingly, none of the companies report on the propensity for local procurement, unlike the literature that positively correlates this dimension with the sustainability orientation (Caccialanza, 2022; Perez *et al.*, 2010).

On the other hand, we confirm the consolidation of relations with research institutes and universities in the promotion and operationalization of models aimed at implementing sustainable product innovations (Boström *et al.*, 2015; Valente *et al.*, 2020). This networking initiative with institutional stakeholders across the SC, including nonsector-specific entities like universities, supports our model's hypothesis that legitimizing a company's role within the SC and market is crucial. It positions the company as both a proactive agent in transforming production models and a credible participant in advancing sustainability efforts, as discussed by other scholars in innovative protein sector (Tziva *et al.*, 2021) or meat sector itself (Van der Heijden and Cramer, 2017).

4.4 Social dimension

The social dimension in this model includes the discussion of four themes correlated to this dimension, namely: work life balance, equity, health and safety. At first, the work life balance has embraced several practices such as parental leave and initiatives to support maternity but is not yet correlated to performance indicators in terms of increase of salaries in the timespan considered.

Second, a consideration of equity is aimed at disclosing the gender equality policies that in all of the three companies have been formalized in terms of target as well as monitored in terms of specific quantitative performance measures. This, therefore, leads to a reflection on the positive integration of this theme in the sustainable strategic orientation of the case studies analyzed. Moreover, it confirms that sustainability reporting process can play a significant role in advancing gender equality by openly disclosing their organization's gender-equity practices and by linking them to performance evaluation process (Barrientos, 2023; Miles, 2011) also in this SC.

Workers' health and safety play a key role both for the hours of training dedicated to worker safety at plants and for the contextual development of process safety-oriented managerial practices and standards (Marshall and Standifird, 2005). Moreover, this theme assumes a reinforced role in the light of the COVID-19 crisis that stressed continuity of both production and processes (Hobbs, 2021). During this period of disruption, which forced the closure of many production activities, the sector had to continue operations under new constraints. These included not only the usual hygiene requirements but also the need for physical distancing on production lines. Simultaneously, the sector faced an emergency in the production process due to a surge in demand from Italian modern grocery distribution, driven by increased domestic consumption of meat and cured meats in lockdown.

The fourth element, fair trade behavior, explicitly is one of the challenges of the meat SC, namely, the downstream SC operators' support with fair and transparent contracts. This element plays a key enabling role in the reduction of information asymmetries and a greater disclosure to external stakeholders (Theurl *et al.*, 2017). In the light of this consideration, this model proposes a target indicator that has been positively confirmed by all three companies. However, no performance indicators have been implemented in the performance measurement systems, leading to the suspension of the communication transferability of information on the distribution of the value within the SC (Adams, 2017) and the distribution of bargaining power within the categories of stakeholders (Fuchs *et al.*, 2016; Grabs and Ponte, 2019). This consideration becomes even more significant when viewed through the lens of a SC due diligence (outside-in) perspective. In aiming for full transparency in performance measurement processes, this approach seeks to highlight where in the SC the transmission mechanisms of corporate margins may encounter bottlenecks (Asif *et al.*, 2020). These bottlenecks could jeopardize the sustainability of socially and environmentally favorable practices that are essential for transitioning the production model (Bebbington, 2007; Hübel and Schaltegger, 2022). This lack of dissemination of accessible and cost-effective tools makes it even more unlikely that the propensity to "greenhushing" and the analysis of accountability and performance at the SC level will be overcome (Adams and Larrinaga, 2007, 2019). This occurs despite increasing pressure to enhance transparency in production processes and trace the social impacts of production, driven in part by the spread of enabling technologies (Searcy *et al.*, 2022). When applied to practical tools like the one proposed, these technologies can make the collection and preservation of information more accessible while ensuring its integrity is maintained throughout the process (Gaur and Gaiha, 2020).

5. Contributions

5.1 Theoretical contribution

While the ability to estimate models that establish baselines from a multidimensional and multitier perspective at the SC level is undeniably important (Hofmann *et al.*, 2018; Khalid *et al.*, 2015), this study emphasizes the critical role of abductive and qualitative approaches. By using operational models within traditional production contexts – such as the one analyzed in this paper (Cagno *et al.*, 2023; Hübel and Schaltegger, 2022) – the research contributes to fostering a broader debate on accounting for sustainable development (Bebbington and Larrinaga, 2014; Taïbi *et al.*, 2020). This approach confirms with its results the urgent need for academic intervention research that also aims to provide application and self-assessment tools for the promotion of the transition of production models (Bebbington, 2007). Specifically, we have contributed to the debate within the accounting literature, particularly to respond to this urgent need an accessible and cost-effective tool is provided to diminish the propensity to "greenhushing" and disseminate the sensibility to accountability of impacts and the sustainability performance analysis at the SC level (Adams and Larrinaga, 2007, 2019; Castellini *et al.*, 2012). In doing so, a further development of the application of target-setting logics linked to the material issues at the sectoral level is achieved, in line with prior research on the exogenous and endogenous driving factors that may guide this transition (Caccialanza and Torelli, 2024; Galli *et al.*, 2023). It leverages the theoretical implications of these studies to measure the impacts of these exogenous and endogenous drivers on the accountability of real case studies selected for their differing approaches to sustainability and their propensity for impact disclosure. Consequently, it achieves a higher level of applicability depending on the various contexts, including prior attention to the topic and the medium or large scale of the activities. This higher level of accountability of performances and SC due diligence can also be interpreted across different levels. On one hand, it builds on the drivers of sustainability reporting at the level of individual firms (Galli *et al.*, 2023; Khalid *et al.*, 2015; Schaltegger *et al.*, 2023); on the other, it also engages the mesolevel of the SC (Caccialanza and Torelli, 2024). The SC dimension allows for work not only on the performance of individual actors within the SC using the same self-assessment tool – customized with indicators specific to the farm and transformation phases – but also on fostering the debate around SC due diligence and full transparency in impact disclosure. This aspect has direct implications for internal efficiency-led improvements and the legitimacy of the operations, while the second strengthens the due diligence of SC actors particularly from the perspective of external stakeholders. Furthermore, it operationalizes this self-assessment tool over a multiyear timeframe to promote the idea of performance comparison over time, both against one's own performance and against a hypothetical industry average, thereby engaging in a process of internal performance improvement. For each of the material themes, context-specific indicators have been identified and associated to specific targets, managerial practices and performance evaluation criteria to foster the debate on sustainability assessment at organizational level (Adams and Larrinaga, 2007, 2019; Lamberton, 2000). Given the theoretical model proposed in Figure 1, future studies may also test or adapt this analysis to other agrifood SC contexts, thus highlighting further differences in the perception of pressure for SC value disclosure and assessment of impacts (Bebbington, 2007; Havardi-Burger *et al.*, 2021; Petit *et al.*, 2018) or notice a different propensity to engage in SC due diligence processes.

5.2 Managerial contribution

This study underscores the need for meat SC stakeholders to analyze the intricate interrelations in terms of impacts, and cooperation at the different tiers of the production

process (Hübel and Schaltegger, 2022). These difficulties arise from the fragmentation of operations, resulting in a disjointed condition of both the analysis and propensity to disclosure among actors (Galli *et al.*, 2023; Khalid *et al.*, 2015). Overcoming this "greenhushing" propensity and fostering transformation necessitates extensive cooperation throughout the production chain (Asif *et al.*, 2020; Caccialanza and Torelli, 2024). To do so, we suggest examining the development of a novel sustainability self-assessment instrument grounded in four consolidated dimensions of sustainability (the four areas of the model) through the adaptation of a consolidated existing framework (Gibassier and Schaltegger, 2015). Consequently, on the managerial side this paper reinforces the need for promoting intervention-research initiatives from a SC perspective (Taïbi *et al.*, 2020). Integrating various dimensions related to the strategic sustainability orientation, and using validated self-assessment tools are pivotal for advancing sustainable development in the meat industry (Bebbington and Unerman, 2020; Cagno *et al.*, 2023). Finally, this tool offers valuable support to companies that are or will soon be part of the SCs of large (focal) companies, which, starting in 2024, will be required to report according to the new European standards, the ESRS, due to the implementation of the CSRD. This tool can be particularly beneficial for SMEs in the sector, allowing them to promote conscious and comparable disclosure of their impacts (Baumgartner and Ebner, 2010; Demartini *et al.*, 2016; Golini *et al.*, 2017; Hübel and Schaltegger, 2022; Kumar *et al.*, 2022), even though they are not yet legally bound by these regulations within the European context [see Directive (EU) 2022/2464 or EFRAG IG 2 – Value chain' (2024) or Sustainability Due Diligence Directive (CSDDD) in 2024].

5.3 Policy contribution

This study provides policy contribution by presenting an assessment model to better understand the interaction between exogenous and endogenous factors that shape sustainability practices. By highlighting the connection between conflicting regulations, the tendency of actors toward "greenhushing" and the reinforcement of industrial norms, the findings support the development of multilevel initiatives (Cagno *et al.*, 2023; Hofmann *et al.*, 2018) and impactful legislation aimed at promoting the transition of production systems (Fellegara *et al.*, 2023). Policy measures are essential to incentivize sustainable practices, particularly in overcoming the lack of motivation to adopt sustainable production methods and disclose sustainability reporting (Bebbington *et al.*, 2007, 2017, 2019; Dillard, 2015). This aligns with the goals of recent European legislation, such as Directive (EU) 2022/2464, which emphasizes the assessment and disclosure of nonfinancial performance. In this context, the study anticipates key themes of the CSRD by advocating for a broader dissemination of sustainability-related skills and awareness, extending to SMEs. While the CSRD targets larger firms with formalized requirements, SMEs can benefit from a more flexible approach that builds on emerging best practices observed in the selected companies (Adams and Larrinaga, 2019; Chamas *et al.*, 2021; Caccialanza *et al.*, 2023a, 2023b). The study also aligns with the draft implementation guidelines of EFRAG IG 2-Value chain (2023), which emphasize the importance of focusing on various tiers within the SC. This approach seeks to transmit sustainability information across the SC, from production to distribution and ultimately to the end consumer. Recent publications, such as the CSDDD in July 2024 and the VSME guidelines in December 2024, underscore the growing attention on disclosure requirements for SMEs. These developments highlight the increasing role of SMEs in sustainability accountability and SC due diligence processes. Complementing these legislative tools, the validated self-assessment model offers a sector-specific yet customizable instrument. It provides practical applications for a specific product category within a Western European context, further encouraging higher accountability in processes

and legitimacy among stakeholders. By addressing sector-specific challenges and aligning with legislative frameworks, this tool helps SMEs navigate sustainability expectations while contributing to a culture of transparency and accountability. Further research could explore the impact of recent legislative developments, such as the CSRD and CSDDD, on the perception of internal efficiency-led and exogenous institutional drivers in shaping sustainability disclosure practices. Additionally, the influence of CSDDD on the perceived pressures for SC due diligence and impact assessments could have long-term effects on the competitiveness of SMEs integrated into the value chains of larger firms subject to these regulations. Understanding these dynamics will be critical for assessing the broader implications of these policies on SME competitiveness and sustainability transitions.

5.4 Social contribution

Many industry stakeholders remain unaware of the strategic sustainable positioning of alternatives, such as alternative protein products (Caccialanza *et al.*, 2023a, 2023b). Therefore, intervention-research initiatives that integrate insights from diverse research domains and practical experiences are essential (Taïbi *et al.*, 2019). This integration of knowledge can be beneficial for several categories of stakeholders. In fact, this sustainability integration and assessment of performance empower producers to make informed decisions and embrace more sustainable practices (Asif *et al.*, 2020) and help them in the legitimization process (Cheng, 2010; Crossley *et al.*, 2021). On the consumer side, the historicity and accumulated experience in a sector strongly anchored to the territory and the cultural nature linked to meat consumption make this effort even more urgent (Allievi *et al.*, 2015; Leroy and Praet, 2015). This urgency is further confirmed in the perspective of the emergence of other product categories that wish to position themselves in the market with marked sustainability attributes such as “plant based” (Whelan and Kronthal-Sacco, 2019). More broadly, this self-assessment tool enhances accountability and strengthens SC due diligence processes, fostering stronger connections between producers of traditional products and their local territories while promoting the valorization of local and rare breeds.

6. Conclusions

Managerial practices and their performance have been proven to play an essential role in the food SC sustainability transition (Fellegara *et al.*, 2023; Hübel and Schaltegger, 2022; Petit *et al.*, 2018; Porter and Kramer, 2011). Consequently, this case study moves the discussion forward within the existing literature on the assessment, reporting and evaluation of the impacts of food production with a multidimensional accounting model perspective (Cagno *et al.*, 2023; Kumar *et al.*, 2022; Rialti *et al.*, 2022). The aim of this study is to contribute to the disclosing of the real impact of managerial practices through the validation of a new self-assessment tool within the context of the Italian meat SCs. This self-assessment tool offers the opportunity to orient producers in the decision-making process to a cleaner production system (Antonini and Larrinaga, 2017; Bebbington *et al.*, 2007). This contribution highlights five main conclusions. The first one identifies the different propensities to measure performance within this production SC, in accordance with prior studies (Caccialanza and Marinoni, 2023; Caccialanza *et al.*, 2023a, 2023b; Fiandrino *et al.*, 2019). Second, it underlines the call for the integration of sustainability principles within the strategic orientation of firms both with an outside-in perspective to the SC transparency and an inside-out perspective on how firms can contribute to the transition to more sustainable production systems (Azadnia *et al.*, 2015; Maas *et al.*, 2016; Schaltegger *et al.*, 2023). The theoretical framework proposed in Figure 1 can be applied across various geographical contexts and explored with different product categories within the agri-food sector or adapted for other

production SCs. Third, in this holistic perspective and multidimensional accounting approach, this study concludes that the development of one sustainability dimension (or theme) is not sufficient to fulfill the external stakeholders' expectations in terms of information asymmetries (Bremmers *et al.*, 2007; Fuchs *et al.*, 2016; Theurl *et al.*, 2017). Fourth, fostering the diffusion of new comparable metrics and indicators in one single tool may lower these information asymmetries and orient the decision-making process to a more systemic approach (Dabkienė, 2016; Ghosh and Shah, 2012; Korca *et al.*, 2023). As a fifth element, this study highlights its anticipatory nature with respect to European guidelines that promote the disclosure of sustainability performance at the micro level (e.g. CSRD or VSME guidelines), as well as transparency and due diligence initiatives at the meso-level within SCs (e.g. CSDDD). Finally, this consideration could be further investigated by an evolution of the present research. A first direction consists of considering whether similar results are identifiable in studies dedicated to the SCs of other food products and, more generally, in the literature on food production. Secondly, the analysis is limited to a single national context, while it seems likely, given the nature of the topic, that further research on the topic may expand its generalizability. Thirdly, the customized tool we propose strengthens internal validity, yet two caveats remain. First, deleting 47 global indicators from the SAFA (FAO) framework improves feasibility but limits comparability with non-EU or crop-based studies. Second, despite triangulation, qualitative evidence still influences governance and social scores more than quantitative metrics, potentially overstating leadership commitment while understating biodiversity pressure when quantitative data are missing. We interpreted the intercompany differences with this asymmetry in mind; nevertheless, future work could test alternative combinations of qualitative and quantitative elements to better balance information needs.

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Note

[1.] For further details see the official ASSICA website: https://www.assica.it/

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Supplementary material

The supplementary material for this article can be found online.

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