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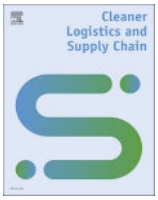

Gains in sustainability using Voluntary Sustainability Standards: A systematic review

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ABSTRACT

The ongoing growth of concerns with regard to the sustainability of the planet has led to the increasing expansion on international agendas of commercial certification schemes based on Voluntary Sustainability Standards (VSSs). This has influenced public planning and policy-making, and stimulated the interest of researchers. The application of VSSs plays an important role in the transition of supply chains toward sustainability. These initiatives promote appropriate social, economic, and environmental practices for the production of goods and services, as well as meeting the demands of environmentally-conscious consumers. However, the diverging definitions of the concept, and the contradicting interpretations of the impacts of VSSs exacerbate the complexity of the analysis of their real impacts on Global Value Chains. The present study is based on a systematic review of the literature on VSS based on the Systematic Search Flow method. The principal objectives of the study were to identify the prevailing groups of researchers on the VSS theme and their perceptions regarding the sustainable gains with the adoption of these standards. A number of different terms have been used in the literature on standards, although "Voluntary Sustainability Standards" has been consolidated by its use in recent years, and provides a focal point for the analysis of standards of sustainability. Two different streams of thought were identified here. These streams complement each other. The first considers VSSs to be a barrier to the access of producers to major consumer markets, while the second stream of thought argues that VSSs fulfill, stimulate, and objectify sustainability. The results of the review show that the gains of adopting a VSS are diverse, with the economic pillar being the most valued, in general. Based on the distinct pillars of sustainability, our analysis contributes to a robust and differentiated understanding of the topic of VSS by identifying an ample range of examples that consider the gains in sustainability accruing to the application of VSSs. The analysis also establishes valuable insights and guidelines for the expansion of research in this field.

1. Introduction

In recent years, and over the past two decades in particular, many companies have adopted sustainability standards as a strategy to improve social and environmental practices in their supply chains, and, in particular, to share these sustainable practices with their customers (Tscharntke et al., 2015; Lambin and Thorlakson, 2018; Smith et al., 2019). In this context, the Voluntary Sustainability Standard (VSS)[1] specifies a series of requirements that encompass a wide range of related sustainability metrics which producers, traders, manufacturers, retailers, service providers, and exporters are expected to follow (Marx et al., 2012; UNFSS, 2013; Oosterveer et al., 2014). These metrics include employee health and safety parameters, respect for human rights, reducing the environmental impacts of production, community relations, and rationalizing land use.

The recent growth in the application of VSSs is associated with the increasing complexity and impact of the Global Value Chain (GVC) (Lambin and Thorlakson, 2018; Liu, 2009). Researchers such as Henson

Abbreviations: VSS, Voluntary Sustainability Standards; GVC, Global Value Chains.

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[1] A number of distinct terms have been adopted to describe voluntary certification systems, including the Voluntary Sustainability Standard (VSS), Voluntary Certification Scheme (VCS), Private Sustainability Standard (PSS), sustainability certification, eco-certification, eco-labels, Non-State Market Driven (NSMD) systems, certification schemes, labeling schemes, and Environmental Information. While all these terms refer to a similar concept, we have standardized our approach, and refer only to the VSS in the present study [Tscharntke et al., 2015 [1], Castka; Corbett, 2016a [4], Prag et al., 2016 [5], Corrêa, 2019 [6], Furumo et al., 2020 [7]].

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and Humphrey (Henson and Humphrey, 2010), Thorstensen et al. (Thorstensen et al., 2018), and Castka (Castka et al., 2020), have devoted considerable attention to the question of VSSs and their demands on the GVC. These standards were first established for environmental resources and in labor-intensive sectors, in particular sectors that are integrated globally, such as mining, the chemical and textile industries, agriculture, textiles, and clothing (DIE, 2017). The VSSs then expanded along the GVC towards the consumer, who may consider environmental, ethical, and social factors as criteria for their selection of products (Nadvi et al., 2004; Castka and Corbett, 2016).

Previous research has addressed a number of different aspects of the application of VSSs. These aspects include the costs of sustainable certification and non-transparent practices (Liu, 2009; Harbaugh et al., 2011; Bray and Neilson, 2017) and the proliferation of the VSS as a strategy for the creation of incentives for the adoption by the market of more sustainable production techniques (Timmermans and Epstein, 2010; Mavroidis and Wolfe, 2017; Montiel et al., 2019), as well as case studies on the effects of a specific VSS on the sector to which it was applied (Maertens and Swinnen, 2009; Schuler and Christmann, 2011; Elliott, 2018).

Although previous studies on VSS have analyzed different dimensions of sustainability (Marx et al., 2022), most focus on the impacts of specific sectors or production sites and their respective VSSs (Castka and Corbett, 2016). Therefore, there is an urgent need for research that examines the role of VSSs in gains in sustainability from a broader perspective. The present study advances in this ampler direction, adding value to the field of VSS research by using relevant academic references to identify the prevailing groups of researchers in the literature, by assessing the gains accruing from the application of VSSs to each pillar of sustainability, and to the whole set of pillars, in combination. A more systematic and scientific approach to the theme of VSS will be important to validate the performance of an organization, improve the response of the consumer (Kareiva et al., 2015); and contribute to sustainable production and consumption.

The VSS theme also encompasses a number of unexplored or poorly-evaluated dimensions that have attracted increasingly the attention of scholars in recent years, including the credibility and legitimacy of the VSS, the participation of the VSS in the GVC, and other trade-related phenomena (Henson and Humphrey, 2010; Castka, 2020; Dando and Swift, 2003). Other aspects include the lack of governance[2] of VSSs, the impacts of the VSS in different sectors (Smith et al., 2019; Ponte et al., 2011; Bennett, 2018), the financial risks (Bray and Neilson, 2017; Nugnes and Larrea, 2020), the VSS of the Global South (Schouten and Bitzer, 2015; Schleifer and Sun, 2020), and the relationship between the VSS and Corporate Social Responsibility (CSR).

Some of the topics reviewed in the present study are valuable, but are still fragmented, and require further, more integrated research, to ensure a better understanding of the factors that motivate the adoption of these standards. The investigation of these topics using the Systematic Search Flow (SSF) approach should thus provide a more comprehensive analysis and assessment of Voluntary Sustainability Standards. Based on these considerations, the present study has two principal objectives: (i) to identify the prevailing groups of researchers on the theme, and the respective gaps in each approach, and (ii) to investigate how the authors evaluate the potential gains in sustainability with the adoption of these standards.

Through this review, the present study integrates the published data on the topic of VSS, including specific cases, even when only partially concerned with this topic, and their implications for certain value chains. Up to now, however, the research has focused on very specific topics, which often cover only one or two dimensions of sustainability. Clearly, then, a more holistic approach is required, which will encompass the gains of VSS across all the different pillars of sustainability, and will better address the understanding of VSS-related issues through the views of different specialists, based on a stream-of-thought perspective (Lakatos, 1978; Parente and Ferro, 2016)].

In the present study, methods are described in Section 2. The results are presented in Section 3 and its various sub-items. Section 3.1 assigns the authors to two groups or different streams of thought. We divide gains in sustainability into five parts, beginning with Section 3.2, which provides a general overview of the topic, followed by Section 3.3, which highlights environmental gains. In Section 3.4, we present the economic and market gains, while Section 3.5 focuses on the evidence of social gains. Section 3.6, combined the different perspectives to focus on shared (socioeconomic and environmental) gains. The final part, Section 3.7 will bring the other side of the VSS, the negative impacts. Sections 4 and 5 cover the discussion and conclusions, respectively.

2. Methods

To establish the empirical database for the present study, we reviewed the published literature on VSS using the Systematic Search Flow (SSF) approach (Ferenhof and Fernandes, 2016), which provides a highly systematic literature search tool. The SSF approach also allows for the organization and mapping of the references identified in the search, systematizing scientific knowledge and allowing for replication. In addition, the SSF approach enables the analysis and synthesis of the knowledge found in the literature, which allows the reader to better assess the relevance of the procedures used in the elaboration of the scientific data (Ferenhof and Fernandes, 2016). In the present study, the SSF approach was used primarily to identify groups of researchers and the gains accruing to the application of the VSS concept. For this, we followed the four phases of the SSF (Fig. 1).

Phase 1 – Definition of the Research Protocol. This phase covered the elaboration of the set of rules and parameters applied to the configuration of the research process. The activities of this first phase were: (1) Definition of the search strategy; (2) Database Query; (3) Document Management (organization of the bibliographic portfolio; 4) Document selection standardization (the process of creating filters: reading the titles and keywords of each paper), and (5) Compilation of the portfolio. The latter activity involves the reading of all the abstracts selected in the literature search, and allows for final filtering, to exclude the papers that do not coincide with the objectives of the study.

Our search protocol used the search engines available in the Scopus (Scp) and Web of Science (WoS) databases to identify the presence of the key terms (Voluntary Sustainability Standards – VSS; Sustainability Certification - SC; Private Sustainability Standards – PSS; Certification Schemes – CS; Certification labeling – CL; Eco-labels – EL, and Global Voluntary Standard - GVS) in the title, abstract, and keywords of the target papers. These seven terms were selected because they appear universally in the published literature. The principal search term (VSS) was combined with the six other terms using the Boolean operator AND, which allowed us to select even more from the databases for our systematic review. We are able to determine the total number of published papers per term and for each combination of terms. The database search protocol, the number of papers identified for each keyword, and for their combination with VSS, are shown in Fig. 2.

In this first phase, we expanded the review to include all the documents available in the gray literature (flagship reports, working papers, other documents on the topic of VSS, and government and NGO websites) that refer to VSS. No restrictions on the type of document were applied here, except for the timeline, between 2000 and 2020. As this search overlapped with that of the academic databases, repeated documents were excluded. The papers found in both in the databases and in the gray literature were published predominantly in the English language. There is also a minority of studies in Portuguese in the gray literature.

Phase 2 - Analysis (*consolidation of the data*). We verified the following

[2] Amply-used term, which refers to the "process by which the requirements of an eco-label are defined and applied" Castka e Corbett, 2016b [24].

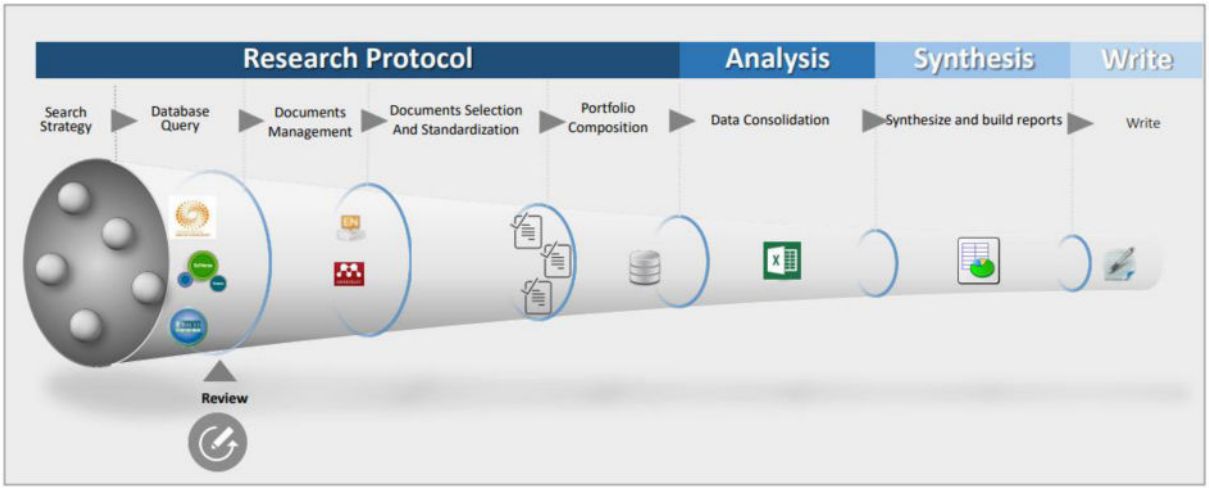

Fig. 1. Systematic Search Flow (SSF).Source: Ferenhof and Fernandes (Ferenhof and Fernandes, 2016).

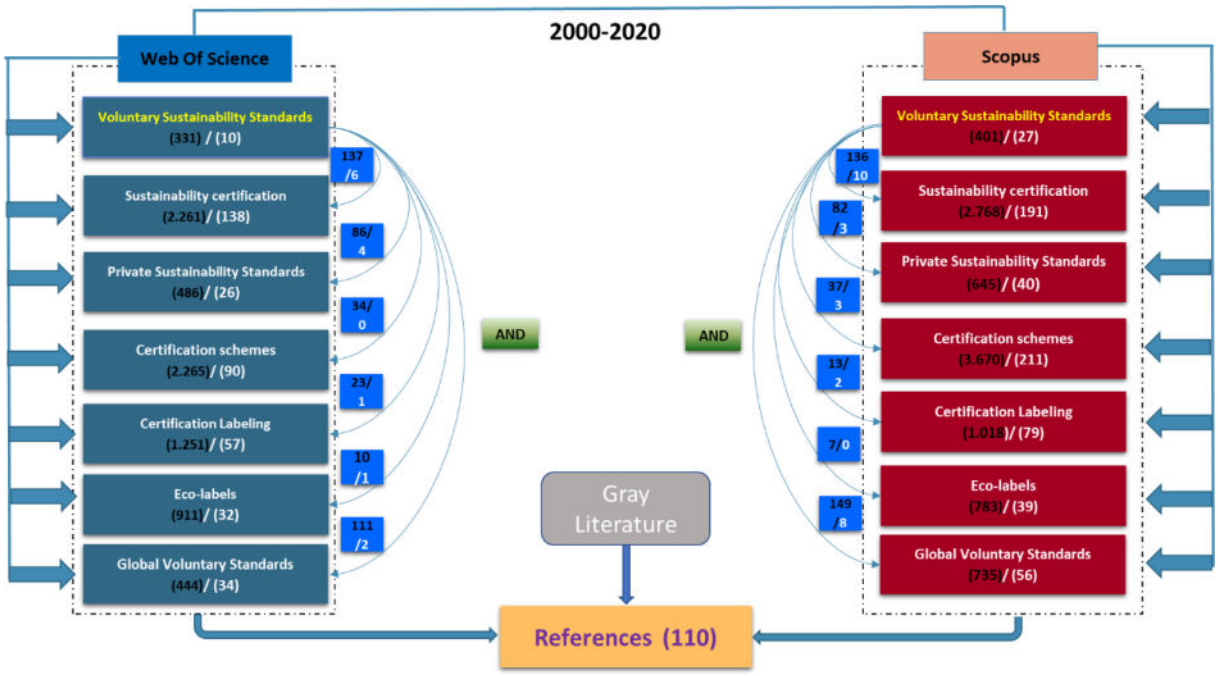

Fig. 2. Database search protocol. Note: The total number of documents identified is shown first in black, while the number of review papers is shown in white. The blue lines show combinations of terms searched in the databases.

information for each publication: type (academic paper, report, book); the journal in which it was published; the authors most cited; the year in which there most papers were published on the research topic; the country of origin (the nation in which the first author's home institution is located); the aims of the study; the methods used; the principal results and conclusions of the study; its challenges, and any other relevant observations. This information was organized in an electronic spreadsheet. After identifying and excluding overlapping documents, we initially selected and analyzed the abstracts of 478 documents, which are related in some way to the objectives of the present study. This set of documents was further refined during the second phase of the search, which included the differentiation of the review papers, in order to identify the principal sectors, supply chains, products, and services with sustainable certifications that have been investigated by researchers.

Phase 3 – Synthesis. During this phase, we compiled and condensed our inferences on the results of the literature search, and applied the Idea Puzzle tool to identify the principal schools or streams of thought, and synthesized them for evaluation and discussion. We also sought to identify gaps in the research on VSS that would benefit from further study, and the testing of new questions and hypotheses.

The Idea Puzzle tool is a scientific methodological software which assists in decision-making and ensures the coordination and consistency among the theoretical, methodological, and empirical aspects of a study (Parente and Ferro, 2016).

To Lakatos (Lakatos, 1978), streams of thought, which are sometimes referred to "schools of thought" or "research programs", or, in the words of Laudan (Laudan, 1977), "research traditions" or "metaphors" (Mintzberg et al., 1998; Morgan, 1986), are important research tools because they contextualize a topic in theoretical terms. Parente and Ferro (Parente and Ferro, 2016) recommend the inclusion of at least two alternative streams of thought in any literature review to ensure a stimulating and up-to-date review.

Phase 4 – Writing. The results were consolidated during the writing phase, which structured and substantiated the data for analysis, in the

context of the objectives of the present study, and organized the results for discussion. We included 110 documents in our review to identify sustainable gains Then, 23 more documents were inserted into the review to complement the study and show the negative impacts of VSS. This phase also included the selection of the journal to which the present study would be submitted, which included the verification of the scope of the potential journals, their language style, the necessary documents, translation, and the preparation of the cover letter to the editor.

The results of the present study were analyzed and organized systematically using the content analysis technique (Bardin, 2011) with a process of critical reflection (Fook, 2011). To achieve our goals, we limited our analysis to the predominant streams of thought related to the theme of VSS and the opinion of the authors with regard to the gains associated with the adoption of these standards. We have organized our findings on gains in sustainability in the environmental, economic, market, and social spheres for a better interpretation and understanding of the theme. However, the literature also shows negative, mixed, and neutral results for the VSS. We have reserved a specific section to show the negative impacts.

3. Results

The results of the systematic search within the 20-year timeframe (2000–2020) confirmed the plurality of the terms that have appeared in the literature in recent years to describe voluntary sustainable certification systems. Overall, the studies identified in the Scopus (Scp) and Web of Science (WoS) databases indicate that most publications refer to the terms *Certification Schemes* and *Sustainability Certification*. Over the past 10 years, however, the use of the term *Private Sustainability Standards* has grown more frequent and *Voluntary Sustainability Standards* has been adopted increasingly since 2015.

Many studies relate the term VSS to its possible contribution to the achievement of the Sustainable Development Goals (SDGs) of the 2030 Agenda (Corrêa, 2019; Castka, 2020; UNFSS, 2018). Examples of this association include the promotion of decent working conditions and economic growth (SDG 8), the demand of consumers for products and services that conserve the environment, the need for responsible production and consumption (as indicated in SDG 12), action against global climate change (SDG 13), the protection of aquatic and terrestrial ecosystems (SDG 14 and ODS 15), and the integration of the interested parties in pursuit of common goals through partnerships and implementation programs (SDG 17).

The number of papers published on the theme of VSS increased considerably over the 20-year timeframe of the present study (Fig. 3), with more than two-thirds of the papers selected in the literature search being published in the last ten years of this period. The association between the VSS and the SDGs of Agenda 2030, which was launched in 2015, may account for at least part of this concentration of research in the period 2015–2020, together with the increasing demands of global markets for more sustainable products.

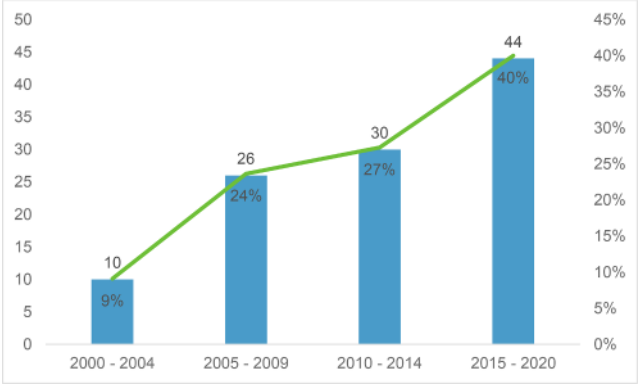

Fig. 3. Evolution of the number of publications on the theme of sustainable standards over time, between 2000 and 2020.

The publications reviewed in the present study are distributed worldwide (Fig. 4), based on the location of the home institutions of the first authors. However, more than half (53 %) of the papers were published by authors based in Europe, in particular, the Netherlands (11 %) and the United Kingdom (11 %), while more than a fifth (22 %) were produced by a single country, the United States. By contrast, Asia was under-represented, with only 4 % of the studies. Brazil (4 %) and Colombia (3 %) are the most important countries in South America. We can hypothesize from this global distribution pattern that developed countries conduct the bulk of the research on VSS and probably create more regulations, which are then applied to developing countries.

The literature reviewed in the present study indicated clearly that emerging economies (Fig. 4:), such as South Africa, Brazil, China, India, Indonesia, Mexico, and Russia, are the most impacted by VSS requirements (DIE, 2017; Coria and Sterner, 2011; Nordén et al., 2016; UNFSS, 2018). Despite this, most of these countries, as well as the least developed countries, contribute little to the publications on VSS, based on the home institution of the first author. Two exceptions are Brazil and India, although their contributions are disproportionately small.

3.1. Streams of thought

The present study identified the principal theoretical approaches, or streams of thought, to the assessment of the potential gains of VSS. We divided and classified the authors into two streams of thought according to what they most point out, emphasize or defend in their research (Table 1).

On the one hand, the author that adopt Stream of Thought 1 see the VSS as an obstacle to the access to large consumer markets, by establishing what are known as non-tariff barriers, which tend to exclude small and medium producers. Based on this stream of thought, the majority of producers adhere to the VSS only to guarantee the marketing of their products. By contrast, Stream of Thought 2 encompasses the researchers who argue that the VSS plays a role in the stimulation and fulfillment of the cause of sustainability. While most of the studies identified in the present review adopted clearly-one or other of these theoretical approaches, some either did not specify a position or did not present sufficient evidence to allow us to identify conclusively the stream thought adopted in the study.

Overall, it was possible to assign to of these two principal streams of thought, 36 research (Stream 1) and 82 (Stream 2), with 8 being repeated in both streams because the authors do not make their positions clear (*). Table 1 presents an overview of the two principal streams of thought and their exponents, rather than a definitive analysis. However, both streams of thought provide important guidelines for further research and the development of new questions.

3.2. Gains in sustainability through the adoption of VSS

Voluntary Sustainability Standards are presented as mechanisms of consolidation of sustainability in production chains (Thorstensen et al., 2018; Costa and Beitum, 2020)]. Salmon (Salmon, 2002) claimed that there has been an increasing trend in the eco-labeling movement to incorporate an ever greater diversity of questions that interest the consumer. This includes not only environmental problems, in a strict sense, but also animal welfare, food security, human rights, work and social justice, and also the development of different types of regulation for these problems.

To Salmon (Salmon, 2002), this trend reflects the fact that the consumer seeks to establish a relationship with companies that behave ethically in a whole range of issues that are relevant to their business. Standards schemes provide further guarantees that the rules and regulations are going to be respected (Henson and Humphrey, 2010; Lemeilleur et al., 2015; Thorlakson et al., 2018)].

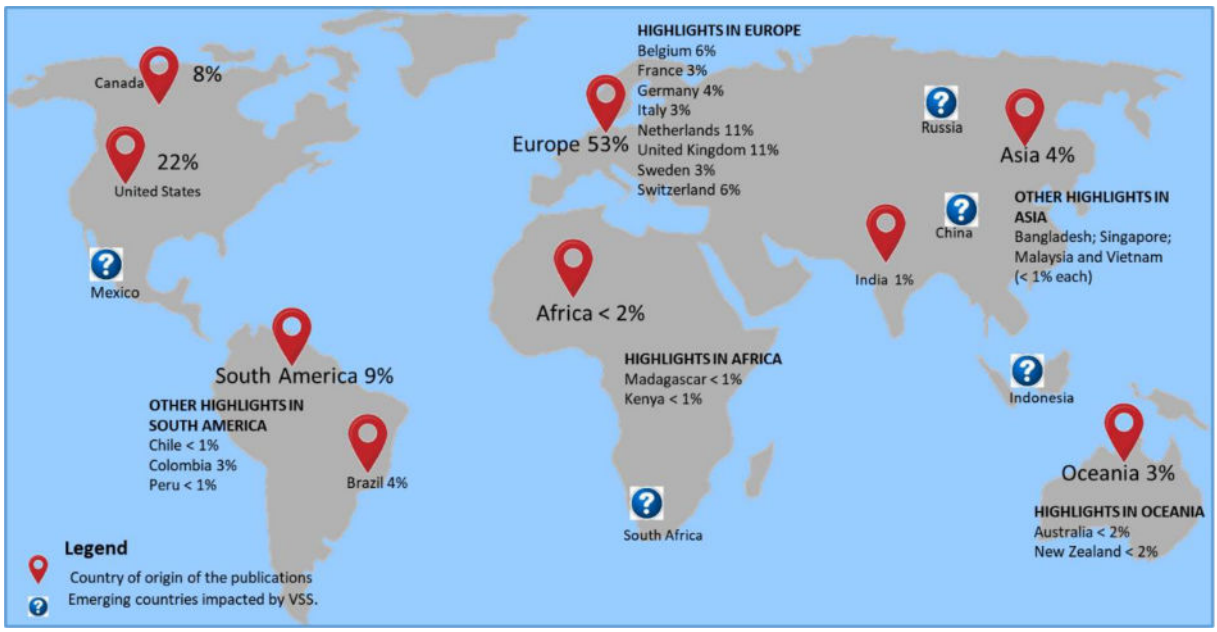

Fig.4. Geographic distribution of the publications on the theme of sustainable standards (considering the home institution of the first author) identified in the present study.

Lazar (Lazar, 2003) and ITC (Itc, 2011) claimed that transparency, accountability, trust, consensus, and standardization are essential tools in the global quest for sustainability, and that certification audited by third parties to internationally-recognized standards is one of the best strategies to achieve sustainability, and create an important baseline for future convergence. Castka and Corbett (Castka and Corbett, 2016) concluded that voluntary standards contribute to the worldwide order, provide instruments of transaction between organizations, and reduce the imbalance of knowledge on merchandise and its (often hidden) characteristics.

Henson and Humphrey (Henson and Humphrey, 2010) emphasize the need not to limit the focus on the present state of standards, but rather to consider them as part of a broader trend in the governance of value chains, in the context of altering regulatory controls and consumer demand. Lambin et al. (Lambin et al., 2014) and Prag et al. (Prag et al., 2016) go even further, by arguing that standards and labeling are not, in themselves, a solution, and should be seen within the broader context of universal policies, together with adequate regulation and market-oriented incentives.

Despite the challenges of evaluating separately the different pillars of sustainability associated with the VSS, we will first deal with the three principal aspects – environmental, economic, and social – separately here, before considering the shared gains covered in many studies.

3.3. Environmental gains

The socio-biodiversity certification of products, usually classified as a Voluntary Sustainability Standard (VSS), guarantees the differentiation, and identification of the origin of the product, according to the parameters outlined by each specific regulatory body (Costa and Beitum, 2020). Kareiva et al. (Kareiva et al., 2015) concluded that these standards may influence producers in a combined way to enhance their practices.

Compliance with environmental standards can improve the management of natural resources, in particular those that are essential to guarantee the livelihood of farmers (Liu, 2009). Within the scope of the management of natural resources, VSS may also provide useful tools to combat asymmetries in information and provide consumers with valuable data on the environmental sustainability of different management practices (Coria and Sterner, 2011). Salmon (Salmon, 2002) concluded that VSS contributes to the reduction of the environmental impacts of consumption by guiding consumers in their desire to practice environmentally-conscious purchasing, while also stimulating the development of products and services with a lower environmental footprint.

Bray and Neilson (Bray and Neilson, 2017) point out that a VSS can impact the stock of natural capital in a producing region as a result of (i) the introduction of good agricultural practices, and (ii) the active promotion of the protection or restoration of habitats by farmers. They go on to conclude that sustainability standards which focus on improving productivity may have indirect benefits by alleviating pressure on marginal land and forests. However, improving productivity could also make marginal lands more profitable, which would encourage growth. Furumo et al. (Furumo et al., 2020) also found evidence that certified producers adopt better environmental practices, such as the substitution of synthetic fertilizers with organic ones, a reduction in the use of agrochemicals, and the conservation of larger natural reserves.

Voluntary Sustainability Standards provide a promising mechanism for the mitigation of the negative impacts of agricultural growth on biodiversity (Tscharntke et al., 2015). Smith et al. (Smith et al., 2019) found important potential in the global sugarcane sector, with the adoption of standards contributing to increased production efficiency which, in turn, reduces the direct environmental harm caused by the productive process. They concluded that VSS may be a way to reduce the negative impacts of agriculture worldwide. The authors also state that in the case of sugarcane production, VSS improvements production processes (reducing eutrophication, water use, greenhouse gas emissions, and natural ecosystem conversion) to achieve sustainable outcomes.

An ample diversity of activists, companies, and international organizations have advocated the adoption of sustainable standards as a means of improving the negative environmental impacts of commodity agriculture (van der Ven et al., 2018). Eco-labels are increasingly important as a private regulatory measure to support sustainability in areas such as water consumption, carbon emissions, and organic produce (Castka and Corbett, 2016). While there is still a clear need for the improvement of assessment procedures, the evidence compiled up to now indicates that certification can contribute positively to both conservation and the improvement of livelihoods (Tayleur et al., 2018).

Table 1
The two principal streams of thought on Voluntary Sustainability Standards, and the most important studies that have adopted one or other of these positions (or both).

Year of publication	Stream 1: sees Voluntary Sustainability Standards as a barrier to the access of companies to larger consumer markets	Stream 2: considers that Voluntary Sustainability Standards fulfill, stimulate, and support the cause of sustainability
2020	UNCTAD (UNCTAD, 2020)	Furumo et al. (Furumo et al., 2020); Nugnes e Larrea (Nugnes and Larrea, 2020); Schleifer and Sun (Schleifer and Sun, 2020); Castka (Castka, 2020); Costa and Beitum (Costa and Beitum, 2020; Costa and Beitum, 2020) **.
2019	Thorstensen et al. (Thorstensen et al., 2019); Montiel et al (Montiel et al., 2019); Dietz et al. (Dietz et al., 2019); Thorstensen and Mota (Thorstensen et al., 2019).	Smith et al (Smith et al., 2019); Corrêa (Corrêa, 2019); Partiti (Partiti, 2019).
2018	Thorstensen et al. (Thorstensen et al., 2018); Elliot (Elliott, 2018)*; van der Ven et al. (van der Ven et al., 2018); Marx (Marx, 2018).	Lambin and Thorlakson (Lambin and Thorlakson, 2018); Elliot (Elliott, 2018); Bennett (Bennett, 2018); Thorlakson et al (Thorlakson et al., 2018); Tayleur et al. (Tayleur et al., 2018); UNFSS (UNFSS, 2018); Smith et al. (Smith et al., 2018).
2017	Mavroidis and Wolfe (Mavroidis and Wolfe, 2017) *; Fiorini et al. (Fiorini et al., 2017)*.	DIE (DIE, 2017); Bray e Neilson (Bray and Neilson, 2017); Mavroidis and Wolfe (Mavroidis and Wolfe, 2017); Fiorini et al. (Fiorini et al., 2017); Marx (Marx, 2017); Rueda et al. (Rueda et al., 2017).
2016	Nordén et al. (Nordén et al., 2016)*; ITC (Itc, 2016).	Prag et al. (Prag et al., 2016); Castka and Corbett (Castka and Corbett, 2016; Castka and Corbett, 2016)**; Nordén et al. (Nordén et al., 2016); UNFSS (UNFSS, 2016).
2015	Kareiva et al. (Kareiva et al., 2015); Schouten and Bitzer (Schouten and Bitzer, 2015); Lemeilleur et al. (Lemeilleur et al., 2015); Glasbergen and Schouten (Glasbergen and Schouten, 2015)*.	Tscharntke et al (Tscharntke et al., 2015); Rueda et al. (Rueda et al., 2015); Sibhatu et al. (Sibhatu et al., 2015); Byerlee and Rueda (Byerlee and Rueda, 2015); Glasbergen and Schouten (Glasbergen and Schouten, 2015).
2014	Lambin et al. (Lambin et al., 2014); Derkx and Glasbergen (Derkx and Glasbergen, 2014); Gulbrandsen (Gulbrandsen, 2014).	Green (Green, 2014); Potts et al. (Potts et al., 2014); Oosterveer et al. (Oosterveer et al., 2014); Pavlovskaia (Pavlovskaia, 2014); Loconto and Dankers (Loconto and Dankers, 2014).
2013	Bush et al (Bush et al., 2013).	UNFSS (UNFSS, 2013); Rueda and Lambin (Rueda and Lambin, 2013); De Beenhouwer et al. (De Beenhouwer et al., 2013); Nesadurai (Nesadurai, 2013); Gross and Milder (Gross and Milder, 2013).
2012	German and Schoneveld (German and Schoneveld, 2012).	Marx et al. (Marx et al., 2012); Blackman and Naranjo (Blackman and Naranjo, 2012); Seufert (Seufert, 2012).
2011	Cafaggi (Cafaggi, 2011); Harbaugh et al. (Harbaugh et al., 2011)*	ITC (Itc, 2011); Harbaugh et al. (Harbaugh et al., 2011); Schuler and Christmann (Schuler and Christmann, 2011); Ponte et al. (Ponte et al., 2011); Coria and Sterner (Coria and Sterner, 2011); UNEP-WCMC (Unep-wcmc., 2011).
2010	Hatanaka (Hatanaka, 2010).	Spaargaren and Oosterveer (Spaargaren and Oosterveer, 2010); Henson and Humphrey (Henson and Humphrey, 2010); Timmermans and Epstein (Timmermans and Epstein, 2010); Valkila and Nygren (Valkila and Nygren, 2010).
2009	Maertens and Swinnen (Maertens and Swinnen, 2009)	Liu (Liu, 2009); Arnould et al. (Arnould et al., 2009); Minten et al. (Minten et al., 2009).
2008	Wouters et al.* (Wouters et al., 2008); Wolff (Wolff, 2008); Brown and Getz 104] *.	Boström and Klintman (Boström and Klintman, 2008); Spaargaren and Mol (Spaargaren and Mol, 2008); Wouters et al. (Wouters et al., 2008); Martínez-Torres (Martínez-Torres et al., 2008); Freer-Smith and Carnus (Freer-Smith and Carnus, 2008); Swinnen and Vandemoortele (Swinnen and Vandemoortele, 2008); Van Dam et al. (Van Dam et al., 2008); Bacon et al. (Bacon et al., 2008); Giovannucci and Potts (Giovannucci and Potts, 2008); Brown and Getz (Brown and Getz, 2008); Henson (Henson, 2008).
2007	Graffham et al. (Graffham et al., 2007); UNCTAD (UNCTAD. United Nations Conference on Trade and Development, 2007).	Gulati et al (Gulati et al., 2007); Raynolds et al. (Raynolds et al., 2007); Swinnen (Swinnen, 2007).
2006	Havinga (Havinga, 2006).	
2005	Gandhi (Gandhi, 2005); Okello (Okello, 2005).	Ferraro et al. (Ferraro et al., 2005); Utting-Chamorro (Utting-Chamorro, 2005).
2004	Garcia Martinez and Poole (Garcia Martinez and Poole, 2004).	Nadvi e Wältring (Nadvi et al., 2004); Minot and Ngigi (Minot and Ngigi, 2004).
2003	Rametsteiner and Simula (Rametsteiner and Simula, 2003).	Dando and Swift (Dando and Swift, 2003); Lazar (Lazar, 2003); Maxwell and van der Vorst (Maxwell and van der Vorst, 2003).
2002		Salmon (Salmon, 2002).
2000		Dolan and Humphrey (Dolan and Humphrey, 2000); Mol et al. (Mol et al., 2000).

* Publications containing evidence of both streams of thought or without clear positioning.
** Authors with two publications in the same year.

The principal environmental gains of VSS perceived by associations and cooperatives include the promotion of good management practices (for example, açaí [*Euterpe oleracea*]), a range of different types of training related to the adoption of sustainable production practices, and guaranteeing organic products, which can benefit the workforce in particular (Costa and Beitum, 2020). In the coffee sector, the positive results of the certification of management practices include the better management and protection of soil cover (Martínez-Torres et al., 2008), fewer chemical inputs (Blackman and Naranjo, 2012), and better water and waste management (Rueda and Lambin, 2013). De Beenhouwer et al. (De Beenhouwer et al., 2013) also found evidence that environmentally friendly practices support conservation goals, such as an increase in ecosystem services and biodiversity, while Rueda et al. (Rueda et al., 2015) observed benefits in tree cover at the landscape level.

Certification also has the potential to reduce the global loss of forest cover (Freer-Smith and Carnus, 2008), promote the traceability of the supply chain, while also minimizing socio-environmental risks and liabilities (Costa and Beitum, 2020), cultivating respect for ecosystems,

and promoting biodiversity, as well as having the potential to function as a tool for the management of environmental and social risks for corporations and suppliers (Costa and Beitum, 2020; Costa and Beitum, 2020). In some regions, the combined pressure from international markets and certification schemes is leading land managers to adopt more effective environmental protection practices (Freer-Smith and Carnus, 2008). Mechanisms such as governmental or national procurement policies recognize certification as an independently-verified voucher of Sustainable Forest Management. The total area of forest covered by certification schemes is increasing and, together with purchasing policies, this initiative may amplify the impact of certification (Freer-Smith and Carnus, 2008).

In addition to their direct environmental effects, VSS initiatives contribute other, equally-important transformations. Salmon (Salmon, 2002) argues that they contribute to the growth of public awareness and commitment to sustainable development, and are especially valuable for the difficult task of convincing farmers to adopt environmentally-sound agricultural practices, and promote green retail purchasing policies by grocery store chains and public authorities. The perceived success of VSS provides a number of NGOs with an effective bargaining position for the establishment of constructive programs of sustainability, as well as the integration of developing countries.

3.4. Economic and market gains

Commercial and sustainable development should converge on mutual objectives (Thorstensen et al., 2018), with the adoption of a VSS having a range of economic gains for the producer, including better purchase conditions or long-term agreements with foreign buyers (including the payment of price premiums for a sustainable product), and increased competitiveness in foreign markets based on environmental production credentials. Marx (Marx, 2018) and Dietz et al. (Dietz et al., 2019) both recognized the payment of significant price premiums as one of the most effective determinants of the implementation and "regrouping" of environmental standards and practices. Price premiums for certified lumber may reach 5 % (Nordén et al., 2016), which provides farmers with the financial capability that allow them to fulfill expected requirements. Even so, as Tscharntke et al. (Tscharntke et al., 2015) have pointed out, the advantages of certification extend well beyond the potential price premiums.

The modification of production practices in line with the requirements of a VSS can also lead to a reduction in operating expenses, including a reduction in the consumption of energy and the production of waste (Tscharntke et al., 2015; Prag et al., 2016; Costa and Beitum, 2020; Ferraro et al., 2005)). Voluntary Sustainability Standards can also benefit producers through more efficient management, the reduction of costs, improved access to markets, increased product quality, and the improvement of the corporate image (Liu, 2009). Overall, however, the key benefit is the improvement in the sustainability of the production process, in particular in the agricultural sector (Oosterveer et al., 2014).

Henson and Humphrey (Henson and Humphrey, 2010) concluded that VSS provides an efficient tool for the dominant supply chain actors to keep transaction costs under control. While VSS can increase the overall efficiency of the value chains of agricultural products that lead to an overall reduction in information, they can also redistribute these costs among supply chains, primarily from the dominant buyers to their suppliers.

Standards also reassure consumers with regard to the security of the food they buy, establish competition for safety and quality, and protect the principal food supply agents from liability in the event of a health crisis (Marx et al., 2012), for example, with the possibility of traceability (Itc, 2011). These driving forces, which represent structural changes in the global food market, institutionalize VSSs in global food governance (Marx et al., 2012; Wouters et al., 2008). Swinnen and Vandemoortele (Swinnen and Vandemoortele, 2008) concluded that certification requirements may have positive effects on the production of food by small farmers through the combined effects of improvements in the knowledge, technology, and input markets. Oosterveer et al. (Oosterveer et al., 2014) concluded that this ensures the small farmers who are able to satisfy the rules a high and predictable income.

From the economic perspective of developing countries, some standards can add value to exports and, therefore, increase financial gains, generate employment, support small producers, improve food security, and diversify the local economy (Liu, 2009). Farmers and exporters see certification increasingly as a means of adding value to their products and gaining access to international markets that value certification as a vital socio-environmental safeguard (Liu, 2009; Costa and Beitum, 2020).

Voluntary Sustainability Standards may have an even broader impact on economic activities than simply their direct impacts on the production process. They may also affect the market structure, for example, the global share of the value chain, and other trade parameters. These processes may, in turn, impact sustainable development by creating incentives for producers in other sectors to consider sustainability, that is, a learning effect, or through their impact on profitability, investment incentives, productivity, and economic growth (UNFSS, 2018). The adoption of VSS may provide a number of commercial opportunities at the level of the producer. One empirical study has shown greater gains in productivity for small farmers who have adopted a variety of certification standards (Prag et al., 2016). Standards can also be used to manage geographically broad supply chains more efficiently, to standardize product requirements, and to reduce the costs of transactions (Itc, 2011).

The application of standards can enable small and medium-sized enterprises (SMEs) to access the GVCs and export markets, benefit from price premiums, increase sales, and to create safer markets (Furumo et al., 2020; Itc, 2011; Itc, 2016; UNFSS, 2016). The integration with the GVC also promotes the dissemination of information and technology, improving the productivity of SMEs in developing and emerging countries (UNFSS, 2016). The implementation of sustainability standards can thus boost the expansion of SMEs and contribute significantly to the dissemination of sustainable development (DIE, 2017).

Voluntary Sustainability Standards have the potential to ensure that agricultural producers will adopt sustainable practices, which will, in turn, help to mitigate the financial risks of investments (that is, minimize the probability that the real return of the investment is different from the expected return) and, finally, guarantee access to financial support (Nugnes and Larrea, 2020). Bray and Neilson (Bray and Neilson, 2017) also observed that it is possible for certification to improve the access of producers to credit, as a result of the strengthened organization of producers, directly through an actor in the downstream value chain or through facilitated access to third-party financial institutions. The application of criteria of sustainability guarantees this condition over the long term, and ensures investments. One other positive effect of introducing these criteria is that products which comply with them may eventually be linked to government subsidies (Van Dam et al., 2008).

The growth in the commitment of governments and the private sector to sustainability through the production of commodities supported by VSS emphasizes the potential of these standards to create more sustainable food production worldwide (Smith et al., 2019). The adoption of these standards also allows the leading companies to manage the reputation of their brands and gain access to high-value segments of the market, such as ethical or organic produce, which can influence conscious consumer decision-making (DIE, 2017).

Voluntary Sustainability Standards play a significant role in the promotion of actions, innovations, and shifting attitudes toward sustainable standards of both production and consumption. These standards also test governance models and practices that support the progress of international economic markets toward sustainable development (Salmon, 2002).

Large-scale producers are now struggling to obtain certification and

gain a share in markets dominated by environmentally-oriented consumers. In Europe, for example, industrial and retail companies have agreed to buy only certified forest products (Coria and Sterner, 2011). On the other hand, although sustainable consumption is increasing mainly in traditional markets, Europe and North America, in some commodity markets (for example, coffee, bananas, cocoa, palm oil, sugar cane, soy, and tea), demand is not growing at the same pace as supply, generating an over-supply of products considered to be significantly covered by sustainable certifications (Tayleur et al., 2018; UNCTAD, 2020).

The principal economic gains of VSS perceived by associations and cooperatives is their greater visibility in the marketplace, which facilitates the attraction of funds from foundations and private firms. As these projects are operated by community enterprises or third-sector organizations, VSSs will guarantee the socio-environmental safeguards and counterparts that are essential to ensure access to certain types of financial resources (Costa and Beitum, 2020). Furumo et al. (Furumo et al., 2020) concluded that the VSS has become an important strategy for the improvement of palm oil production practices, but also that the effectiveness of certification programs remains unclear. Costa and Beitum (Costa and Beitum, 2020; Costa and Beitum, 2020) emphasized that the adoption of VSS provides a means for continuous improvement and the possibility of assessing overall performance, fair trade and corporate social responsibility, access to products from distinct regions of the world (supporting fair trade), long-term partnerships, honest pricing, shared values within the supply chain, the financing of collective projects, and the promotion and defense of fair trade.

3.5. Social gains

In addition to economic gains, sustainability certification can influence the decision-making of farmers on land use and rights, which in turn have consequences for local food security (Schleifer and Sun, 2020). Some standards promote a greater diversity of crops, which, in turn, have the potential to improve the nutritional quality of the diet of local producers and consumers (Seufert, 2012; Sibhatu et al., 2015)). The Deutsches Institut für Entwicklungspolitik, or DIE (DIE, 2017), increasingly emphasizes the need to include an explanation of the consequences for employees, the local people, and the environment in the development of the production process.

Organizations that establish VSS can contribute to combating wage inequalities by demanding minimum wage levels or equivalent wage premiums, and requiring employers to train workers and encourage them to negotiate collectively (Furumo et al., 2020; Bennett, 2018; Potts et al., 2014)]. In their review, Schleifer and Sun (Schleifer and Sun, 2020) found a positive relationship between certification, the financial gains of farmers, and food security, albeit a relatively weak link, which is highly context-dependent. Even so, there is clear evidence of the link between certification and food security through its influence on gender equality and land use rights.

Labor standards can reduce employee turnover, accidents, absenteeism, and illness, as well as reducing costs and increasing productivity. They can also ensure better healthcare for farmers and agricultural workers, and improve relationships with the local community (Liu, 2009). The adoption of some VSSs can have broader impacts in the supply chain, such as a greater transparency in labor standards, which help countries achieve sustainable development goals (Prag et al., 2016; Costa and Beitum, 2020).

Social capital can be considered to be a potential result of certification and a crucial means of initiating involvement with VSSs (Bray and Neilson, 2017). Many certification schemes seek to protect the land rights of vulnerable groups, for example, such as indigenous peoples and small independent farmers (Nesadurai, 2013; Byerlee and Rueda, 2015). Costa and Beitum (Costa and Beitum, 2020; Costa and Beitum, 2020) reported important gains, such as respect for human rights and fair working conditions, with a focus on regional development.

Certification is also expected to improve the financial capital of farmers as a result of (i) higher yields, associated with price premiums; (ii) higher yields ensuing from the adoption of more profitable agricultural practices (or lower costs; iii) greater access to financial credit, and (iv) a reduction in financial risk and price volatility, derived from long-term purchase contracts, reliable supply chain relationships, and ethical procurement (Castka and Corbett, 2016; Bray and Neilson, 2017). Costa and Beitum (Costa and Beitum, 2020) showed that sustainability schemes facilitate the standardization of the relationship between corporations and suppliers with regard to safety at work, fair labor relations, and the elimination of slave and child labor.

A number of studies have shown that VSS correlates with improving educational performance following the introduction of certification (Bacon et al., 2008; Arnould et al., 2009; Valkila and Nygren, 2010) and that the premiums paid to cooperatives have often been invested in educational programs (Utting-Chamorro, 2005). The positive impacts are rarely attributed to certification alone, however, given the combined influence of local factors, such as the education levels and the availability of a skilled workforce, market structures, administrative resources, and local infrastructure (Bray and Neilson, 2017). The principal social advantage of VSS perceived by associations and cooperatives is the facilitation of the management of community enterprises, in particular, in the administrative and financial sectors, as well as the resolution of legal problems (Costa and Beitum, 2020) and the inclusion and empowerment of women (Nugnes and Larrea, 2020).

Schleifer and Sun (Schleifer and Sun, 2020) identified three principal ways in which sustainability certification can empower women: (i) by providing them with additional influence in both community and family decision-making spheres, (ii) through the formal acquisition of land rights, and (iii) the improvement of their economic opportunities. They nevertheless found that the question of land rights is still poorly-documented. The empowerment of women through sustainability certification can also help to improve food security. Many certification schemes organize special training, awareness, and activities to promote gender equality in agricultural communities (Smith et al., 2018).

3.6. Shared gains (socioeconomic and environmental)

In practice, as indicated by Tscharntke et al. (Tscharntke et al., 2015); the gain in standards accruing from the results in the social, economic, and environmental pillars of a VSS system tend to occur in synergy, which limits the evaluation of a single component in isolation. We identified many gains in sustainability that either involve more than one pillar of sustainability or involve all the pillars simultaneously.

Giovannucci and Potts (Giovannucci and Potts, 2008), for example, postulated that certification is a means for the customer to cut back on the social and environmental externalities of their consumption, and for brand manufacturers to mitigate the risk of eventual shortages. It is widely claimed that certification contributes primarily to the protection of producer livelihoods (economically, socially, and environmentally), which involves a shift toward a movement for social justice (Arnould et al., 2009). This plurality of applications of VSS partly accounts for its diversity of impacts (Bray and Neilson, 2017).

Voluntary Sustainability Standards also contribute to the reduction or elimination of externalities that ensue from the processes of production or consumption, including the risks of pollution, and to health and safety, as well as addressing the moral concerns of consumers with regard to questions such as animal welfare and working conditions (Partiti, 2019). The adoption of these standards also contributes to worker well-being, the protection of both communities and the soil, as well as the defense of human rights, by addressing the environmental impacts of both production and consumption (Gross and Milder, 2013; Tscharntke et al., 2015; DIE, 2017; Thorstensen et al., 2019; UNFSS, 2013; UNFSS, 2018).

Even broader expected impacts, which different schemes may have in common, embrace products of higher quality and greater yield, and

thus better income, higher standards of living for both producers and workers, as well as the improvement of environmental conditions (Bray and Neilson, 2017). There is clear evidence that certified forests and participants in the value chain perform better than non-certified entities (Loconto and Dankers, 2014). One example of such an association is the Canadian forest merchandise firm, which finances research and policy development voluntarily, adopts international standards and certification, and a corporate social responsibility framework, working together with other stakeholders to build a future based on social, environmental, and economic sustainability (Lazar, 2003). Schuler and Christmann (Schuler and Christmann, 2011) argue that the rigor of certification requirements, on the one hand, and the promotion of the eco-labels, on the other, result in socially accountable behavior by firms and sustainable consumer demand.

Costa and Beitum (Costa and Beitum, 2020) ascertained that large trade agreements, such as those cited by Morin et al. (Morin et al., 2018)[3]; have directed themselves towards sustainability criteria, while consumers are also more and more concerned with questions of health, product origin, impacts, and styles of production. In this context, to ensure social and environmental safeguards, VSSs have proven to be effective tools for the attenuation of negative impacts, while generating positive effects along value chains. Fig. 5 shows some VSS identified in this review and the sector, subject, or product to which it applies.

In the studies reviewed by Bray and Neilson (Bray and Neilson, 2017), certification is generally assumed to be more likely to generate positive impacts than negative effects, although the predominance of neutral or mixed findings indicates that a substantial degree of uncertainty persists.

3.7. The other side of VSS (negative impacts)

In the previous sections, we delved deeper into the main sustainable gains that the Stream 2 authors found and highlighted in their investigations. However, the impact of VSS on sustainability is a hotly debated topic in academia and a common consensus is far from being reached (Bonisoli et al., 2019). The results of some studies on the impacts of VSS, for example, are somewhat scattered, highly variable or negative, and sometimes inconclusive (DeFries et al., 2017; Glasbergen, 2018; UNCTAD, 2021). For this reason, it is also important to report that there are not only sustainable gains and that many negative or even neutral impacts are mentioned in the literature on VSS.

The authors of Stream 1 emphasize a negative point much explored in the VSS literature: standards as a barrier to exports or access to large consumer markets. These barriers are mainly related to the exclusion of small and medium producers from developing countries from Global Value Chains. One of these exclusions was reported by Ting et al. (Ting et al., 2016) in a case study on certified palm oil. The certification excluded small-scale farmers and small and medium-sized companies.

Negi et al. (Negi et al., 2020) conjointly show that the literature usually suggests that, though their impact is context-specific, VSS may adversely affect the participation of smallholders in the market. The threat of exclusion in the event of non-compliance with standards may be large for small producers. In other words, the VSS vision of transforming the market and its desire to include all actors along the value chain does not achieve its social objectives with these exclusions (Ting et al., 2016).

Also regarding small producers, the studies even show socioeconomic gains for farmers who are part of certification systems. However, Negi et al. (Negi et al., 2020) say these gains can have perverse implications for environmental sustainability. To avoid such contradictory results, the authors suggest that control and safeguard mechanisms should be implemented.

VSS schemes usually fail to achieve producers and the environment in developing countries, areas most in want of support to transition to more sustainable modes of production (UNCTAD, 2021). Research on certifications in the nut chain in Brazil showed that more than half of the nut producers interviewed reported that organic certification had no effect or that they had a negative experience. To obtain and maintain them, greater commitment (extra work) was required, and the agreed payment for the processing of the nut did not take place in the time agreed between the parties (Costa and Beitum, 2020).

Bray and Neilson (Bray and Neilson, 2017) reported that several studies showed that organic certification resulted in this increase in work. They explain that without the help of labor-saving chemicals, the demand for work in the community has increased. However, these job opportunities were often arduous, specifically for women, who traditionally performed this activity (Kasente, 2012), which can have other negative impacts on livelihoods.

Glasbergen (Glasbergen, 2018) has already concluded that smallholders such as Indonesian coffee and palm oil are struggling to improve their livelihoods and working conditions. The author highlights that leaving the responsibility for sustainable change to the VSS is limited in their ability to achieve these improvements. A United Nations Conference on Trade and Development (UNCTAD) publication on the role of VSS for more sustainable trade concluded that the implementation of VSS schemes is not profitable enough for producers in developing countries to adopt and maintain improved sustainability practices (UNCTAD, 2021).

Changes to more sustainable trade require substantive investments in sustainable value chains. (UNCTAD, 2021). Negi et al. (Negi et al., 2020) point out that for smallholders to have access to certified markets, they must organize cooperatives or other smallholder groups. Furthermore, certification of smallholders often requires outside support because it requires investments and skills that smallholders often lack. What is observed again is that without external support, small producers can be left out of global trade. Fransen (Fransen, 2018) pointed out several relevant dangers for chains and activities that demand VSS: which in addition to the business domain, failures to involve social groups, and implementation gaps, there is also the dependence on Non-Governmental Organizations.

Glasbergen (Glasbergen, 2018) also states that certification demands reflect more the preferences and concerns of consumers than the values and interests of those demanded by the VSS: the producers. This is also shown in many other certification impact assessments that investigate whether VSSs meet their objectives and the needs of producers. According to Negi et al. (Negi et al., 2020), for there to be lasting gains, the environmental goals of smallholder certification need to be given the same attention as socioeconomic goals from the outset.

Oya et al. (Oya et al., 2018) say that concerning socioeconomic impacts, the different VSS are not equally effective concerning positive impacts on prices, certified production yields, and schooling. That is, the implementation of the same VSS can have different results in different contexts and regions. For example, in the study by Winter et al. (Winter et al., 2020), organic certification does not show a positive impact on the environmental dimension of coffee production systems in Ethiopia. However, the situation is different in Brazil, where agribusiness is much more developed than in that African country. The authors point out that in Brazil, organic certification considerably influences the choice of inputs and, therefore, a great improvement in sustainability is visible in the environmental dimension for certified coffee.

In the study by Ssebunya et al. (Ssebunya et al., 2019) on sustainability on coffee farms in Uganda, the authors concluded that all farms have positive gains in the social and environmental dimensions, but

[3] EC – CARIFORUM Economic Partnership Agreement; EC – Central America; EC – Republic of Korea; EC – Colombia-Peru-Ecuador; EC – Georgia; EC – Republic of Moldova; EC – Singapore; EC – Ukraine; EC – Viet Nam; Canada – EC (CETA); EFTA – Montenegro; EFTA – Bosnia Herzegovina; EFTA – Central America; USMCA (formerly NAFTA); Peru – United States; Republic of Korea – United States; Republic of Korea – Turkey; Colombia – Republic of Korea and Canada – Chile. Morin et al., 2018 [87].

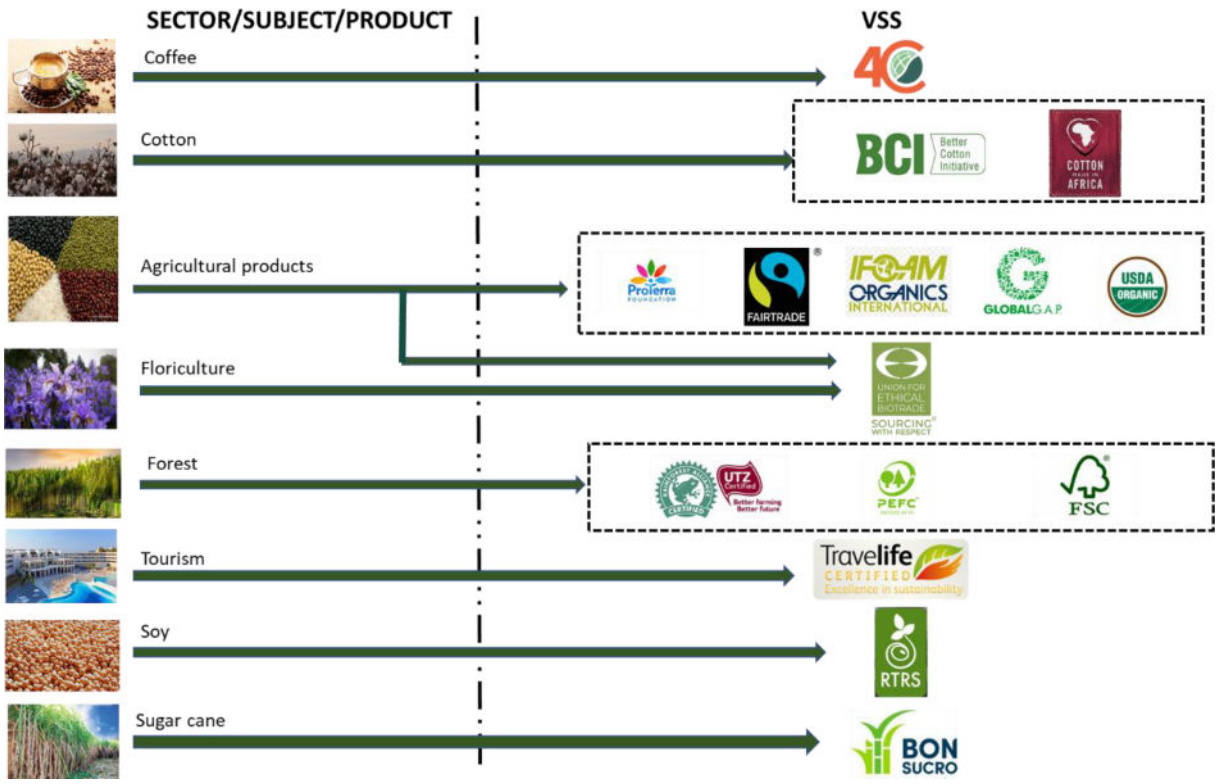

Fig. 5. Examples of VSS and sector, subject or product.

there are negative impacts or low scores in the economic and governance dimensions. Vellema et al. (Vellema et al., 2015) claim that access to specialty coffee markets does not increase revenue. These researchers report that on-farm certification as a precondition for accessing specialty coffee markets is having a profound impact on smallholder livelihoods.

Henson and Humphrey (Henson and Humphrey, 2010) had already highlighted in their work that VSSs are important for exporting countries. The authors report that there is much concern about the impact of VSS, predominantly in developing countries, and more broadly, value chain governance, particularly in food chains.

The United Nations Forum on Sustainability Standards (UNFSS) (UNFSS, 2018) also reports that the impacts of VSS on developing country exports can be very large. On governance, VSS is not subject to the direct discipline of the World Trade Organization (WTO) or any other Organization (Partiti, 2019). This lack of governance may explain why producers in many developing countries operate in a regulatory context that is not aligned with the VSS approach (UNCTAD, 2021).

There is also a governance gap between government regulations, which are typically weaker in developing countries, and VSS requirements, which are more stringent. Producers and companies in developing countries are therefore used to operating under more lenient regulations, and compliance with VSS requires changes involving production costs, the need for technical capacity, and know-how (Marx et al., 2022).

In the case of food safety and other requirements of European markets, there are widespread allegations that developing countries are unable to meet the requirements embedded in the VSS (Garcia Martinez and Poole, 2004; UNCTAD, 2007)). In developed countries, where government regulations are more stringent, compliance with VSS by producers is easier (UNCTAD, 2021; Marx et al., 2022). Negi et al. (Negi et al., 2020) note that to be effective, standards need a favorable economic and institutional environment.

The lack of governance is also related to the emergence of Southern standards, which emerged as a direct response to existing global standards (generally perceived as Northern initiatives) (Schouten and Bitzer, 2015). Some authors claim that there is an unbalanced distribution of costs and gains to the detriment of southern producers (Fuchs et al., 2011; Schouten and Glasbergen, 2012).

According to Kalfagianni and Pattberg (Kalfagianni and Pattberg, 2013), there is an exclusion of southern stakeholders from decision-making processes. As a result, Schouten and Bitzer (Schouten and Bitzer, 2015) claim that Northern standards end up being more accepted among multinational companies and parts of the international NGO community, but not at the production level, where these standards must be met disseminated, and implemented (generally located in the Global South). This may reflect in developed countries imposing policies on developing countries. Consequently, in some nations, governments use the development of national VSS to avoid such constraints (UNCTAD, 2020).

The growing number of available VSS is seen as a negative effect on the global market. It is a challenge in terms of guidance for consumers, producers, traders, and public authorities, as it has raised questions about their credibility (UNFSS, 2018; Thorstensen et al., 2019a; Thorstensen et al., 2019b; UNCTAD, 2020). In their study of the seafood industry, Prag et al. (Prag et al., 2016) state that there are retailers that declare themselves sustainable. This practice ends up being seen as misleading or unverifiable. Fransen (Fransen, 2011) states that there is a relative lack of convergence between the VSS. Glasbergen (Glasbergen, 2018) cites the fragmented approaches of the VSS.

For consumers, it is difficult to measure the credibility of a VSS to others regarding the promises of sustainable products, such as less impact on the environment, conditions for obtaining worker well-being, and respect for animal well-being. For producers, it is not just a question of credibility, there is a fragmentation of the normative horizon applicable to production chains and costs related to each right or wrong choice that the producer makes (Thorstensen and Mota, 2019; Fransen et al., 2018; UNCTAD, 2021).

Besides credibility, VSSs face significant challenges in terms of effectiveness and cooperation (Fransen, 2011). In particular, the potential of the VSS to contribute to the achievement of the Sustainable

Development Goals (SDGs) of the 2030 Agenda depends on its level of adoption as well as its sustainability impact on the base (UNCTAD, 2020; Marx and Depoorter, 2020; UNCTAD, 2021; WWF, 2030).

Some studies argue that VSS help to reduce transaction costs between buyers and sellers. Nevertheless, the main argument for VSS hurting international trade revolves around the burden of compliance costs, which are frequently perceived as hindering instead of enabling sustainable development and commerce (UNFSS, 2018; UNCTAD, 2021).

In addition to this cost reduction with VSS, shown in the literature, the infinity of existing certifications emerged to promote fairer and more sustainable trade practices and seek to raise the level of chain relationships. However, Vanni (Vanni, 2018) analyzes that these certifications have a little economic impact, and do not guarantee significant price premiums. The author concluded that in the case of the açaí chain (a typical fruit from the Amazon), certification plays an important role for consumers in the United States, but has little meaning for producers in Brazil.

Another point concerns existing studies that are highly concentrated on some specific certifications, especially forestry (FSC) and fair trade (Fairtrade). The results show a considerable share of negative evaluations for these two VSS, which again fits into the limited overall effectiveness of the VSS to promote sustainable change (UNCTAD, 2021). Burivalova et al. (Burivalova et al., 2017), in their review to assess the environmental, economic, and social impacts of a VSS for forest products, concluded that none of the interventions consistently met all expectations. They were sometimes associated with worse-than-conventional outcomes or no governance at all. The authors also claim that VSSs often do not appear to be economically viable without external subsidies, at least in the short term and until the positive externalities of good management are captured.

According to Marx and Depoorter (Marx and Depoorter, 2020), a very consistent result is that it is difficult for VSS to perform equally well in all dimensions of sustainability. The authors argue that it is too much to expect that standards will address all dimensions of sustainability, even if that is the stated objective. Formulating the principles and criteria of a VSS involves difficult negotiations. Therefore, sustainability standards cannot provide comprehensive solutions to all problems (Negi et al., 2020).

UNCTAD (UNCTAD, 2021) argues that while VSSs can promote behavioral changes to sustainable practices (called intermediate outcomes), these changes do not essentially translate into robust and tangible sustainability outcomes (final results), especially in developing markets. In their study, Bonisoli et al. (Bonisoli et al., 2019) presented an analysis of the sustainability of certified agri-food products. The results demonstrate that the certified banana system operates at a higher level of sustainability in the governance, environmental and economic dimensions, but has lower sustainability results in the social dimension.

Countries such as Brazil, Côte d'Ivoire, and Indonesia are markets that have seen increased adoption of VSS in one of their main crops soy, cocoa, and palm oil, respectively. Even so, all these crops have been linked to deforestation (van der Ven et al., 2018). The authors further concluded, based on existing evidence and data, that VSSs have neither favored nor impeded the conversion of forest land into agricultural production. Furthermore, they found little evidence to suggest that VSS are applied widely or prescriptively enough to stop environmentally destructive land-use change actions. In their study, Marx et al. (Marx et al., 2022) show that the environmental impacts of VSS on deforestation in certified farms and plantations are differentiated between countries, with no significant effect in some (such as Brazil and Indonesia), but positive in others (such as Ethiopia and Colombia).

Negi et al. (Negi et al., 2020) state that large-scale environmental gains in greenhouse emissions and deforestation are viewed as difficult to achieve with VSS. Researchers additionally state that one of the most reasons for the restricted effectiveness in environmental terms is that VSSs have gaps and face implementation and management challenges. While many VSSs have focused on habitat, few focus on climate change, which is another major factor in biodiversity loss. Furthermore, most VSS prescribe practices rather than performance results for protecting biodiversity (Fransen et al., 2018).

In another study, it is shown that despite the considerable potential of VSS for biodiversity conservation, most current VSSs have been assessed as having a negative or mixed effect on biodiversity conservation (Ting et al., 2016). It appears that certification schemes may not be operating in regions where the greatest threats to biodiversity exist (Fransen et al., 2018).

Other research also points out that there is a paucity of evidence on the actual impacts of VSS adoption on biodiversity conservation and other social and environmental outcomes (Fransen et al., 2018). In the economic and social dimensions, DeFries et al. (DeFries et al., 2017) see that VSS is not a sufficient condition to improve social outcomes and incomes for smallholder farmers. Other studies resulted in negative evaluations of the capacity of VSS to make trade and production processes more sustainable (UNCTAD, 2021).

4. Discussion

Here, we provide an overview of the results of the present review in the context of the objectives of the study, which integrated previously segmented and often disjointed results from previous research. In our analysis, we adopted one of the two principal streams of thought (Stream of Thought 2) identified during the present study to deepen and investigate the possible gains for sustainability (positive impacts) accruing from the adoption of VSS. However, negative, mixed, or neutral impacts exist and are mentioned in the literature. A specific section of this manuscript (Section 3.7) brought this other "side of the coin" of the VSS. This served to expand Stream 1, which brings one of these negative impacts (barrier to market access) and avoids biases.

It is also possible to establish a link between the two streams of thought. On the one hand, there are authors in Stream 1 who recognize that VSS can also lead to sustainability gains. Although these gains are not general in GVCs or all dimensions of sustainability. Often, VSSs improve only one pillar of sustainability or some aspects of the chain, but not necessarily all links benefit.

On the other hand, there are authors from Stream 2 who recognize that even with sustainable gains from the adoption of VSSs, they can represent non-tariff barriers for small producers and SMEs if they do not have adequate support to comply with and maintain the VSS requirements. Other barriers are related to having to adopt multiple VSSs, often even similar in scope, to serve different countries. Therefore, despite being different and emphasizing or defending one aspect over another in their research, the two Streams of Thought complement each other.

Additional streams of thought may eventually arise, such as the view of VSS as a type of "greenwashing", which conveys an image of sustainability, but contributes little or nothing to this condition, in practice. The term greenwashing has been cited in many studies of VSS.

In general, however, most authors (69,49 %) interpret the VSS positively in terms of its contribution to sustainability (Table 1), even though some authors (*) remain neutral or even present evidence of both streams of thought and thus appear in both columns of the table. This lack of a well-defined stance paves the way toward the identification of other streams of thought in future studies and confirms that they complement each other.

Overall (Table 2), it is clear that VSS is present in many sectors and has a diversity of applications that contribute to sustainable development. We identified the distribution of the most relevant VSS studies and verified that the term *Voluntary Sustainability Standards* encompasses the greatest diversity of topics investigated by researchers, based on the application of the key terms in the literature search. This indicates clearly that the term VSS has been gaining space in the literature, and is being applied increasingly in studies on the subject of sustainability. However, the variation of terms to describe VSS schemes makes it

Table 2
The content of the principal terms investigated in the present study.

Keywords	Research Fields
Voluntary Sustainability Standards	Conservation of biodiversity; Food security and consumer protection; Forest certification for sustainable management; Certification of global food chains; Sustainable management; Impact of VSS on agriculture; Social justice and fair trade; Problems and challenges related to the proliferation, coherence, convergence, harmony, and transparency of VSS; VSS in Amazon fruit and seed chains; Benefits, impacts and implementation of VSSs; Factors related to the adoption of a VSS.
Sustainability Certification	Green buildings; The importance of certification; Biodiversity; Sustainable tourism/ecotourism; Sustainable fishing; Certification of coffee, cocoa, and palm oil; Implications, applications, and impacts of certification; Green labeling; Corporate governance.
Private Sustainability Standards	Certification; Social and Environmental Responsibility; Integration of stakeholders; Food Security; Environmental sustainability in agriculture; Forest management.
Certification Schemes	Green certification in the construction industry; Food supplements; Agriculture; Certification schemes for palm oil production, forest management, and animal health and welfare.
Certification labeling	Social enterprises; Forest Labeling; Certification and credibility (food sector); The perspective of manufacturers and consumers; Fishing; Social justice.
Eco-labels	Ecological packaging; Sustainable consumption; Green consumerism (textile sector); Labeling: wood, fishing; Labels, standards, and certification programs; Vegetation cover and deforestation; Governance.
Global Voluntary Standard	Relationship between private food standards and trade; Interaction between private actors, civil society, and governments; Factors and consequences of voluntary standards.

difficult to analyze their impacts throughout history, as the older terms continue to be used in the literature.

Our systematic review strategy also enabled us to identify weaknesses (knowledge gaps) in the literature on each stream of thought (Table 3). These topics represent challenges and opportunities for further research. They refer to international trade, corporate social responsibility, and the pursuit of sustainable production and consumption. Clearly, VSS involves highly complex issues for entrepreneurs, governments, producers, and consumers, as well as economic and financial consequences for trade and GVCs.

Table 3
The principal knowledge gaps identified in each stream of thought in the present study.

Stream of thought 1	Stream of thought 2
a1) Transparent rules for obtaining financial resources; b1) The reduction of financial risks; c1) The creation of VSSs by emerging or developing countries (Brazil, China, India, Indonesia, Mexico, Russia, South Africa); d1) Lack of information and research on VSS in the value chains of sectors such as leather, fruit, nut, and vegetable oil.	a2) Gains in sustainability through the adoption of certification for products and services; b2) Valuation of Corporate Social Responsibility (CSR); c2) Credibility of sustainable certification; d2) Challenges of sustainable certification and greenwashing; e2) Sustainable certification in public procurement; f2) Perception of the final consumer on the net gains of VSSs.

4.1. These knowledge gaps influence the popularity, recognition, and adoption of VSS by stakeholders, as follows:

4.1.1. Stream of thought 1

a1 and b1: There is a lack of research on the requirements for achieving sustainable practices that minimize financial risks and facilitate access to financing, which would ensure that producers are able to improve their management techniques, pay for certification, and maintain practices. The requirements of VSSs are not always transparent in terms of their economic sustainability, and often have ill-defined goals or indicators that are difficult to monitor. Without any guarantee of financial returns, access to credit can be difficult and will discourage companies from obtaining certification.

c1: The literature shows that interest in adopting VSS differs widely between developed and developing economies. The emergence of sustainable rules and the quest for sustainable consumption and awareness are much greater in developed economies. Given this, the low investment in in-depth studies of the topic in developing economies creates imbalances in the commercial conditions and competitiveness of these two groups of countries.

d1: Most studies in VSS are investigating the tropics shown in Table 2. There is a lack of research on the impacts of VSS in many value chains, such as the leather, fruit, nut, and vegetable oil sectors. These products are affected by sustainable standards and are prominent exports for many emerging countries.

4.1.2. Stream of thought 2

a2: The present study filled this gap. However, as more value chains adhere to sustainability certification, and more VSSs emerge and more countries adopt them, the greater will be the need to reassess gains in sustainability, as well as the standardization of certification schemes, in order to reduce the intrinsic complexity of the VSS.

b2: Voluntary Sustainability Standards are potential instruments for the management of the corporate social responsibility of companies and their supply chains. Studies are needed to show the connection between VSS and CSR, the challenges of improving sustainable consumption and production, and to ensure the transition to sustainability in the global marketplace.

c2 and d2: Voluntary Sustainability Standards provide opportunities for companies to convey credibility to their customers and avoid the suspicion of greenwashing, but such guarantees, as well as the effects of sustainable certification, still need to be verified in many value chains.

e2: Despite the commitment of many governments to the 2030 Agenda, they are the largest consumers of goods and services. While the laws of many countries have sustainable criteria and are constantly being updated in areas such as public procurement, there is a lack of research on the definition, criteria, and impacts of VSS in government procurement.

f2: Standards play a differentiated role in consumer relations and can increase consumer confidence. However, there is little research on the perception of the final consumer with regard to sustainable certification and the potential advantages of purchasing a product labeled as sustainable.

An additional question is how the VSS theme is being addressed around the world, given that the literature reveals significant effects of sustainable certification on trade and exports, especially in emerging countries (Montiel et al., 2019). Despite this, our review showed that these countries have a limited participation in the research in this area, based on the home institution of the first author. However, other criteria could be adopted to better evaluate the possible underrepresentation of emerging countries in research on VSS.

We detected a considerable increase in publications on VSS over the past few years, with 67 % of the research being concentrated between 2010 and 2020 (Fig. 3). Considering only the publications with a consolidated stream of thought in Table 1, the total number of publications since 2015 represents 40 % of the total, even if the two

publications that cover both streams of thought are disregarded. This recent increase in publications is related to the emergence and commitment of many countries to the 2030 Agenda. While this relationship is undoubtedly well-founded, other factors may also be involved, such as the increasing awareness of consumers, the CSR, and pressure from NGOs and markets for more sustainable products. In the future, it should be possible to assess to what extent VSS has contributed to the achievement of each SDG.

In the present study, a separate section was written for each pillar of sustainability, with a number of examples of gains in sustainability resulting from the application of VSS. The separate analysis of each pillar provided a better interpretation of the perception of the gains by the interested parties (researchers, producers, NGOs, companies, governments, and consumers). In many cases, however, the gains are difficult to isolate, given their ample interrelationships. This reflects the synergy of this process, and how VSSs are gradually inserting requirements that fulfill all the pillars of sustainability, which are intertwined conceptually. By organizing the examples per pillar and also in an integrated overview, we were able to demonstrate that there are many ways in which research on this topic can be organized and substantiated. As each VSS considers all the different pillars of sustainability, the separate consideration of impacts by pillar is more complex, but may be more favorable for the achievement of sustainable development.

We also found that most of the existing research refers to case studies of a certain sustainable certification in a specific sector, without necessarily addressing the impacts of the VSS on all the different pillars of sustainability. In fact, the number of papers reviewed in each section (3.3, 3.4, and 3.5) indicates that the economic pillar is investigated most frequently (43 % of the papers), followed by the social pillar (30 %), and finally, the environmental pillar (27 %).

These findings indicate that most authors pay more attention to economic and market aspects, with emphasis on agricultural systems and bioeconomics, with many case studies focusing specifically on the lumber and food sectors (principally coffee and palm oil). However, many other products that fall within the scope of VSS, such as Non-Timber Forest Products (NTFPs), require studies. Many studies have also shown that companies obtain sustainable certification primarily to obtain price premiums, access to more financial resources and major consumer markets, as well as Global Value Chains. This allows us to infer that economic interests continue to outweigh environmental and social concerns. Even so, the fact that producers and companies are obliged to meet requirements that encompass all the different pillars of sustainability results in multiple advantages, as shown in the preceding sections.

Another point noticed in this review is that many companies and cooperatives are certified under more than one VSS and that there is little information about the sustainable results of having several certifications. It is necessary to analyze if they are repeated demands that generate only more costs, if such certifications are complementary, if they have little or a lot of variation in requirements between them, or if the companies and cooperatives are confirmed to adopt only for economic and market factors to be present in several countries due to the different "rules" of each importing country. These points make the impact assessment of VSS more challenging, in addition to the uncertainties about the sustainability and credibility that these certifications have.

Finally, we also found that research on VSS mentions very superficially the impacts on communities around large certified organizations and cooperatives. There are no results that indicate whether these communities benefit from the sustainability that these establishments claim to have. For this, the following questions need to be answered: does the company hire regional employees when their skills, profiles, and conditions are similar to those of other candidates? Does the company purchase from local suppliers when the same or similar conditions apply compared to suppliers in other regions? Are contracts with local suppliers fair? Does the company have implemented actions that have improved the conservation and diversity of habitats or rehabilitated degraded areas within its sphere of influence? Did the company's operation improve the indexes (formal jobs and higher income, education and more children and young people in school, reduction of crime, hunger, and diseases)? The company's investments also contributed to meeting the needs of the community and brought more infrastructure to the region (basic sanitation, treated water, electricity, paving, internet and telephony access, and environmental balance, among other gains such as the growth of local businesses and access to more services that improve the quality of life)?

5. Conclusions

In recent decades, a range of different terms has been adopted in the literature to refer to the standards that focus on sustainability, although the term Voluntary Sustainability Standard (VSS) has become prominent since 2015, with a tendency to consolidate as the principal term used in this area. In the publications reviewed in the present study, VSS is linked to the greatest diversity of research topics, and reflects changes in the perspective of trade for sustainable actions influenced by the objectives proposed in Agenda 2030.

In the present study, we reviewed systematically the literature on Voluntary Sustainability Standards in the general context of sustainable gains. This review contributes to the literature on sustainability standards in a number of different ways. Firstly, it provides an overview of both the evolution of the publications on VSS over the past two decades and the worldwide geographic distribution of these publications.

In particular, we found that 75 % of the research on VSS is concentrated in Europe and the United States, with minor contributions from researchers based in countries in Africa (Madagascar and Kenya), Asia (Singapore, Bangladesh, Malaysia, Vietnam, and India), and Oceania (Australia and New Zealand). This greater concentration of research and interest in the topic of VSS in developed regions can be explained by the level of educational quality, ease of access to information on sustainable certifications, appreciation of consumption of products that do not harm the environment, and environmental awareness. However, studies are needed to deepen and evaluate the commercial and marketing intentions behind this centralization.

While no research was based in Central America, South America was relatively well-represented, in particular Brazil and Colombia. We found no publications on which the first author was based in South Africa, China or Russia, emerging countries that participate in major markets that need to resolve their issues of sustainability. These regional disparities in the creation and study of VSS also contribute to the economic, social, and environmental distances found among them.

Throughout the Results section and its subsections, we have shown that most studies focus on the same countries/regions, sectors, and VSS. These concentrations make a more robust and general assessment and analysis of the adoption of VSS at a global level difficult. They also impede further contributions in this field of research, as many value chains are left out or not investigated on the impacts of VSS.

Secondly, we identified 110 significant contributions, which were assigned to two different streams of thought, based on their interpretation, emphasis or defense of positions in relation to VSS, with a majority (approximately 70 %) of the studies adhering to stream of thought 2. This classification by stream of thought permitted the refinement of the analysis and, in particular, the definition of the essential content of the opinion of the most influential authors with regard to the gains in sustainability accruing to the adoption of these standards. Obviously, these two streams of thought are not the only perspectives on VSS. However, they complement each other when we analyze the gains in adopting standards with the demands of large markets for sustainable products.

Other approaches to the classification of the theoretical perspectives should be identified in future studies in order to better understand the

VSS phenomenon. These alternative perspectives may focus on the point of view of producers, NGOs, cooperatives, consumers or a specific market niche. In the present study, we aimed to identify the principal, or macro, trends in the theoretical perspectives on the VSS theme.

The more detailed analysis of the studies assigned to stream of thought 2 allowed us to determine that the studies that adhere to this perspective are ample and diverse. This is in line with the examples of structured sustainability issues in ISO Guide 82 - Guidelines for Addressing Sustainability in Standards (ISO, 2014). However, it is important to highlight that the literature is very varied and the impacts of VSS are not only positive (gains). Some studies point out the negative and neutral aspects of VSS, as shown in Section 3.7. Such aspects can be deepened in more research covering the chains or sectors that are still poorly studied, which were identified in this study (Table 3).

Thirdly, we were able to differentiate the gains in sustainability by pillar, as well as the shared gains. Although this breakdown is challenging, it highlights the enormous variation in the scope of standards, as well as the increasing trend of the integration of the pillars of sustainability in VSSs. A fourth, transversal pillar – governance – could also be included in the analyses, in order to determine the entities responsible for the formulation of the norms.

The results of the present study contribute to a more systematic understanding of how VSS affects all the different dimensions of sustainability and global locations. In managerial terms, the adoption of VSS facilitates the access of companies to markets whose consumers are more aware of the importance of sustainability and traceability in the products they buy. This implies cleaner production and greater social and environmental responsibility. As a result, companies will be inclined to follow the stream of authors who view VSS positively.

The present analysis contributes to the growing interdisciplinary literature that aims to measure the effectiveness of VSS and boost the adoption of sustainability in supply chains, as well as attempting to satisfy consumer demands. The demands of the consumer are related to the security associated with selecting a brand and consuming the product, as well as its traceability, which ensures the confirmation of the origin of the product, and whether it involves slave or child labor, the control of environmental impacts, correct disposal at the end of its life cycle, and in particular, whether it brings if returns to the local community, such as income, access to education, sanitation, and worker safety.

Voluntary Sustainability Standards is a diverse topic with many possibilities for future research, and we would recommend that future investigations focus on the knowledge gaps identified in the present study (Table 3) and which were not covered in this review. Given the recent global transformations, future studies should also consider how VSS contributes to more conscious and responsible models of both production and consumption in the post-pandemic world. In this scenario, effective actions that promote sustainability are ever more important.

The present study faced a number of limitations for the validation of content due to the variation in the quality of the material available in the different sources (flagship reports, books, websites, etc.) in comparison with the peer-reviewed papers. In fact, some relevant publications may have been overlooked due to a lack of any of the seven terms (see Section 2) employed in the search protocol, which focused on the title, abstract, and keywords registered in the databases. Other limitations are related to the consideration of only two streams of thought and the lack of a specific focus on governance, which is considered to be a fourth, transversal pillar of sustainability in many studies. The development of future research in the area of VSS governance should better align the academic analysis of the phenomenon with the complex reality of the norms dealt with by the GVCs.

We conclude that VSSs are just one factor among many other factors that will contribute to sustainability in value chains. The VSSs are serving as a guide to promoting changes in sustainable production and consumption. However, there is a high degree of variation of positive and negative impacts depending on the value chain, the region, the link in the chain, and the sustainable certification that is being analyzed.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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