Food and Agriculture Organization of the United Nations

Voluntary Sustainability Standards

Impacts, enablers and barriers to shaping sustainable food systems

Enhancing the Effectiveness of Sustainability Standards in Agrifood Systems

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Impacts, enablers and barriers to shaping sustainable food systems

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Abbreviations

4C	Common Code for the Coffee Community
B2B	Business-to business
B2C	Business-to-consumer
BCI	Better Cotton Initiative
BRICs	Brazil, Russia, India and China
C.A.F.E.	Coffee and Farmers Equity practices
CAP	Common Agricultural Policy
CBD	Convention on Biological Diversity
CMiA	Cotton made in Africa
EU	European Union
FAO	Food and Agriculture Organization of the United Nations
FMP	Forest Management Plan
FSC	Forest Stewardship Council
FT	Fairtrade International
GAP	Good agricultural practices
GHG	Greenhouse gases
GM	Genetically modified
GMOs	Genetically modified organisms
GSSI	Global Sustainable Seafood Initiative
HCS	High Carbon Stock
HCV	High Conservation Value
IDA	Institute of Development Studies
IFAD	International Fund for Agricultural Development
IFOAM	International Federation of Organic Agriculture Movements
IFPRI	International Food Policy Research Institute
ILO	International Labour Organization
ISEAL	International Social and Environmental Accreditation and Labelling Alliance
ITC	International Trade Centre
LAC	Latin American and the Caribbean
MSC	Marine Stewardship Council
NGO	Non-governmental organization
ODI	Overseas Development Institute
OECD	Organisation for Economic Co-operation and Development
ORG	organic
PEFC	Programme for the Endorsement of Forest Certification
RA	Rainforest Alliance
RA-SAN	Rainforest Alliance Sustainable Agriculture Network
ROI	return on investments
RSPO	Roundtable on Sustainable Palm Oil
RTRS	Round Table on Responsible Soy Association
SLA	Sustainable Livelihood Approach
SSA	Sub-Saharan Africa
SSCI	Sustainable Supply Chain Initiative
ToC	Theory of change
TSR	Tripartite Standard Regime
UNFSS	United Nations Forum on Sustainability Standards
UNIDO	United Nations Industrial Development Organization
USDA	United States Department of Agriculture
UTZ	UTZ Certified (now merged with Rainforest Alliance)
VSS	Voluntary Sustainability Standards
WTO	World Trade Organization

1. Introduction

While providing food for billions of people, agrifood systems are currently failing to provide enough healthy food for all while contributing to environmental degradation and deepening socioeconomic inequality. Achieving sustainability requires profound changes in how agrifood products are produced, processed, traded and consumed. This shift can be supported through a combination of instruments, both mandatory and voluntary. Since the 1990s, Voluntary Sustainability Standards (VSS) have gained prominence as a tool to govern the sustainability of global food value chains, and studies to assess their impact have proliferated.

This working paper seeks to respond to the following research questions:

- ***What are the real (as opposed to the declared) impacts of sustainability standards on food systems sustainability, across its environmental, economic and social dimensions?***
- ***What factors shape the ability of VSS to support sustainable food systems?***

Drawing on more than a decade of impact studies (2013–2024), this working paper assesses the potential of VSS to improve sustainability across its different, interrelated dimensions, and identifies contextual and other factors that may act as enablers of, or barriers to effectiveness. It concludes by offering policy recommendations that can strengthen the contribution of VSS to shaping sustainable food systems.

1.1 Voluntary Sustainability Standards: What are they and what do they cover?

Voluntary Sustainability Standards (VSS) are defined as

> *standards specifying requirements that producers, traders, manufacturers, retailers or service providers may be asked to meet, relating to a wide range of sustainability metrics, including respect for basic human rights, worker health and safety, the environmental impacts of production, community relations, land use planning and others (UNFSS, 2012: 4).*

In a context of increased awareness and concern over the negative economic, social and environmental externalities arising from food production and post-production processes, VSS provide producers and companies with a reference, and a marketing tool, that can be voluntarily adopted to mitigate impacts and communicate this purpose to a growing segment of "conscious" consumers.

Standards are typically understood as a conformity assessment system for demonstrating performance against a set of technical specifications (FAO, 2014; Loconto and Busch, 2010).

> *The system begins with a standard, which is a written document that contains criteria and indicators. It defines what needs to be done and often how to do it. There is usually some type of certification or control on producers and/or traders that consists of audits and tests. This is how we can know if things*

are being done properly. These checks can be done by self-assessment, by a party to the market exchange, usually a buyer, or by an independent third party. Accreditation is an important aspect of these systems as it is an oversight mechanism to make sure that the certification system is working properly. In other words, effective accreditation of certifiers means that we can trust the results that certification provides. Both certification and accreditation are functions of the verification systems of standards. Finally, there is often a label. This label is a logo or a brand that communicates the key message of the standard to consumers. These components are organized in different ways in each of the standards systems currently in use. The use of particular combinations of components depends on the market in which the standard operates as well as the contexts of implementation and enforcement. (Loconto, 2014b: 81)

VSS emerge when actors, for various reasons concerned with sustainability, agree on common sustainability goals, basic principles and rules of behaviour – usually referring to international agreements and conventions,[1] or developed independently to address such sustainability concerns. While the originating actors might differ,[2] in the 2000s VSS show a remarkable similarity in their basic features (Dingwerth and Pattberg, 2009). In particular, the governance regime of most VSS consists of three key bodies:

1. A standard-development organization, comprising actors from either the public or private sectors, or civil society, usually encompassing a broad representation of different stakeholders, creates the standards.
2. Certification organizations conduct audits to assess the conformity of farm/enterprise practices against the standards.
3. An external accreditation body oversees the integrity of the process by verifying that certification bodies are competent to carry out audits.

This form of governance is defined by Loconto and Busch (2010) as a "Tripartite Standards Regime (TSR)". The resulting "third-party" model of assurance is one in which the certifiers are independent organizations (third party), different from both the entity being audited (first party, e.g. the producer) and the entity who is requesting the first party to comply with standard (second party, e.g. the buyer).

There are many types of VSS. Some are applied to individual crops, such as coffee (e.g. the Common Code for The Coffee Community [4C]), cotton (e.g. Better Cotton Initiative [BCI]; Cotton Made in Africa [CmiA]), sugar (e.g. Bonsucro), palm oil (e.g. Roundtable on Sustainable Palm Oil [RSPO]) or soy (Round Table on Responsible Soy Association [RTRS]). Others cover multiple crops, as in the case of the Organic standards,[3] Fairtrade International, Rainforest Alliance or the Proterra Foundation. Beyond crops, some VSS cover the forestry and fishery sectors, most prominent examples of which are the Programme for the Endorsement of Forest Certification (PEFC), the Forest Stewardship Council (FSC) and the Marine Stewardship council (MSC).

Most VSS apply to export-oriented, global value chains, given that domestic demand for certified products is still limited in low-income countries. The main eight food commodities certified are: bananas, cocoa, coffee, cotton, oil palm, soybean, sugarcane and tea (Kemper *et al*., 2024). These commodities, which are associated with important economic, social and environmental sustainability concerns, are often very important for the income, food security, job creation and human development of producers in low-income economies.

[1] For example, the Convention on Biological Diversity (CBD), the United Nations Framework Convention on Climate Change (UNFCCC), the United Nations Convention on the Rights of the Child; and the ILO Declaration on Fundamental Principles and Rights at Work, among others.

[2] Fairtrade International was originally an NGO-driven VSS; the Forest Stewardship Council (FSC), the Marine Stewardship Council (MSC) and the Roundtable on Sustainable Palm Oil (RSPO) were set up by a diversity of private and civic actors; the Programme for the Endorsement of Forest Certification (PEFC) was created by associations of small forest owners who wanted an alternative approach to FSC to forest certification; and organic certification was pioneered by farmers' associations.

[3] There is no single, universal organic standard; rather a variety of standards and associated certification systems exist across countries. The International Federation of Organic Agriculture Movements (IFOAM) Family of Standards contains all standards officially endorsed by the Organic Movement, based on their equivalence with the Common Objectives and Requirements of Organic Standards. The Family contains more than 349 private standards and government regulations from all over the world. For more information, see www.ifoam.bio/our-work/how/standards-certification/organic-guarantee-system/ifoam-family-standards (accessed 17 July 2025).

According to the latest available data, VSS cover at least 22.59 million hectares (ha) or 9 percent of the global harvested areas of the eight aforementioned commodities, in addition to at least 418.76 million ha of forests or 10.3 percent of the global forest area (Kemper *et al*., 2024).

Of all VSS, Organic has the largest product coverage, the largest areas certified (98.9 million ha or 2.1 percent of all agricultural land, of which the largest share is located in Oceania)[4] and the largest absolute growth of any of the VSS (2.6 million more hectares were certified in 2022–2023) (Willer, Trávníček and Schlatter, 2025). Organic is also the standard with the largest number of producers (4.3 million farmers), with India, Uganda and Ethiopia ranking highest globally (Willer, Trávníček and Schlatter, 2025).

However, where single-crop standards exist, they usually hold a dominant position over multiple-commodity standards. For example, 13.8 percent of the global cotton harvest area is certified by BCI and 5.5 percent by CMiA, well above the 1.9 percent of Organic, the most important multiple-commodity standard for that crop. The only exception is coffee, which is certified mainly by Fairtrade (9 percent of the global harvested area). Cocoa is the largest certified commodity in percentage terms (between 31.4 percent and 44.30 percent of cocoa-cultivated land is certified, equating to at least 41.6 percent of global production), while cotton ranks first in terms of certified areas (covering at least 6.6 million ha and 10.2–11.4 percent of land cultivated with cotton), with at least 20.3 percent of cultivated cotton being certified (Kemper *et al*., 2024).

VSS uptake[5] is uneven across world regions and countries. While, overall, VSS are more intensively adopted by producers in higher- and middle-income countries, producers in low-income countries are catching up, especially in regard to tropical commodities such as cocoa, coffee, cotton and tea, which are grown extensively in the tropical belt of Latin America, Africa and Southeast Asia (UNCTAD, 2020). Meanwhile, certified forests are found mostly in North America and Europe, while Asia, Latin America and Africa lag behind (Wolff and Schweinle, 2022). Certified fisheries are also highly concentrated around member countries of the Organisation for Economic Co-operation and Development (OECD), but are more evenly distributed throughout the world. Some 19.3 percent of wild marine products are either certified by the Marine Stewardship Council or engaged in the pre-assessment process (MSC 2024).

The main destination markets for certified products are Europe and North America, but demand is increasing in developing countries, particularly for Organic. This is particularly true in the case of the BRICs countries (e.g. Brazil, China and India) due to growing population, the rise of the middle class, and increased consumer awareness about food safety and sustainability (Guéneau *et al*., 2019; Li and Loconto, 2019; Lin *et al*., 2025; Nautiyal and Lal, 2025; Niederle *et al*., 2020). However, such increased demand is often tied to the setting of national public organic standards (Darjee, 2023; Fouilleux and Loconto, 2017) and other government "counter-strategies" to create their own versions of international VSS (Marques and Eberlein, 2021). For some key commodities (e.g. tea or palm oil), commitments by large brands to purchase only certified products drove an increase in demand (Loconto, 2014a; Singh, Sehajpal and Khati, 2025). For example, the European Union set a Farm to Fork goal of 25 percent of agricultural land under organic cultivation by 2030, and by 2023, 14 EU countries had an organic farmland share of at least 10 percent, with Austria (27.3 percent) surpassing the 25 percent mark (Willer *et al*., 2025). In 2023, India had the second largest area of land under organic cultivation (4.48 million ha) and the largest number of organic producers (nearly 2.5 million) (Willer *et al*., 2025). China has the third largest consumer market for organic production, amounting to EUR 12.6 billion in 2023 (Willer *et al*., 2025). In Africa, consumer demand for organic products is emerging but is still in its infancy despite 20 years of farmers being certified (Garrido-Garza, Loconto and Robinson, 2025; Willer *et al*., 2025).

[4] This figure includes the full range of commodities certified as organic. Also, it includes areas certified and areas in process of being certified.

[5] Measured as the percentage of active VSS in a given country in relation to the total number of active VSS worldwide.

1.2 Six selected standards: Overview, criteria and theories of change

One crucial element that underpins the credibility of standards is having a clear "theory of change" that articulates "all building blocks required to bring about a defined long term goal or impact" (ISEAL Alliance, 2023: 55). Essentially, a theory of change is a description of how the adoption and implementation of standards is expected to lead to sustainability results. It serves not only as a tool to communicate the logic behind the standard to consumers, stakeholders and the general public, but, perhaps more importantly, as a planning and management tool to ensure coherence between what the standard sets out to achieve and how it operates in practice. Theories of change are often depicted graphically as *impact pathways* that map how interventions coming with the certification process (e.g. capacity building, or guaranteed prices) lead to a series of intermediate outputs and outcomes (e.g. better farming practices, productivity and profits for the farmer), and finally to impacts (e.g. increased income and well-being). The International Social and Environmental Accreditation and Labelling (ISEAL) Alliance recommends that theories of change also include a description of "assumptions", the conditions that must hold true for the impact pathway to work as expected (Beuchelt, Schneider and Gamba, 2022; Loconto, 2018).

Based on a review of the scientific literature on the impacts of standards, **six standards** were selected which cover the largest areas of marine, land and forest agrifood systems (according to the latest State of Sustainable Market Report, Kemper *et al*, 2024) and that have received the most widespread study in the literature. The standards are: Fairtrade, the Forest Stewardship Council (FSC), the Marine Stewardship Council (MSC), Organic-IFOAM, Rainforest Alliance [UTZ] and the Roundtable on Sustainable Palm Oil RSPO (see section 2. *Methodology* for further details).

The following two tables condense key information on these standards. Table 1 provides an overview of the type of requirements – or, using the Standard Map's terminology, "criteria" – commonly adopted by VSS to operationalize economic, social and environmental sustainability, and translate it into measurable actions and indicators. The table is in line with the International Trade Centre (ITC)'s Standards Map, which separates out four categories of criteria included in the VSS written standards: Environmental, Social, Management and Ethics, and Quality. Table 2 provides an overview of the six selected VSS, detailing for each the percentage of criteria belonging to each of the four categories.

As is evident from Table 2, coverage in terms of the type of criteria included in each standard is uneven. While Fairtrade, Rainforest Alliance, FSC and MSC contain all four criteria categories, EU Organic and RSPO feature only three. The EU Organic standard includes no social criteria, yet nearly one-quarter of its requirements focus on quality, far more than private VSS, where quality plays a relatively minor role. Indeed, while most standards acknowledge quality considerations, EU Organic includes a much larger number of explicit requirements related to quality management, such as risk assessments, documentation and monitoring systems, and technical specifications. According to the Standard Map classification, RSPO lacks quality criteria altogether, FSC and MSC dedicate only 2 percent of their criteria to quality, and the proportions for Rainforest Alliance and Fairtrade are 4 percent and 9 percent, respectively. The private VSS are concerned mostly with social criteria, with nearly 50 percent of their standards dedicated to these requirements. The only exception is MSC, which places very little emphasis on social issues, yet is currently expanding its scope in this area within the framework of a collaboration with the Global Sustainable Seafood Initiative (GSSI) – against which the MSC is benchmarked – and the Sustainable Supply Chain Initiative of the Consumer Goods Forum (SSCI). In terms of environmental criteria, 65 percent of the EU Organic standard and 52 percent of the MSC standard are focused on the environment. The remaining four VSS focus less than 40 percent of their attention on environmental sustainability. Finally, all of the standards allocate at least 10 percent of their criteria to management and ethics requirements.

The differences observed not only in the number of criteria focused on the different pillars of sustainability but also, more subtly, in the actual content of the criteria, are a result of very specific institutional designs (Loconto *et al*., 2025) and theories of change (ToCs) that drive the ways in which the VSS envision the types of impact that their standards can have on agrifood systems. A particularly illustrative example concerns input use requirements. Organic standards prohibit the use of synthetic inputs, while other standards focus on providing training on good agriculture practice to prevent

Table 1

Overview of VSS criteria

ENVIRONMENTAL CRITERIA
Soil and water: implementation of soil and water management plans, prevention of soil erosion, soil conservation, prevention of soil and water contamination, soil preparation for planting, use of cover crops, permits for water use, monitoring of resource use, managing water scarcities, water reuse, recycling and harvesting.
Biodiversity: adherence to biodiversity conventions, implementation of impact assessment and mitigation plans prior to production or harvesting, land conversion, safeguards against ecosystems/habitat fragmentation, ecosystems protection and rehabilitation, and protection of rare and endangered species, native species and wildlife.
Forests: legal harvesting rights, deforestation prevention, regeneration of free cover after logging, sustainable timber harvesting, forest conservation, forest management plans and record keeping, criteria on mix land use, criteria on shade, and monitoring of deforestation.
Inputs and waste: prohibition/criteria on the use/storage/disposal of pesticides and hazardous and other chemical substances, implementation of integrated pest management systems, use of organic natural inputs, traceability and labelling of GM crops, waste reduction, safe management and disposal, air quality, pollution and hazardous waste.
Energy and climate: reduction of resource use, use of renewable energy, use of biofuel, monitoring, quantifying and reducing GHG emissions, and soil/tree sequestration and adaptation activities.
Animals: animal welfare (drinking, feeding, housing, etc.)
SOCIAL CRITERIA
Human rights: policies, requirements related to prevention and mitigation of adverse human right impacts and violations, and grievance and remediation procedures.
Labour rights: compliance with ILO core labour standards – including specific criteria regarding the prohibition of forced and child labour, freedom of association, non-discrimination, workers' health and safety, remuneration, living wages and income, social benefits and contracts.
Women rights and gender equity: policies for female workers, prevention of gender-based violence, equal opportunities, agency and leadership, and women's health and safety.
Community rights: safeguarding access to basic services and livelihood resources, land rights, Indigenous Peoples' rights, minority group rights, consultation with local communities, free, prior and informed consent and grievance mechanisms, involuntary resettlement and heritage protection.
MANAGEMENT AND ETHICS CRITERIA
Economic viability: planning to ensure long-term economic viability, (e.g. business/management/farm improvement plans, etc.), requirements to enhance production efficiency, productivity and continuous improvement, diversification of business operations and fair competition.
Sustainability management: staff training on sustainability, implementation of assessment/response plans for vulnerability risks, internal control systems and reporting.
Supply chain responsibility towards producers: recording transaction/sales, transparency on market prices, sustainability differentials (e.g. premium prices), living incomes, access to financial services, minimum price guarantees, social premiums, criteria for setting up contracts with traders, inclusion of suppliers' voice, advance payments, and access to inputs and technology.
Ethics: compliance with national and international regulations, conventions, and anti-corruption and auditing clauses.
QUALITY CRITERIA
Product/service quality management: compliance with relevant regulations, risk assessment and hazard control procedures, documentation and monitoring, technical specifications and quality management systems in place.
Food/feed management systems: safety management systems in place, storage conditions, hygiene requirements, programmes and verification processes, and risk management.

Source: Authors' elaboration based on the ITC's Standards Map www.standardsmap.org/en/home.

Table 2

Overview of selected VSS

Who is Certified?	Main crops*	Main producing countries	Sustainability coverage of criteria in the standard (%)			
			Env.	Soc.	Mgmt	Quality
Fairtrade International						
▪ Small-scale producers ▪ Hired labour ▪ Traders ▪ Chain of custody	Cocoa, coffee, tea, bananas, cotton, sugarcane	Africa (68%) LAC (18%) Asia (9%)	29	48	17	9
EU Organic						
▪ Operators ▪ Traders	Coffee, cocoa, cotton, bananas, oil palm, soybean	Global in scope, 127 countries	65	-	11	24
Rainforest Alliance (merged in 2018 with UTZ)						
▪ Farmers ▪ Chain of custody	Tea, oil palm, coffee, cocoa, bananas) – *main crops: cocoa, coffee, tea*	Kenya, Brazil, Côte d'Ivoire (RA) Côte d'Ivoire, Ghana and Brazil (UTZ)	37	47	12	4
Roundtable on Sustainable Palm Oil (RSPO)						
▪ Plantations ▪ Independent smallholders ▪ Chain of custody	Oil palm	Indonesia, Malaysia, Papua New Guinea	33	50	17	-
Forest Stewardship Council (FSC)						
▪ Forest managers ▪ Chain of custody ▪ Controlled Wood	Timber, non-timber forest products	Russian Federation, Canada and Sweden	39	44	15	2
Marine Stewardship Council (MSC)						
▪ Fisheries ▪ Seaweed ▪ Chain of custody	716 Fisheries, Top 10: ** ▪ Alaska pollock ▪ Atlantic cod ▪ Chilean jack mackerel ▪ Skipjack tuna ▪ Atlantic herring ▪ Gulf menhaden ▪ Blue whiting ▪ Yesso scallop ▪ North Pacific hake ▪ Haddock	Fisheries where >50% catch is certified: ▪ 88 (Pacific, Antarctic) ▪ 58 (Indian Ocean, Antarctic) ▪ 77 (Pacific, Eastern Central) ▪ 67 (Pacific, Northeast) ▪ 48 (Atlantic, Antarctic) ▪ 31 (Atlantic, Western Central) ▪ 21 (Atlantic, Northwest)	52	20	26	2

* In order of percentage of area harvested
** MSC (2024).
Source: Authors' elaboration based on the ITC's Standards Map www.standardsmap.org/en/home.

overuse and health risks, essentially permitting the use of most substances – for example, almost all types of pesticides, except those classified as highly hazardous by international conventions (Loconto *et al*, 2025).

The **Fairtrade** ToC outlines how its certification system drives sustainable development for farmers and workers in marginalized regions by addressing trade inequities, empowering producers and promoting environmental stewardship. The logic driving this ToC is that, by connecting disadvantaged producers with consumers in the global north and promoting fairer trading conditions, it will empower those producers to combat poverty. The latter is achieved mostly by guaranteeing a minimum price, strengthening producer cooperatives and providing an extra social premium that is usually used for cooperative investments, youth education in the communities and yearly bonuses to members of the cooperatives (Loconto *et al*., 2021). The key leverage points along this impact pathway are economic, with a strong focus on social equity and farmer empowerment (e.g. cooperative governance, labour rights and gender inclusion). Additionally, an increasing number of environmental criteria ban genetically modified organisms (GMOs) and hazardous pesticides, promote climate adaptation, requires buffer zones and reduced deforestation, so as to reduce biodiversity loss.

One of the most recognized and widely implemented organic standard worldwide is **EU Organic.** The European Union's Organic Agriculture Directive (Regulation (EU) 2018/848) establishes the legal framework for organic production and labelling, and its ToC explains how the regulation aims to transform agriculture toward sustainability, primarily through fostering the adoption of food and farming systems grounded in four principles of organic agriculture: health, ecology, fairness and care.[6] The key leverage points within the EU Organic TOC are a strong public regulatory framework and a compliance assessment system, adopted and followed by farmers in Europe and around the world. The idea is that farming practice will change by focusing on environmental sustainability (e.g. soil fertility), maintaining ecological focus areas (e.g. hedgerows and fallow land) and reducing water pollution – as well as through public investment in research, development and farm advisory services. The common market and supply chain development are also leveraged by investments in protecting clear labelling requirements, providing subsidies for the delivery of ecosystem services, and protecting the entry into the EU market by requiring the same standards around the world (Fouilleux and Loconto 2017).

The **Rainforest Alliance Sustainable Agriculture Standard** (RA-SAN) is designed to protect forests, improve the livelihoods of farmers and forest communities, promote their human rights, and help them mitigate and adapt to the climate crisis. The Rainforest Alliance ToC leverages environmental sustainability (e.g. biodiversity, carbon sequestration and water conservation) and social sustainability (e.g. strengthening human rights, gender equity and community engagement), to achieve its intended impact. However, its biggest leverage point is economic, based on the assumption that increased profitability through efficiency and premium markets will create landscape-level transformations (Loconto, 2014a). The Rainforest Alliance's approach emphasizes continuous improvement, requiring certified farms to progressively meet higher sustainability benchmarks over time. A new regenerative agriculture standard is to be launched in 2025, which is more stringent than the current standard and will transition farmers through three levels of difficulty, to increase their sustainability performance.

The **RSPO** is a global certification system aimed at making palm oil production more environmentally and socially responsible, by halting deforestation to grow oil palm, protecting wildlife and improving the working conditions of farming communities. The RSPO ToC explains how the standard drives sustainability across the palm oil supply chain, mainly through their certification and standards compliance requirements. The main leverage point is stopping deforestation, and requiring satellite monitoring of deforestation is a key approach to achieve this objective. The other important leverage point is a Supply Chain Certification system that offers traceability through a "Mass Balance" system, whereby the physical product is mixed with non-certified palm oil, but the certificate can be traced and eventually sold as a credit in a financial market (Hinkes and Peter, 2020).

The **FSC** is designed to promote responsible forest management via market-based incentives and through the verification of sustainable sourcing of forest products and ecosystem services at every step of the value chain, from forest to consumer. The FSC ToC explains how focusing on compliance with laws and upholding Indigenous

[6] www.ifoam.bio/why-organic/shaping-agriculture/four-principles-organic

rights can lead to environmental, social and economic improvements in forest management. Beyond leveraging the protection of High Conservation Value (HCV) forests, strong stakeholder inclusion and benefit-sharing with local communities, the key leverage point is relying on consumer pressure and certification incentives to transform the way in which forests are managed (Judge-Lord, McDermott and Cashore, 2020).

The **MSC** promotes sustainable fishing practices through market-driven incentives[7] to end overfishing, protect oceans' health and transform the seafood market. The MSC ToC transforms fisheries and influences consumer behaviour through strong brand recognition of the MSC "blue label", to achieve healthy marine ecosystems. The entry point is at the collective level of a fishery, where sustainably maintaining healthy levels of fish stocks (i.e. no overfishing and harvesting at scientifically set limits) must be proved through third-party audits and a multi-level system of checks and balances within the MSC before conferring a certificate. The MSC uses large-scale corporate commitments from major retailers (Walmart, McDonald's) and brands (IKEA, Nestlé), who promise to source MSC-certified seafood, as its most effective leverage point (Wijen and Chiroleu-Assouline, 2019).

Table 3 presents the core elements of the theories of change that underpin each of the VSS examined here. It simplifies what at times are extremely complex causal assumptions into essential goals (or principles), interventions, intermediary outputs, outcomes and impacts.

Table 3

Comparison of the theories of change of six VSS

VSS	Principles	Interventions	Outputs	Outcomes	Impacts
Fairtrade International	Poverty reduction Smallholder empowerment	Minimum prices Premiums Cooperative training	Certified tropical commodities Farmer training Premium investments	Higher incomes Improved farm resilience Stronger cooperatives	Sustainable livelihoods Trade justice Environmental protection
EU Organic	Soil health Climate resilience Consumer trust	Legal bans (GMOs, synthetic inputs) CAP subsidies EU harmonized standards Strict labelling requirements	Certified farms Labelled products	Reduced chemical use Higher biodiversity	Environmentally sustainable food systems
Rainforest Alliance	Climate resilience Biodiversity-friendly farming	Farm-level training Optional Biodiversity module Regenerative Agriculture Standard (released in 2025)	Certified farms Sustainability plans	Improved yields Habitat conservation	Resilient landscapes Market transformation
Roundtable on Sustainable Palm Oil (RSPO)	Deforestation-free Ethical palm oil	Zero deforestation rules Free, Prior and Informed Consent (FPIC) Grievance mechanisms Supply chain audits Mass balance	Certified plantations RSPO credits	Reduced forest loss Better labour conditions	Sustainable palm oil sector
Forest Stewardship Council (FSC)	Forest protection Indigenous rights	Legality Forest management standards Free, Prior and Informed Consent (FPIC) Grievance mechanisms Chain-of-custody	Certified timber FSC-labelled products	Reduced deforestation Improved labour rights Market shift	Global sustainable forest management
Marine Stewardship Council (MSC)	Sustainable fisheries Ocean health	Science-based catch limits Bycatch reduction	Certified seafood MSC blue label on products	Rebuilt fish stocks Better fishery practices Less bycatch	Healthy marine ecosystems

Source: Authors' elaboration based on the theories of change published by each organization, available on their websites.

[7] It is important to note that all of the VSS examined in this study are market-driven tools. However, only the FSC and MSC include this specific language in their published theories of change.

Table 4 summarizes the primary focus of each standard, the target stakeholders and the key drivers and levers of change. Following systems thinking (Davelaar, 2021; Meadows and Wright, 2008), which underpins theories of change and impact pathways, a *driver of change* refers to an external or emergent factor – such as economic shifts, technological advancements, or environmental pressures – that propels a system toward transformation, often without deliberate intervention. In contrast, a *lever of change* (or a leverage point) represents a strategic and intentional intervention within the system's structure – such as altering feedback loops, modifying rules or shifting paradigms – where targeted actions can produce significant, cascading effects with relatively minimal effort. While drivers operate as exogenous forces that may indirectly influence system behaviour, levers are endogenous points of control that enable purposeful redirection of the system's trajectory. More than 50 years of research based in systems thinking suggest that effective systemic change requires identifying and manipulating high-impact leverage points rather than merely reacting to external drivers.

As demonstrated in Table 4, both primary and secondary drivers of change influence the ways in which each of the six selected VSS have developed their systems. The primary drivers are often tied to the principles (see Table 3) that guided the creation of each VSS, while the secondary drivers reflect the exogenous pressures that have influenced the development of each sector since their emergence in the 1980s, 1990s or 2000s. These different drivers reflect the need for industry actors to balance trade-

Table 4

Drivers and levers of change in VSS theories of change

Standard	Primary focus	Primary driver	Secondary driver	Levers of change	Target stakeholders
Fairtrade International	Trade justice and poverty reduction	Social equity (prices, wages)	Environmental safeguards	Minimum price and premium for farmers Cooperative empowerment Social equity focus	Smallholders Plantation workers Direct traders
EU Organic	Environmental agroecology	Regulatory compliance	Consumer demand	Legal bans on synthetics (GMOs, pesticides) Subsidies for conversion to organic and ecosystem services	Farmers Agribusinesses EU member states
Rainforest Alliance	Holistic farm sustainability	Farm-level resilience	Corporate sourcing commitments	Training for certification Market access Climate-smart agriculture	Farmers Corporations (e.g. Unilever)
Roundtable on Sustainable Palm Oil (RSPO)	Sustainable palm oil	Deforestation-free supply chains	Brand reputational risk	Deforestation bans (HCS/peat) FPIC for communities Supply chain traceability	Plantations Smallholders Brands (e.g. Unilever)
Forest Stewardship Council (FSC)	Responsible forestry	Ecosystem protection	Retailer and public procurement policies	Forest management standards Consumer label Indigenous rights protection	Loggers NGOs Retailers (e.g. IKEA)
Marine Stewardship Council (MSC)	Sustainable fisheries	Fishery science	Seafood industry partnerships	Science-based catch limits Bycatch reduction Blue label for consumers	Fishers Seafood brands Retailers

Source: Authors' elaboration based on analysis of each VSS' ToC.

offs in each system where there is a focus either on influencing a small subsector of the food system (i.e. fishing, logging, palm oil) or the whole food system itself (i.e. fair trade or system sustainability).

All six VSS use audits and consumer-facing logos as key levers of change, as these are defining features of this particular market-driven mechanism. However, in addition to these core features of their systems (which are quite varied in how they function, see Loconto & Chancé, 2025), all VSS include training for producers and target both producers and brands or retailers. Premium prices or preferential access for certified products are the ways through which these VSS channel the power of their market incentives. If examining the types of levers of change that are considered to be the "deep" levers (i.e. those that change the rules, values, beliefs and social structures of a given system – like equitable supply chain relations or agroecosystem redesign) and those that are considered "shallow" (i.e. modifying the inputs/ outputs of the system without changing the systems' logic – like prices or limited regulations), all six VSS are found to generally focus on shallow leverage points, rather than deep levers that could leverage system transformation.

As shown by Table 3, VSS differ in their stated objectives and expected impacts; nonetheless, they are all driven by the same underlying assumption according to which the definition, by stakeholders and experts, of a set of good practices and their enforcement would naturally lead to improved sustainability outcomes.

Thanks in large part to the harmonization work of the ISEAL Alliance, standards have been primarily structured around these practices and have required the establishment of similar internal structures and management systems (i.e. "institutional isomorphism", DiMaggio and Powell, 1983) to allow the consistent implementation of these practices over time (Loconto and Fouilleux, 2014).

Over time, the accumulation of research revealing that outcomes of certification vary significantly across contexts, largely due to differing local conditions (Blackman and Rivera, 2011; FAO, 2014; ITC, 2011a, 2011b, 2011c, 2012), has challenged the assumption that compliance with practices consistently leads to improved sustainability outcomes. This variability in results has highlighted the limitations of practice-based approaches and the difficulty of reconciling standardized frameworks with heterogeneous real-world conditions, leading to increased pressure to demonstrate measurable results through the adoption of a performance- based approach (Mallet, 2024).

1.3 Current changes in VSS criteria: The move towards performance measurements

Since around 2010, some VSS have begun to introduce performance measurements into their standards.[8] Standards such as Bonsucro and Field to Market emerged, which were focused primarily on measuring performance using on-farm metrics rather than a typically VSS audit (Hatanaka and Konefal, 2024). The premise of this new shift is that rather than writing standards, checking compliance and ensuring that the certifiers are competent to verify compliance, VSS can simply ask individual farm enterprises – and other companies in global supply chains – to collect data for a set list of indicators and send this data to the VSS for analysis. Based on performance against these indicators, enterprises will be approved within the VSS and thus be able to use the label on their products. This innovation proposes to reduce the work burden on the VSS standard-setters and enable them to expand the use of their labels to include other operators along the supply chain.

The growing move by certifiers and supply chain actors to integrate performance metrics either into standards or through monitoring systems has certain advantages, including better suitability for communicating concrete improvements in farm performance to the market and stakeholders, as well as for supporting internal learning on when and where standards are most effective, while giving enterprises flexibility in how targets are achieved (UNCTAD, 2025; Mallet, n.d.). However, it has been

[8] Please note that this is not the same thing as a "performance standard" as described in Footnote 11. The basis is the performance standard, but some new VSS are moving away from the prescriptive approach towards writing VSS criteria and are requesting companies to collect data based on standardized metrics. Indeed, these VSS are introducing a new type of mechanism (lever of change) that permits companies full flexibility in their policies, and judges the companies purely according to the data they provide that measure specific performance criteria requested by the VSS.

noted that defining performance-based indicators that are meaningful across different contexts remains difficult, data collection can be costly and time-intensive, and the removal of structured guidance through prescribed practices may reduce the role of standards as capacity-building tools, particularly for smallholders (FAO, 2014; Hatanaka and Konefal, 2024; Mallet, 2024).

2. Methodology

2.1 Scope

As VSS proliferated, so have studies assessing whether they deliver on their promises. This body of research includes a comprehensive study conducted by FAO (2014) that focused on their impact on smallholders' market participation in developing countries. The current paper provides a follow-up to that study, taking stock of research conducted over the last decade (2013–2024). The focus is narrowed in terms of VSS inclusion (only the six most important standards are included – see above) but broadened in terms of impact variables of interest, from smallholders' market participation to the three pillars of sustainability.

To be considered for inclusion, studies had to comply with the following criteria: 1) they should be written in English; 2) they should present empirical evidence (primary evidence or reviews) on the sustainability impacts of VSS at farmer or firm level; 3) they should be peer reviewed; 4) they must focus on the Global South (Asia, Latin America and the Caribbean, and sub-Saharan Africa); and 5) they must be published after 2013 (the cut-off date for the 2014 FAO study). These criteria were the only ones applied during the initial search of the Scopus database (see section 2.2).

This initial search surfaced a subset of standards with high coverage in terms of certified area[9] and frequent examination in the literature. This discovery led to the application of a sixth criterion – a focus on the following VSS: Fairtrade, FSC, MSC, Organic, Rainforest Alliance (UTZ) and RSPO. Regarding MSC, only a few impact studies were found but its prominent role as the leading standard for sustainable fisheries merits its inclusion. In the case of Rainforest Alliance (UTZ), the merger between these two standards in 2020 was a complicating factor considering the timespan of the analysis. A choice was made to include both studies focusing on Rainforest Alliance and Rainforest Alliance (UTZ), treating pre- and post-merger data as a single category, while excluding studies focusing only on UTZ (pre-merger). This approach was motivated mainly by the lack of accessible, standardized information on UTZ, which is no longer represented in the ITC's Standards Map – a key resource for the comparative analysis of standard design, criteria and theory of change undertaken for this paper. In the case of organic standards, most impact studies referred only generically to "Organic" without specifying the particular scheme (e.g. EU Organic, USDA Organic, or other), thus precluding disaggregation. Accordingly, Organic is treated as a single, unified category. Nonetheless, it is acknowledged that the various standards within the IFOAM Family may differ in scope, design, rigour and other key characteristics. A similar approach was applied to standards that allow for contextual adaptation – such as FSC – where variation in implementation is built into the certification model. Finally, it was decided to exclude GlobalG.A.P., despite a substantial body of research, because the focus of this paper is standards with sustainability as their principal objective, while GlobalG.A.P. is concerned primarily with food safety and quality assurance (see Henson and Russo, 2025).

2.2 Search strategy and data analysis

In accordance with systematic review principles, both database searches and manual reference checks were employed to ensure comprehensive coverage of the relevant literature. For the database search, a title, abstract and keyword search was

[9] Based on Kemper *et al*, 2024.

performed in the Scopus database, using an extensive string to cover a wide range of VSS (see Annex 2). The first result produced 1 687 journal articles. Screening for inclusion was based on title and – when needed – abstract reading, and resulted in 144 documents retained for further screening.

Regarding the manual reference check, the bibliographies of about 120 systematic literature reviews and reports from international organizations[10] were reviewed to identify empirical studies as the basis for secondary reviews. Based on the title and – when needed – abstract reading, 70 studies qualified for inclusion.

The two lists were cross-checked to eliminate duplicates, and all remaining papers were selectively read to assess their relevance and compliance with the six eligibility criteria. These criteria were applied in a somewhat less stringent manner to reviews, to permit the inclusion of state-of-the-art papers, narrative reviews and other theoretical studies, in addition to systematic reviews and meta-analysis – provided that they contained substantial information on VSS impacts. Primary studies were also assessed for methodological rigour to exclude those lacking the minimum prerequisites (e.g. lack of a clear explanation of research methods, a control group or an adequate sample size).[11] The final list consisted of 108 studies (76 primary studies and 32 reviews) and constituted the evidence base for the paper.

These 108 articles were read in their entirety and key data were extracted (i.e. standard, country/region, commodity/sector, sustainability pillar, impact sign and impact description, as well as factors explaining impacts – context, enablers and barriers – when available). As the analysis progressed, common trends in terms of factors explaining impact were identified, allowing for more granular and consistent coding (e.g. VSS design, market factors, policy factors, antecedent variables, etc.). Descriptive statistics of the corpus of study, as well as the full list of references are available in the Annexes.

2.3 Caveats and limitations

Some authors have pointed out a notable shortage of studies that simultaneously assess the impact of VSS and related enablers and barriers, while maintaining sufficient methodological rigour. As a result, it is difficult to establish clear causal links between outcomes and the *specific* elements of the "intervention package": for example, the type of price mechanism, the social premium and capacity development components, or contextual factors including pre-existing conditions or capacities at the producer and community level, as well as agronomic or market conditions (Oya, Schaefer and Skalidou, 2018). Without a clear understanding of these causal linkages, it is difficult to establish how the intervention package or the implementation modalities may be improved.

The present review cannot overcome this limitation. Furthermore, by focusing on empirical, peer reviewed and impact-oriented literature, it inevitably excludes a substantial body of work (e.g. grey literature, research on implementation dynamics, and qualitative and ethnographic research, which might be underrepresented due to the selection criteria), offering valuable insights into the mechanisms through which VSS operate and how impacts are realized on the ground. Despite this limitation, the factors identified as important in shaping VSS effectiveness tend to be consistent across the diverse studies included in the review. This consistency has been adopted as an indicator of their significance, and of the solidity of the paper's findings as a foundation for further, more extensive inquiry.

[10] Including those of FAO, the Institute of Development Studies (IDS), the International Fund for Agricultural Development (IFAD), ITC, the International Food Policy Research Institute (IFPRI), the ISEAL Alliance, the Overseas Development Institute (ODI), OECD, the United Nations Forum on Sustainability Standards (UNFSS), the United Nations Industrial Development Organization (UNIDO) and the World Trade Organization (WTO).

[11] For an overview of criteria to assess methodological rigour, see FAO (2014: 9).

3. Results – can VSS improve food systems' sustainability?

A number of systematic reviews on the sustainability impacts of VSS have been published in recent years, the combined findings of which indicate that impact is mixed and highly context dependent. Overall, positive or neutral outcomes are more common than negative ones (Garrett *et al*., 2021; Meemken, 2020; Oya, Schaefer and Skalidou, 2018; Traldi, 2021). Given the heterogeneity of results, identifying factors that maximize positive impacts is crucial.

3.1 Environmental impacts

The following section presents results on environmental impacts, drawn from primary studies and recently published reviews. Overall, and both in the case of agriculture and forestry VSS, impacts on the environment are highly case dependent and mixed, with a predominance of positive or neutral outcomes – and lower incidence of negative outcomes than in other pillars (Di Girolami, Kampen and Arts, 2023; Traldi, 2021). Concerning agriculture standards, available evidence is heavily skewed towards coffee certification. Deforestation, biodiversity and environmental practices at farm level are the most researched environmental dimensions in the review, so the paper takes these as its focus.

Agriculture-driven **deforestation** and forest degradation[12] are major issues, especially for some commodities such as timber, palm oil, soy, rubber, coffee and cocoa. Overall, the impact of certification on deforestation and forest degradation is mainly positive (54 percent and 70 percent of studies, respectively) or neutral (46 percent and 21 percent of studies), although these impacts were mostly minor. Even in those cases where certified concessions showed lower levels of deforestation than non-certified, the difference is typically less than 1 percent (Wolff and Schweinle, 2022).

Individual studies comparing certified farms with non-certified farms and/or surrounding landscapes reveal heterogeneous results, with no clear pattern emerging by country or standard. In the case of Rainforest Alliance, for instance, positive impacts were observed in Colombia (Rueda, Thomas and Lambin, 2015) and Brazil – though benefits were modest in the latter case (Hardt *et al*. 2015). In contrast, another study on Rainforest Alliance in Brazil found low and similar levels of forest cover on certified and non-certified coffee farms but noted that certified farms contributed more significantly to the restoration of environmentally sensitive areas (d'Albertas *et al*., 2023). For FSC, positive impacts in terms of higher regrowth of native forest were identified in certified eucalyptus plantations in Brazil (da Silva *et al*., 2019), whereas neutral or negligible impacts on deforestation were found in Mexico (Blackman, Goff and Rivera Planter, 2018; Heredia-Telles *et al*., 2023), Peru (Rico-Straffon *et al*., 2023) and Cameroon (Panlasigui *et al*., 2018). In Cameroon, the very low positive impact (<1 percent less forest loss in certified concessions compared to non-certified) appears to be

[12] Deforestation is the loss of forest due to its conversion to other land-use. Forest degradation is the deterioration of forests capacities to provide important ecosystem services. One key driver of forest degradation is forest fragmentation – i.e. the conversion of formerly continuous forest into patches of forest separated by non-forested lands; this has impacts on biodiversity, especially for species that needs large habitats, limits species movements and increase ecological vulnerability. A less severe or early-stage form of forest fragmentation is forest perforation, which occurs when small clearings or "holes" are made within a forest that largely remains intact and continuous. Perforation can still harm biodiversity through the loss of habitats of interior forest areas, where many sensitive species live.

less influenced by certification, per se, than by other factors driving deforestation, such as distance from population centres and roads (Panlasigui *et al*., 2018). In the Congo Basin, where countries (i.e. Central African Republic, Cameroon, Congo and Gabon) have implemented reforms requiring lodging concessions to adopt a forest management plan (FMP), to ensure the sustainable use of resources, concessions with a FMP – either FSC-certified or non-FSC-certified – appear to have lower levels of deforestation than those without. However, FSC certification does not confer any additional benefit with respect to having only an FMP (Tritsch *et al*., 2020). Similarly, in Guatemala the establishment of a sustainable forest management plan was the main driver of reduced deforestation, while FSC certification conferred minimal additional positive impact (Bocci and Fortmann, 2023).

Studies in Indonesia found positive impacts for both FSC and RSPO, albeit with caveats, which provide a clearer sense of the potential and limitations of VSS. In the study on FSC, deforestation was lower (-5 percent) in certified concessions than in non-certified; however, certified concessions showed higher rates of forest perforation. This indicates that, while effective in reducing the clearing of large sections of forests and promoting more "*selective"* logging practices, certification may induce the creation of internal gaps within forest areas. This can still compromise ecological integrity, landscape connectivity and therefore harm biodiversity (Miteva, Loucks and Pattanayak, 2015).

In the study on RSPO, certification was associated with reduced deforestation only in high tree cover areas and primary forests; in contrast, little or no effect was found in lower tree cover areas and peatlands. In other words, RSPO offered effective protection to dense, intact forests but not to areas where tree cover was already sparse or degraded. This can be easily linked to the emphasis placed by RSPO on protection of High Conservation Value (HCV) areas (Carlson *et al*., 2018) as opposed to "ordinary" forests. At the same time, the study reports that certified plantations were, on average, older than non-certified ones—having been established before 2000—and displayed lower forest cover at baseline. In other words, the amount of remaining forest available for protection in certified areas was often limited from the onset, constraining the overall potential impact of certification (Carlson *et al.*, 2018). According to the authors, this pattern might be indicative of a form of "greenwashing", whereby forest operators might have deliberately accelerated forest clearing prior to entering the certification process, in anticipation of future requirements, and took advantage of loose VSS criteria that allows recently cleared plantations to be certified as "sustainable" (Dröge *et al*., 2024).[13] In support of this interpretation, it is reported that RSPO-certified plantations registered a peak of deforestation approximately five years before the issuance of the letter of intent (LOI) to certify (Carlson *et al*, 2018). A more positive – perhaps complementary – interpretation could be that certification results in improved capacities on the part of companies and operators to plan lodging cycles (that would allow for reduced pressure on areas that had already been exploited) and monitor access to forests from other actors who might contribute to deforestation (e.g. illegal timber harvesters) (Tritsch *et al*., 2020).

Finally, both Carlson *et al*. (2018) and Miteva, Loucks and Pattanayak (2015) found no significant impact on the incidence of fire, which remains a common tool for land conversion and management in oil palm production. Conversely, in Indonesia, Cattau, Marlie and DeFries (2016) observed a reduction in the incidence of fires in the RSPO plantation, but not for "risky" years (i.e. drought-stricken) and locations (e.g. peatlands, which are more prone to ignition).

To complement studies based on counterfactual analysis between certified and non-certified farms, plantations or concessions, Dröge *et al*. (2024) offer a broader perspective analysing the impact of certification at the country level. Their study covers seven VSS (4C, Fairtrade, GlobalG.A.P., Organic, Rainforest Alliance, RSPO and UTZ) across 67 tropical countries and five commodities (cocoa, coffee, tea, palm oil and banana), and focuses on primary forest loss as the main sustainability outcome of interest. The hypothesis is that an increase in the certified area in a country should lead to a reduction in primary forest loss. However, the findings

[13] RSPO has protected primary forests since 2005, prohibiting conversion to plantations starting from November 2005. Additionally, conversion of High Conservation Value (HCV) and High Carbon Stock (HCS) areas to plantation has been banned since November 2018. Any plantation established on primary forests before November 2005, and on HCV or HCS before 2018, can still qualify for RSPO certification as sustainable. In addition, RSPO allows for compensation procedures for deforestation after the cut-off dates.

show negligible – or even negative – impacts: only Fairtrade is linked to reduced tree cover loss, while UTZ, RSPO and Organic are associated with slightly higher loss rates. The study concludes that, although individual studies may find positive impacts at the farm or plantation level, these impacts vanish at the country level (Dröge *et al*., 2024). Constraining factors at the broader scale might include limited adoption, selection bias (i.e. operators already close to compliance are more likely to adopt standards, as they would incurr lower costs) and leakage (i.e. displacement of deforestation from certified to non-certified areas) (see also Lambin *et al.*, 2018).

In relation to **biodiversity**, systematic reviews of forestry-related certification conclude that the conservation impacts are mainly positive (74 percent of studies, including the majority of those conducted in low and middle-income countries, versus 19 percent of studies reporting neutral, and 7 percent mixed impacts. The presence, richness and composition of both plants and animal species (particularly threatened species), habitat connectivity and ecological integrity are the most frequently assessed impact variables, while notable gaps remain concerning VSS impacts on ecosystem services (Wolff and Schweinle, 2022, Di Girolami, Kampen and Arts, 2023).

Primary studies show heterogenous results. For instance, in Brazil, slightly greater habitat availability and a greater contribution to the conservation of the studied species is reported in Rainforest Alliance-certified coffee farms compared to non-certified farms – but the changes were subtle, and certified farms did not present a clear pattern of improvements over time (Hardt *et al*., 2015). In Costa Rica, Rainforest Alliance was associated with lower on-farm biodiversity compared to both non-certified and organic-certified farms (Sanderson Bellamy *et al*., 2016).

Positive results were found for FSC in Argentina and Peru, where no significant difference was found between certified and non-logged/undisturbed areas in terms of provision of habitats for the studied species – large mammals in the first study (Alveira *et al*., 2023) and birds in the second (Campos-Cerqueira *et al*., 2020). In contrast, Morgans *et al*., 2018 found that in Indonesia the population of Bornean Orangutans declined at a similar rate in RSPO-certified and non-certified concessions.

These results can be at least partly explained by the biological and behavioural specificities of the studied species, whereby highly mobile and resilient species can find habitats in degraded landscapes, and in general respond better to disturbances than species like orangutans, who need large, forested areas (Alveira**,** de Bustos and Tálamo, 2023; Campos-Cerqueira *et al.*, 2020; Morgans *et al*, 2018).

The reduced impacts of RSPO on biodiversity conservation, and almost no impact for species that need large-forested areas such as orangutan, were also found by a theoretical study analysing RSPO's framework in relation to Indonesian sociopolitical and legal context (Ruysschaert and Salles, 2014). Both the empirical and theoretical studies point to a structural weakness of certification: that is, the narrow focus on *the farm*, where the *landscape* is the minimum scale required to achieve meaningful change. Indeed, even if certification may cover hundreds or hundreds of thousands of hectares, producers may not be necessarily contiguous, which might induce unintended results such as forest fragmentation and associated reduced biological connectivity and reduction of ecosystems services (Tscharntke *et al*., 2015). Finally, a study investigated landscape heterogeneity – used as a proxy for biodiversity – in Malaysia and found no statistically significant difference between RSPO-certified and non-certified plantations. Additionally, both types of plantations had much lower landscape heterogeneity than smallholding farms producing palm-oil, suggesting that farm characteristics, including size and management systems, might play a more important role than certification (Azhar *et al*., 2015).

Regarding marine biodiversity, a recently conducted meta-analysis of the impacts of VSS found evidence that MSC-labelled fisheries reliably avoid overfishing; however, there is no conclusive evidence of a positive impact of MSC on any other indicator of biodiversity (Ulrich *et al*., 2025). Benefits reported by the literature, based mainly on fishery operators' perceptions, since rigorous impact evaluations are practically non-existent (see footnote 20), include improved fish stock management, lower bycatch, reduced habitat damage and a greater use of ecosystem-based management systems (De Melo *et al.*, 2024). In terms of primary studies, the only one that met the eligibility criteria (Gutiérrez *et al.*, 2012)

found that MSC-certified fish stocks were associated with higher biomass and lower exploitation rates compared to non-certified.[14]

Impacts of certification on **environmental farming practices** vary across contexts and standards but can be generally described as positive, with certain caveats. For example, studies in Ghana found that Organic, Rainforest Alliance and UTZ, among other certification schemes, significantly influence basic farm management practices, but have a much more limited impact on complex climate-resilient strategies, such as agroforestry diversification (Thompson *et al*., 2022). In Nicaragua, a study investigating the impact of certification (including Fairtrade, dual Fairtrade-organic, Rainforest Alliance and UTZ) on environmental practices (i.e. soil and water conservation) and outcomes (i.e. tree carbon stocks and habitat quality measured through tree diversity, strata, basal structure and density) found that certified coffee farms performed better than non-certified on certain indicators. However, no group of certified farms consistently outperformed matched farms across all measures (Haggar *et al*., 2017).

Divergent outcomes have been observed in relation to input use. In Côte d'Ivoire, Fairtrade certification was associated with increased use of chemicals and overall toxicity levels (Sellare, Meemken and Qaim, 2020). In contrast, in Costa Rica, organic certification led to a significant reduction in the use of chemical inputs and improvement in environmental practices and outcomes (Blackman and Naranjo, 2012). In Kenya, conversion to organic was associated with improved farming practices; however, certification per se did not bring about additional benefits (Tankam and Djimeu, 2020). A study comparing the use of environmentally hazardous practices in Thai crude palm oil plantations and mills showed that RSPO-certified farmers performed better than others due to better waste management; however, the most environmentally friendly mills by far exceeded RSPOs standards (Saswattecha *et al*., 2015). In Indonesia, RSPO-certified farmers outperformed non-certified ones in terms of agronomic (yield-enhancing) practices but not in terms of environmentally responsible practices (De Vos *et al*., 2021). In several cases, the limited impacts of certification on environmental practices might be explained by limited compliance. For example, in Honduras, one-third of organically certified farmers reported using synthetic fertilizers, despite their explicit prohibition under the certification scheme (Dietz, Grabs and Chong, 2021).

Additional studies were identified that evaluate the impact of certification on the environmental sustainability of farming practices and, simultaneously, economic outcomes for producers. These studies are discussed in section 3.4, which presents evidence on the synergies and trade-offs between different pillars of sustainability drawn from multi-pillar studies.

Overall, the present review found that the existing body of research is heavily skewed towards a few sustainability criteria under the environmental pillar, compared to the much broader claims of VSS (as shown in Table 1). In addition, the majority of studies focused on deforestation and biodiversity assess FSC, Rainforest Alliance and RSPO, while the majority of studies focused on environmental farm management focus on Fairtrade, Organic and Rainforest Alliance, providing only a partial interpretation of changes on the ground.

Enablers and barriers of impacts

Based on the studies presented above, it appears that VSS can offer a positive, yet limited contribution to environmental sustainability. **Baseline geographic/ environmental context and characteristics**, such as the type of forest, or fauna, involved and its location (e.g. proximity of certified farms/plantation to cities

[14] The main reason behind the paucity of primary impact studies on MSC that are compliant with this paper's eligibility criteria is the strong geographical bias in the distribution of the evidence base, which focuses heavily on high-income countries. These only partially reflect the uneven global distribution of certified fisheries (Arton *et al*., 2020). Additionally, some unique characteristics of the fishery sector increase the costs and complexities of carrying out environmental impact evaluations within classical parameters (e.g. with a reliable control groups/counterfactual) or make it impossible altogether. These include the mobility of fish across wide areas, the seasonality of migration patterns, the depth and inaccessibility of certain ecosystems, and the difficulty of drawing boundaries between areas where certified and non-certified fleets operate, among others (Komives *et al*., 2018). Most studies found – and discarded, as not eligible – provide a stocktaking of benefits and challenges of implementing certification from the point of view of individual fisheries, without a proper counterfactual. For a systematic review of benefits and challenges, see de Melo *et al*. (2024), which covers all three pillars of sustainability, and Carlson and Palmer (2016), which addresses only the economic pillar. There is a need for more robust evidence on the impact of fisheries certification on environmental sustainability dimensions than currently exists in the literature.

or roads and similar elements) appear to play a crucial role in determining environmental risks at the baseline, and therefore potential outcomes.

Another important factor affecting impact is **selection bias**. This was found both for agriculture standards, notably self-selection of farmers already meeting standards, or close to compliance (Blackman and Naranjo, 2012; Hardt *et al*., 2015; Sanderson Bellamy *et al*., 2016; Thompson *et al*., 2022), and forestry standards, for example self-selection of previously deforested areas (Carlson *et al*., 2018), resulting in limited impact from the outset (Lambin *et al*., 2018).

Low stringency (e.g. presence of many exemptions and flexibility clauses), limited scope or lack of clarity of certain standards are often mentioned as the reasons behind low or mixed impact of certification schemes (Blackman and Naranjo, 2012; Wolff and Schweinle, 2022). The relatively recent cut-off year chosen by forest certification schemes, is one such example. Another is the lack of specific requirements – until the 2018 update of the RSPO Principles and Criteria – regarding the conservation of peatlands (Cattau, Marlier and DeFries, 2016), despite the crucial role they play in carbon capture, climate change mitigation and other ecosystem services. This partially explains why several studies find that RSPO, among other VSS, has no impact on this ecosystem.

Additionally, as mentioned above, while VSS protect primary forests, secondary forests receive protection only if they are deemed of High Conservation Value (HCV) (Ruysschaert and Salles, 2014). However, in countries like Indonesia and Malaysia, most forests are classified as secondary or degraded forest (Padfield *et al*., 2016). Likewise, concern over protection of "threatened biodiversity" in "special environments" like forests is not matched by equal concern over "ordinary" biodiversity, revealing a hierarchy of land or species that deserve protection (see Loconto *et al*., 2025). While this might be considered a pragmatic approach, in practice such a selective focus can dramatically reduce the capacity of VSS to attain their claimed goals and may hinder the adoption of more comprehensive strategies for environmental protection.

Some authors link the presence of waivers, insufficiently stringent criteria or excessive room for interpretation and opportunistic behaviour, to the political economy behind standards, many of which are created and/or governed by a mix of civil society actors and industry, whereby the latter are often overrepresented (van der Ven, 2024). Gaps in VSS design would thus reflect the difficulties in bridging these divergent interests, and the inherent conflict between the need to maximize environmental conservation through more stringent rules and the interest in increasing participation through more flexible requirements (Ruysschaert and Salles, 2014). As a matter of fact, both stringency and participation are essential to define the overall impact of VSS on the ground, but the challenge is striking the balance between the two.

It should be noted that VSS are not alike; some are more stringent, some less. As illustrated in section 1.2, variations in design among VSS are explained by underlying differences in theories of change and visions regarding sustainability. For example, organic certification requirements do not compare with the demands of Fairtrade and RA-SAN: while the former aim to reduce chemical input use and improve the environmental friendliness of farm management practices, the latter two are interested principally in increasing farm productivity and do not exclude the use of synthetic inputs.

VSS have, from many perspectives, a narrow focus, which can also affect their impact. As noted earlier, there is an inherent incongruence between the scale at which VSS are adopted (the farm or plantation) and the scale required to effectively address environmental problems (the landscape) (Tscharntke *et al*., 2015). This highlights the fact that standards are not a panacea, and cannot succeed in isolation; rather, they need to be integrated into a broader policy package (Cintori, L. & Meybeck, A. 2026). Most VSS are also narrowly focused on specific commodities, thus by definition favour specialization vis-à-vis diversification practices. However, diversification is an important strategy for both environmental purposes and smallholder resilience (Babin, 2015; Ruben, 2017; Thompson *et al*., 2022). Indeed, specialization suits best large companies compared to small producers, as the former can easily develop economies of scale and integrate vertically into global value chains, facilitating profits to overcome certification costs. Small-scale

producers generally have limited power to influence VSS design and to participate in deforestation governance, in order to accommodate better their diverse livelihood needs (Glasbergen, 2018; Thompson *et al*., 2022). As a consequence, it is not surprising that some certification schemes – notably roundtables and forestry standards – have a low rate of smallholder participation (Garrett *et al*., 2016): smallholders account for only 1.3 percent of oil palm land certified by RSPO, vis-à-vis an estimated 3 million smallholders cultivating palm oil globally (Ogahara *et al*., 2022; World Bank, 2011). The lack of a clear business case (e.g., price premiums, subsidies, or favourable financing) to encourage small producers' participation and/or compliance is one factor that constrains standards adoption and effectiveness (Garrett *et al*., 2021; Lambin *et al*., 2018).

Lastly, the **existence of a favourable political environment** is often cited as an enabler of impact. However, interactions between VSS and policy frameworks are not straightforward. The more VSS requirements surpass legal requirements, the more they confer additional benefits; but VSS can benefit even countries that already have strong environmental legislation in place, through enhancing compliance via more detailed rules, effective monitoring and incentives (Garrett *et al*., 2016; Traldi, 2021). There are also cases of both successful and unsuccessful implementation in weak and strong governance countries, indicating the need for more research to ascertain the role of institutional context (Di Girolami, Kampen and Arts, 2023). What is certain is that failure to embed VSS in a broader policy and legal environment weakens impacts, which underscores the need for increased cooperation between standard setters, public authorities, international organizations and the private sector (Ruysschaert and Salles, 2014).

3.2 Economic impacts

Among the three pillars of sustainability, the economic pillar has received the most intensive study. Primary studies with an economic focus assess mainly the effects on intermediate variables such as incomes from certified production, prices and productivity, and endpoint impacts on total household income and poverty. A small number of studies also shed light on VSS impacts in terms of business upgrading trajectories. Studies are heavily focused on the coffee sector and, notably Fairtrade or Fairtrade-organic.

As revealed in a recently published meta-analysis, different VSS may have divergent impacts on producers' **incomes and poverty**, depending on the context. Even when the impact is the same (positive, negative or neutral), the impact pathway might vary (Oya, Schaefer and Skalidou, 2018). Overall, incomes from the sale of certified produce tend to increase, but this might not necessarily translate into improvement in total household income and poverty status (Meemken, 2020; Oya Schaefer and Skalidou, 2018). This is partially linked to the fact that incomes from certified crop sales may represent only a small fraction of total household income sources (van Rijsbergen *et al*., 2016), or because prices received do not or do not fully compensate for the additional costs or labour requirements (Babin, 2015; Boonaert and Maertens, 2023; Mitiku *et al*., 2017) – although this is generally not the case (Meemken, 2020).

Income gains for certified producers may arise **either from better prices or increased productivity.** Overall, VSS are more often associated with increased prices than productivity, and indeed the association between VSS and productivity is mixed and not always significant (Meemken, 2020; Oya *et al*., 2017). However, the price channel is less effective than the productivity channel in terms of translation into income gains (Akoyi and Maertens, 2018; Oya, Schaefer and Skalidou, 2018; Vanderhaegen *et al*., 2018). Primary studies show a heterogeneity of results in terms of price and productivity (and therefore income) effects. For example, in India, Fairtrade certification successfully increased coffee farmers' yields, prices and incomes (Jena and Grote, 2012), whereas in Ethiopia, Fairtrade-certified farmers experienced lower yields, prices and incomes compared to their non-certified counterparts (Jena *et al*., 2012). In Nicaragua, Fairtrade-certified farmers saw yield gains, while those with organic certification received higher prices, but neither group achieved significant improvements in total household incomes (Jena and Grote, 2022; Jena, Stellmacher and Grote, 2017).

While the presence of well-functioning cooperatives is a major crucial factor behind the differential impacts in the three countries (Jena and Grote, 2022), other elements, such as the pre-existing economic

context and market conditions, and specific VSS features, matter. In the Indian case, the establishment of cooperatives in the very poor region where certification was implemented led to early benefits for certified farmers, including guaranteed access to markets and reduced travel costs, along with positive spillovers to the broader community (e.g. Fairtrade-social premiums were invested in physical and social infrastructure) (Jena and Grote, 2012). In the Ethiopian case, cooperatives did not support farmers with the credit, inputs, market information and capacity-building required to improve quality and productivity, and had limited ability to negotiate prices with buyers (Jena *et al*., 2012). In Nicaragua, a country with an historically established and effective cooperative system, access to extension services and credit was quite widespread, leading to higher productivity for Fairtrade-certified farmers. However, the prices they received were not significantly higher than those received by non-certified farmers, because market prices at that time were equal or even higher than floor prices set by Fairtrade International. Interestingly, the Nicaraguan study also examined the impacts of organic certification and found that while farmers benefited from higher prices, their gains were largely offset by yield decline, closely linked to a severe shortage of organic fertilizers in local markets (Jena, Stellmacher and Grote, 2017).

In Eastern Uganda, the triple Rainforest Alliance/UTZ/4C certification led to increased incomes, even without price premiums, due to higher yields. These productivity gains were facilitated by a well-organized contract scheme in which buyers provided timely access to inputs, credit and training on Good Agricultural Practices (GAPs). In contrast, dual Fairtrade-organic certification had mixed and, in the long run, negative impacts on farmers' incomes, due primarily to a decline in yields – local shortages of organic fertilizers presented a major obstacle – not compensated for by higher prices (Akoyi and Maertens, 2018).

In Central Uganda, Fairtrade certification had a positive impact on farmers' incomes, partly because floor prices protected farmers during a period of low market prices. Conversely, adopters of Organic-UTZ certification saw their income decrease. A key distinction between the two types of certification is that Fairtrade certificates were owned by the farmers cooperatives, allowing them the flexibility to sell to multiple buyers and negotiate prices. Organic-UTZ farmers certificates were owned by buyers, which limited farmers to exclusive contracts and weakened their negotiating position. Additionally, Fairtrade-certified farmers sold coffee in a processed and dried form, whereas Organic/UTZ farmers sold it in its fresh, unprocessed forms, which contributed to price disparity (Chiputwa, Spielman and Qaim, 2015).

Finally in Ethiopia, Rainforest Alliance had a positive impact on incomes and poverty, mainly due to higher prices, while Fairtrade certification had no impact on welfare due to insufficient price premiums (Mitiku *et al*., 2017). It should be noted that Rainforest Alliance-certified farmers were linked directly with exporters who would buy *all* their coffee as certified and offer additional training and quality control services to minimize rates of rejection. In contrast, Fairtrade farmers sold coffee to the regional coffee union, who in turn would sell only *part* of their coffee to exporters as specialty coffee; the other part was sold to the Ethiopia Commodity Exchange at a lower price – since the Commodity Exchange chain does not segregate certified from uncertified coffee.

While this element is much less investigated, different VSS might promote different **upgrading trajectories** which, in the long term, lead to differential impacts on farm productivity and incomes, thus affecting total household incomes and poverty. In Nicaragua, Organic and UTZ farmers pursued low investment-low productivity investment strategies, while Coffee and Farmers Equity Practices (C.A.F.E.) farmers pursued high investment- high productivity strategies (Haggar *et al*., 2017). In Kenya, Fairtrade producers tended to further specialize in coffee production and increase engagement in dry coffee processing, while UTZ farmers increased input intensification and volumes of production, and multiple certification promoted diversification of coffee outlets (van Rijsbergen *et al*., 2016).

Enablers and barriers of impact

In summary, a broad range of factors can influence the direction and size of impact on incomes, prices and productivity. This section explores some of these factors and includes additional explanatory aspects highlighted by the literature.

The first factor relates to **variations in VSS features.** Different VSS promote different price mechanisms, which work more, or less, satisfactorily, depending on market conditions. For example, Fairtrade guarantees floor prices, which acts as a safeguard during price slumps and against fluctuations (Oya, Schaefer and Skalidou, 2018; Parvathi and Waibel, 2016; Valkila, 2014), but might induce negative impacts if market prices are above the agreed fair price with Fairtrade and farmers are not able to obtain adjustments, as seen in some case studies (Jena and Grote, 2022; Jena, Stellmacher and Grote, 2017). Some other standards (e.g. Organic and Rainforest Alliance) do not guarantee minimum prices, instead providing premium prices based on quality, which might be riskier but more rewarding and effective in encouraging upgrading at farm level (Boonaert and Maertens, 2023; Ruben, 2017).

Similarly, not all VSS explicitly target productivity enhancement. Those that maintain this focus and promote training in good agronomic practices (e.g. Rainforest Alliance and UTZ) tend to exhibit better results in terms of incomes. Others that lack this such focus (e.g. Fairtrade) are typically associated with yield decline (e.g. dual Fairtrade-organic certification), which might be not compensated by the higher prices (Akoyi and Maertens, 2018; Fenger *et al*., 2017; Hidayat, Glasbergen and Offermans, 2015; Kalonga and Kulindwa, 2017). Differences in upgrading trajectories might also be linked to VSS requirements, as well as the profiles of participating farmers.

Timely access to farm inputs, equipment, credit and training is crucial to enable farmers to comply with VSS requirements, upgrade their production methods and ultimately improve their productivity. **Provision of support to producers** therefore plays a crucial role. This support may come from buyers, governments programmes, external actors (e.g. NGOs) or, often, farmers cooperatives. Indeed, **the presence of strong and well-functioning farmer's organizations** is a frequently highlighted enabler of positive impact (Bray and Neilson, 2017; Fenger *et al*., 2017; Garrett *et al*., 2021; Jena and Grote, 2022; Makita, 2016; Wolff and Schweinle, 2022). The relationship between certification and the capacities of farmers organization is bi-directional: while cooperative capacities and marketing attitudes are crucial to capitalize on VSS, participation in a certification scheme can trigger a positive process whereby unorganized farmers organize and, through exposure to training, improve their production skills and management systems (Dammert and Mohan, 2015; Donovan and Poole, 2014; Rosdin, Cheah and Moslim, 2023). Indeed, certification is typically directed towards farmer cooperatives and rarely goes to individual farmers, who may lack the necessary resources (Glasbergen, 2018). For some VSS, such as Fairtrade, forming a cooperative is a prerequisite to obtaining certification. Of course, cooperatives have both strengths and limitations. While they might be instrumental for farmers to obtain higher prices, when payments are made to cooperatives instead of directly to farmers, the cooperative size (i.e. number of farmers among which rents are distributed), rules on the distribution of rents and elite capture may reduce the amount that finally accrues to individual farmers (Francesconi and Ruben, 2014; Minten *et al*., 2018; Mitiku *et al*., 2017; van Rijsbergen *et al*., 2016).

As seen in case studies (Akoyi and Maertens, 2018; Chiputwa, Spielman and Qaim, 2015), **the structure and organization of value chains** can play a significant role in shaping contracts and, ultimately, influencing livelihood outcomes (Bray and Neilson, 2017; Marx, Depoorter and Vanhaecht, 2022). Prices, the strength and duration of contracts, the level of support provided to farmers, the existence of opportunities for value addition at farmers' level, and the degree of trust between the parties are indeed shaped by the length and complexity of the value chain, its degree of transparency, and the overall attitude and commitment of buyers toward sustainability (ITC, 2012). At a global level, the extreme concentration of some of these global commodity chains (e.g. coffee and cocoa) in the hands of a few major actors leads to unequal value distribution to the detriment of producers (Barreto Peixoto *et al*., 2023; Daviron and Ponte, 2005). At the local level, a multitude of actors – such as trading companies, aggregators and other intermediaries, large or small – operate between producers and manufacturers. These actors have significant power to influence VSS outcomes, but their role has been insufficiently investigated (Grabs *et al*., 2024). Some research shows that certification in itself is little able to generate changes in the structure of value chains, and smallholders remain the weakest link and those who benefit the least (Hidayat,

Glasbergen and Offermans, 2015; Ogahara *et al*., 2022; van Rijsbergen *et al*., 2016).

Linked to this factor is the **broader dynamics of the global VSS market**. Given the market-driven nature of VSS, the existence of a thriving market demand for certified products is the first and basic condition for their operation. However, the structural and persistent oversupply of certified products, with respect to demand, compels farmers to sell a large portion of standard-compliant products in conventional markets – while investment and compliance costs affect all production and income –reducing the potential welfare effect of certification (Dammert and Mohan, 2015). In this context of over-saturation, wider adoption of VSS leads to thinner margins, making it less attractive to participate in these markets. The economics of VSS remains a critical area for research – one that merits exploration from a forward-looking perspective, taking into consideration the emergence of new middle-class consumers in the Global South, as well as the growing importance of business-to business (B2B) versus business-to-consumer (B2C) demand (Meemken *et al*., 2021).

Certification can meaningfully reduce poverty if the poor have the capacity to participate in certified markets. Research shows that **pre-existing characteristics of producers** – wealth and assets endowment, along with age, gender, education, training, farming experience and attitude – influence their participation in VSS, the choice of which certification scheme to adopt and the final outcomes (FAO, 2014; Garrett *et al*., 2021; Oya *et al*., 2017; Rusli and Fatah, 2022). Group certification can enhance, to some extent, the engagement of medium and small producers, but the most vulnerable remain unable to access VSS (Meemken, 2020; Pinto *et al*., 2014). Some VSS might be more accessible to vulnerable farmers because of their institutional affiliation. For instance, Fairtrade-organic tend to be promoted by NGOs and social movements working with marginalized communities, while other schemes are often promoted by value chain actors, who usually prefer to work with larger, more capable farmers (Haggar *et al*., 2017).

Finally, **agronomic differences in production systems** are likely to play an important role in differential productivity impacts, but these are rarely considered (Garrett *et al*., 2021; Mitiku *et al*., 2017).

3.3 Social impacts

The social pillar is the least investigated dimension of sustainability impacts from VSS. Among the six VSS studied, Fairtrade again received the most attention in the literature, followed by FSC, Rainforest Alliance and Organic. Outcomes assessed include labour conditions, child labour and education, with less consideration paid to food security, nutrition and health, and gender equity.

VSS can influence **labour conditions** in various ways. These might include: explicit requirements (e.g. adherence to national and international core labour standards, additional criteria on wages and labour condition), awareness-raising activities implemented within the farming community, and the promotion of agricultural practices that affect the intensity and demand for labour. In Ghana and Peru, VSS were associated with improved labour conditions, including more stable contracts, higher wages, greater access to training, the establishment of labour unions and heightened awareness of workers' rights (Krumbiegel, Maertens and Wollni, 2018; Schuster and Maertens, 2015, 2017). Overall, meta-analysis shows a contradictory picture for wages, and even when VSS improve wages, they often fail to raise them above the national minimum standard or to lift workers out of poverty (Oya, Schaefer and Skalidou, 2018). This might be due to inconsistent application of labour standards – which are difficult to monitor, especially on small farms – as well as the varying levels of stringency in national labour regulations vis-à-vis VSS requirements (Meemken, 2020; Oya, Schaefer and Skalidou, 2018).

VSS can impact **child labour and child schooling** via the same mechanisms – namely, explicit prohibitions or requirements to adhere to national regulations, sensitization in producers' communities and production requirements affecting the use of labour. Additionally, if certification increases or reduces incomes, it may alleviate or exacerbate household financial constraints, thus influencing decisions regarding child labour versus child schooling (Akoyi and Maertens, 2018). Overall, positive and statistically significant impacts were found on child schooling, but the number of primary studies remains very small (Oya, Schaefer and Skalidou, 2018). In Ethiopia and Uganda, Fairtrade increased the likelihood of

secondary school enrolment but had no impact on child labour, while Rainforest Alliance was associated with reduced workloads but neutral-to-negative effects on schooling (Akoyi and Maertens, 2018). Another study on Uganda found that Fairtrade had a positive impact on child education, while Organic had none (Meemken, Spielman and Qaim, 2017).

Gender empowerment, food security and nutrition are also areas that have received limited attention in research. Three studies on coffee farmers in Uganda provide certain insights. One found that Fairtrade and UTZ – two standards that integrate explicit gender equality commitments, as reflected in their policies, auditing checklists and training programmes – improved access to agricultural extension services for both male and female farmers. Additionally, these certifications increased joint control of household assets, whereas assets were mainly owned by men in non-certified households (Meemken and Qaim, 2018). A second study, focused on Fairtrade, Organic and UTZ, assessed their impacts on both gender equity and food security, as well as dietary quality. In this case, all three standards were associated with positive outcomes: improved incomes, greater control by women of coffee production and monetary revenues, and improved food security and dietary quality (Chiputwa Spielman and Qaim, 2015). This aligns with a broad finding in the literature that women's empowerment tends to translate into nutrition- and health-oriented prioritization of household resources, which in turn results in improved maternal and child nutrition. The third study examined Fairtrade and Organic certification and found that both were associated with increased consumption expenditures. However, improvements in nutrition indicators were observed only among organic farmers (Meemken, Spielman and Qaim, 2017). Meanwhile, in Indonesia, FSC was associated with reduced malnutrition (Miteva, Loucks and Pattanayak, 2015). On a global level, positive, although weak and highly context-dependent relationships between certification, farmers' income and food security have been observed (Schleifer and Sun, 2020). However, in Kenya, certification-led crop specialization was associated with higher food purchases, which in turn negatively impacted net household income (van Rijsbergen *et al*., 2016).

Enablers and barriers of impact

Overall, certification has the potential to improve social outcomes such as labour conditions, child schooling, gender equity, food security and nutrition. However, this potential is not always fully realized. In Peru and in the United Republic of Tanzania, VSS have contributed to reinforcing respect of existing national laws in these areas, where such exist (Kalonga and Kulindwa, 2017; Schuster and Maertens, 2017). The present study found that **explicit incorporation of these social concerns into certification schemes and criteria** is an important enabler of outcomes. However, as seen in section 1.2, not all VSS pay equal attention to all three pillars of sustainability – a disparity linked to their visions of sustainability, theories of change and institutional designs (Loconto *et al*., 2025). Some VSS might be more effective than others in resolving certain sustainability issues, and, conversely, some sustainability challenges might be best addressed by other instruments (Marx, Depoorterand Vanhaecht, 2022). The potential risk of "standardizing the standards" (e.g. introducing the same kind of social requirements in all VSS) may reduce the diversity needed to address different problems in different contexts.

In addition, the integration of social criteria into VSS schemes is not be sufficient in and of itself. Farmers' and communities' commitment to these issues also needs to be strengthened through the implementation of **sensitization activities and enhanced monitoring**. These efforts are crucial to ensure meaningful impacts (Akoyi and Maertens, 2018; Meemken, 2020; Meemken, Spielman and Qaim, 2017; Oya, Schaefer and Skalidou, 2018).

3.4 Emerging issues

While most standards include criteria related to all sustainability pillars (see Table 2), studies usually assess effectiveness focusing either on environmental or socioeconomic impacts, with little information on cross-overs. Consequently, **possible synergies and trade-offs among socioeconomic and environmental indicators** remain poorly understood. Recently, a number of multi-pillar studies have been

published, shedding light on this crucial topic. These studies offer very heterogeneous findings – some of which are presented for illustrative purposes – yet the interpretation of such heterogeneity is fundamentally aligned with the conclusions of other sections of this paper, namely: trade-offs might exist but are not inevitable, and their occurrence depends largely on VSS features and implementation dynamics.

Trade-offs are found in the United Republic of Tanzania, where certified coffee farmers (Fairtrade, Organic and Rainforest Alliance) exhibited higher environmental awareness and use of conservation practices, such as mulching, soil erosion control and intercropping, than their non-certified counterparts. However, they also had lower household incomes due to decreased yields, which were not compensated for by premium prices (Kangile *et al*., 2021).

In Ghana and Kenya, Rainforest Alliance and organic certifications among cocoa and macadamia farmers brought some limited positive environmental impacts, but had no influence on most socioeconomic parameters. Explanations include the limited effectiveness of training on farming techniques, constrained access to credit to finance needed investments, restricted availability and access to organic fertilizers, insufficient economic incentives and the narrow scope of the intervention, which targeted single crops instead of the whole farm (Blockeel *et al*., 2023). Along the same lines, a systematic review of forestry schemes undertaken by Garrett *et al*. (2021) concludes that certification is usually associated with improvement in either the economic or the environmental pillar, with no change in the other, and overall, there is *no evidence of trade-offs and synergies* between them.

Two studies on coffee in Nicaragua and Uganda conclude that the adoption of VSS can help, if not to eliminate, at least to *mitigate trade-offs*; however, findings diverge regarding the enabling pathway. Indeed, in the Ugandan case, increased productivity appears to be the main enabling factor, whereas in the Nicaraguan case price effects play a more central role.

In the Ugandan study (Vanderhaegen *et al*., 2018), higher productivity and farm incomes were generally associated with lower biodiversity and carbon storage, regardless of whether farms were certified. This pattern was linked to farming practices: for example, the use of agrochemical inputs increased productivity and income but decreased invertebrate abundance and diversity, whereas environmentally friendly practices (such as intercropping, manure application, mulching and weed control) had the opposite effect. Looking at specific schemes, the triple 4C–Rainforest Alliance–UTZ certification was associated with better economic performance at the expense of environmental outcomes, while the Fairtrade–organic scheme showed the reverse pattern. However, when all certified farms were considered together, trade-offs were smaller than among non-certified farms and, overall, not statistically significant. In other words, certification appears to mitigate trade-offs between economic and environmental outcomes. Since certified farms did not receive higher prices or add more on-farm value than non-certified farms, the main pathway seems to be the promotion of practices that enable increased productivity at lower environmental cost (Vanderhaegen *et al.*, 2018).

The Nicaraguan study also found a general inverse correlation between some environmental and economic outcomes variables (i.e. tree diversity versus productivity, price and net revenue), but this inverse relationship does not apply to the subsample of certified farms (Fairtrade, dual Fairtrade-organic, Rainforest Alliance, UTZ and C.A.F.E.), precisely because they receive higher prices (Haggar *et al*., 2015).

Finally, three studies, all from Ghana, find *synergies* between environmental and economic outcomes. The first study, conducted among Rainforest Alliance-certified cocoa farmers (Fenger *et al*., 2017) concludes that the presence of active farmer organizations, functioning government institutions and better prices are the key factors enabling certification to deliver socioeconomic and environmenta co-benefits.

The second study by Asigbaase *et al*. (2021) found that the income potential of organic cocoa farmers was comparable to that of conventional farms, despite the two systems having very different environmental impacts. Unlike conventional farmers, who replaced shade trees with cocoa trees, organic farmers reduced the number of cocoa trees to incorporate more shade trees and diversified with other species such as banana and plantain. Ultimately, conventional farmers increased their cocoa production but

worsened their soil health and became increasingly reliant on synthetic fertilizers. In organic farms, on the contrary, soil health improved, leading to higher per-tree cocoa productivity, which partially offset the reduction in number of cocoa trees. When considering the combined output of cocoa, banana and plantain, there was no difference in the income potential of the two types of farms, but the organic farms produced a net benefit for the environment.

The third study by Kleemann and Abdulai (2013) found that organic certification functioned as an effective catalyst for the adoption of agroecological practices among pineapple farmers, while improving their return on investments (ROI). However, the relationship between the two elements was not straightforward: ROI increased with a low level of adoption of agroecological practices, declined with a moderate level of adoption, and rose again with a high level of adoption. This can be explained by the suboptimal use of fertilizer, due to farmers' liquidity constraints. The adoption of organic methods brought some early benefits in terms of fertility, yields and returns.[15] As the intensity of environmental practices increases, however, expenses in terms of (scarce and costly) organic inputs rise faster than yields, leading to a negative cost-benefit ratio. Only when intensity of use of agroecological practices increases further, do yield benefits start to outweigh costs again (Kleemann and Abdulai, 2013). It can be concluded that organic production methods and certification make economic sense for marginal farmers, but they need to be supported, especially during the most challenging phases of the cost-benefit curve, through measures like facilitated access to organic inputs, training in soil fertility management and remunerative prices (Eyhorn *et al*., 2018; Kleemann and Abdulai, 2013).

As shown by the latter case, *time* is a crucial dimension that shapes how VSS impact on the different sustainability pillars – and their associated synergies and trade-offs. For any economic actor adopting VSS, from larger firms to the smallest farmer, ensuring economic viability is essential, even for the short term. However, an overemphasis on short-term profitability at the expense of environmental stewardship risks reducing sustainability commitments to a superficial exercise and may ultimately undermine the very foundation of long-term sustainable development (FAO, 2014). This creates a dilemma: on the one hand, environmentally sustainable practices are often resisted because they entail immediate extra costs, while the positive environmental and economic benefits typically take longer to manifest; and, on the other hand, addressing all dimensions of sustainability simultaneously is essential to balance short- and long-term sustainability goals (Wu *et al*., 2017).

Some tentative conclusion might be drawn. From a policy perspective, standards should be designed with a view to mitigating trade-offs and enhancing co-benefits, for example through the inclusion of provisions towards "increased productivity within ecological boundaries" (Vanderhaegen *et al*., 2018). Additionally, it is essential to enhance access to organic inputs, while providing sufficient prices to allow producers to absorb the temporary losses usually associated with environmentally friendly management practices or less intensive production methods (Haggar *et al*., 2017). From a research perspective, there is a pressing need not only for more multi-pillar studies, but also for more longitudinal studies, which track outcomes over longer periods of time. These studies can help capture the temporal dynamics of sustainability impacts and shed light on how the learning and capabilities generated through the implementation of VSS may eventually turn trade-offs into co-benefits (Auld, Rencken and Cashore, 2015).

More research is also needed to assess the **spillover effects of certification** on (and their potential to trigger transformation in) the broader market environment. Among the very few studies identified during the research, one study In Indonesia found that certification has reduced deforestation in certified areas while accelerating deforestation in non-certified areas. Overall, the positive impacts of certified plantations and negative spillover (i.e. the "leakage" phenomenon, discussed in section 3.2) counteracted each other, resulting in an insignificant net total impact on aggregate deforestation (Heilmayr, Carlson and Benedict, 2020). In contrast, in Brazil, improved forest regeneration was detected not only on FSC-certified eucalyptus plantations of the Paraíba Valley in São Paulo State, but also in the surrounding areas in the Atlantic Forest landscapes (Da Silva *et al*., 2019).

[15] Similar results are also found in India among organic rice farmers, who experienced better sale prices while reducing their input costs and not incurring yield penalties, due to the suboptimal use of fertilizers at the baseline (Eyhorn *et al*., 2018).

Examples of economic spillover of certification may include effects on local markets – for example, increased demand for certain types of inputs such as organic, pushing upward prices – as well as on practices implemented by non-certified farmers, which can improve "by imitation" (Ruben, 2017). These aspects were not sufficiently dealt with in the corpus of primary studies but deserve further investigation.

In terms of social spillover, the research uncovered one study targeting Indigenous communities belonging to the Aka ethic group, living along the boundaries between an FSC-certified and a non-certified forest in the Congo Basin. These semi-nomadic hunter-gatherer communities were not involved in the certification process, nor consulted in the formulation of sustainable resource management plans in the area. The research revealed that Aka communities on the certified side of the forest were more likely to report declines in food security, nutrition, health and wealth compared to Aka communities living on the non-certified side. In contrast, Bantu communities living in FSC-certified villages, who are mainly farmers, were largely unaffected (Doremus, 2019). Although FSC Principles and Criteria formally commit to recognizing and safeguarding the legal and customary rights of "local communities" to own, use and manage their lands, territories and resources; and to ensuring their well-being is maintained or enhanced, this study highlights the limitations of treating local communities as homogenous entities. In reality, such communities can exhibit profound internal differences in terms of livelihood strategies, socioeconomic status and cultural practices. Recognizing and addressing these differences is crucial to achieving the effective and equitable implementation of standards.

A third area for further research relates to the **additionalities of multiple certifications.** Multiple certification is often assumed to deliver more benefits compared to single certification, as it exploits complementarities between VSS with a different focus. For example, Fairtrade, which is more focused on socioeconomic impact, is often coupled with Organic, which is more focused on environmental impact. Multiple certification also facilitates access to a wider range of market outlets, helping producers to mitigate price and demand fluctuations. However, the current body of evidence – mostly focused on small-scale coffee production – suggests that this is not universally the case.

Vanderhaegen *et al*. (2018) note that multiple certification often raises production costs while failing to deliver tangible benefits to producers in terms of income or livelihood improvements, and maintain that multiple certification responds more to the interests of large actors, who use it as a strategy to differentiate their products and access niche markets. Ruben (2017) suggests that the increased uptake of both multiple certifications (as well as more stringent, private standards) can partly be understood as a strategic response on the part of the most capable farmers, seeking to maintain a competitive edge vis-à-vis the declining benefits of certification linked to wider adoption and imitation by non-certified producers.

According to some authors, coupling Fairtrade and Organic can be detrimental to smallholder farmers, especially in the context of degraded soil, because lower yields associated with organic farming are not always compensated by price premiums, leaving farmers worse off. If price premium alone is a neither necessary nor sufficient condition for improving smallholder income and well-being, and improvements in productivity through good agricultural practices are essential, Fairtrade can be more effective when combined with standards that promote good agricultural practices, such as Rainforest Alliance-UTZ, which can help increase yields and maintain sustainable production (Akoyi and Maertens, 2018).

Comparing the impacts of organic certification versus Fairtrade-organic certification among pepper farmers in India, Parvathi and Waibel (2016) find positive impacts but little additionality from dual certification in terms of income. However, dual certification was associated with greater asset accumulation, indicating that benefits may be realized in the long term. Additionally, the added value of dual certification might occur in certain circumstances – for example, in the same case study, the advantage of Fairtrade certification became apparent when the price of organic produce fell below the Fairtrade minimum price. Studies from coffee in Kenya (van Rijsbergen *et al*., 2016) also present a more optimistic picture, documenting significant positive effects of dual certification on yields, farm-gate prices and income.

Observed benefits were also attributed to increased investments in coffee renovation and production upgrading among multi-certified farmers, and to the longer duration of certification, suggesting that experience and accumulated learning also play a critical role. On the negative side, multiple certification led to greater specialization in coffee and a reduction of land allocated to food crops and, therefore, increasing reliance on market purchases for household food consumption. This is in line with other authors who maintain that multiple certification tends to enhance specialization (Blackman and Rivera, 2010; Ruben and Zuniga, 2011).

Overall, research suggests that while multiple certifications have the potential to provide market diversification, price security and productivity benefits, these are context-specific. Some combinations may be more effective than others, and overall impact is maximized when certification is coupled with institutional support, long-term investments and capacity building. In conclusion, multiple certification should not be pursued indiscriminately, but instead after due consideration of local agroecological conditions and production systems, and be supported by broader investments in infrastructure and capacity development.

4. Conclusions and way forward

This working paper has reviewed evidence from 2013 to 2024 on the impact of the six most influential VSS on environmental, economic and social sustainability. The review shows that impacts are mixed. If there are positive effects in some outcome variables, the effects on other outcomes might be neutral or negative. While documented impacts are sometimes small in magnitude, in all cases, they are highly context-specific and dependent on strong support systems and favourable institutional conditions.

Overall, positive or neutral impacts are more frequent then negative ones and, as summarized by Marx *et al*. (2024: 4), while *"there is no sector, region, or specific VSS that has been overwhelmingly successful in consistently meeting its stated objectives ... there are many instances of VSS improving sustainability outcomes*", provided certain enabling conditions are met. Among these conditions, the existence of well-functioning producers' organizations is consistently cited as particularly important. These organizations play a key role in facilitating coordination, improving farmers' access to inputs, training and extension, and increasing sustainability awareness at the community level (Loconto *et al*., 2021). Without tailored support, VSS risk exacerbating exclusion rather than enabling participation. The role of cooperatives and producers' alliances in reducing barriers, aggregating compliance and enhancing bargaining power is consistently found to be critical. However, previous research demonstrates that these types of benefits can be achieved even without the use of VSS (Loconto and Simbua, 2012).

Strengthening cooperatives' marketing, financial and managerial capacities, as well as their internal governance mechanisms to allow equitable distribution of gains, is a strategic interest and has been found to be a benefit achieved through Fairtrade, which focuses specifically on strengthening producer cooperatives (Loconto *et al*., 2021). This is beneficial from a buyers' perspective, where large brands are interested in maximizing productivity and the overall impact of VSS. It can also be beneficial from the perspective of the state, as part of public-private investment schemes aimed at improving the overall quality of agriculture knowledge and innovation systems.

Ensuring a clear business case for farmers – through premium prices, subsidies, long-term contracts, pre-financing, technical assistance or the adoption of a gradual approach to compliance – alongside effective monitoring mechanisms on the ground, is essential to limit selective adoption and implementation. Economic incentives are especially important in promoting the adoption of environmentally friendly practices, given the potential trade-offs with productivity and the need to compensate farmers for lower returns. Taken together, these findings suggest that the effectiveness and impacts on sustainability of the existing programmatic framework across buyers, farmers representative organizations, local institutions and NGOs might be enhanced, if guided by the direction that the VSS provide (Arnold *et al*., 2022).

Therefore, these conclusions might be better framed as two new questions for research, specifically:

- ***Do VSS add value to investments in producer cooperatives by providing a sense of direction for changes towards sustainability?***
- ***How and under which conditions do VSS add value to the existing policy mix or provide direction for transitioning current food systems towards sustainability?***

To date, no studies focusing on the sustainability impact of VSS have addressed these questions. However, studies in international relations and regulatory governance have recently begun to advance a political-strategic perspective on government responses to transnational private regulation in the Global South (Grabs, 2020, 2021; Marques and Eberlein, 2021). These papers further reinforce the above conclusion that how VSS work is highly context-dependent and that their impacts are inherently partial, and thus must be situated within broader institutional and policy frameworks. In other words, just as VSS must fit within existing supply chains, agricultural knowledge and innovation systems, rural institutions and sectoral dynamics, they must also fit into national policy mixes where governments will often "reject, substitute, adopt, repurpose or replace" a VSS, not necessarily in that order, often by mobilizing two or more of these responses at the same time (Marques and Eberlein, 2021). This means recognizing VSS as complementary tools – not substitutes – for public regulation, fiscal incentives and coordinated rural development. These reformulated questions on VSS offer a ripe area for future research.

At the same time, this review highlights a critical perspective on the limitations of VSS to address complex sustainability challenges, such as deforestation, biodiversity loss and structural inequities – issues that have multiple drivers, many of which lie outside the scope of certification schemes, as demonstrated by the analysis of their theories of change. Beyond the fact that the VSS studied here did not necessarily envision their impact as specifically as the abovementioned sustainability challenges, there is also a mismatch between the timeframes used to both incentivize compliance with VSS and to evaluate societal impacts. The adoption of VSS by farmers and actors along the supply chain is expensive – both monetarily and in terms of time – and the societal impacts are typically not identified before 15–30 years after such an initiative (Loconto, Poisot and Santacoloma, 2016).

As Glasbergen (2018) notes, VSS can play a catalytic role in embedding sustainable considerations into commodity markets, yet their transformative potential remains limited. While part of this limitation stems from structural factors (e.g. the asymmetric distribution power in value chains, or the oversupply of certain commodities, eroding the economic potential of certification), the inherently narrow focus of VSS is problematic. For example, certification schemes can improve forest management practices but cannot address land use change driven by agriculture expansion, nor can they prevent the displacement of negative externalities from certified to non-certified farms. These issues underscore the need for broader place-based and landscape strategies and legal safeguards, such as binding regulations, to complement market-based certification. Similarly, commodity-focused certification systems are not equipped to address farmers' most urgent needs, such as climate change adaptation, income diversification or land tenure security. This calls for the integration of VSS within comprehensive rural development policies that help farmers plan for resilience and support agriculture *as a whole*, not just individual crops (Thompson *et al*., 2022). Greater attention must also be paid to the perspective of producers – whose voice has historically been underrepresented in certification systems – and the structural constraints they face. In conclusion, achieving deeper and more lasting transformations in food systems will require moving beyond fragmented, market-driven approaches towards governance models that embed VSS within public regulations, local institutions and producer-driven solutions.

Returning to the specifics of VSS, impact studies and related research can be vital in further elucidating how VSS design features influence their efficacy in achieving their intended impacts. They can also help identify gaps and "ambiguous criteria" that require further definition to limit room for interpretation and strengthen accountability. In practice, however, reforming VSS design might be complex. As discussed, VSS are not neutral or purely technical instruments; their criteria reflect a contested understanding of sustainability, and experiences of unsustainability, shaped through negotiation between actors who hold unequal power and who live in very different spheres of production and consumption (Constance, Konefal and Hatanaka, 2018). Furthermore, despite the common institutional architecture in the six VSS depicted in this study, they present divergent theories of change and strategic emphasis – for instance, Fairtrade and organic prioritize social equity or ecological principles, whereas RSPO and MSC are shaped

more by risk mitigation and supply chain concerns. These dynamics are examined further by Loconto *et al*. (2025) through an analysis of VSS institutional designs and the techno-politics of three controversial criteria (i.e. carbon, biodiversity and pesticides).

As already noted, future research should aim to further clarify and rigorously assess enabling conditions, barriers and impact pathways using mixed (qualitative and quantitative) methods (Oya, Schaefer and Skalidou, 2018). It should also expand its focus to underrepresented VSS, crops and countries, as the current over-concentration of studies on a limited number of VSS, crops and countries limits the ability to generalize results (Traldi, 2021). Another issue to be tackled is insufficient rigour in research**.** The absence of credible counterfactuals, the use of different metrics to measure impacts – only the use of standardized metrics can allow rigorous comparison of results – and the paucity of longitudinal studies to improve understanding of how VSS adoption, compliance and impacts evolve over time, are all major weaknesses in research (Bray and Neilson, 2017; DeFries *et al*., 2017; Oya, Schaefer and Skalidou, 2018; Nava and Tampe, 2023; Traldi, 2021).

In a context where competing standards proliferate, creating a confusing landscape for both producers and consumers, more research is needed to determine the conditions under which dual or multiple certification leads to added value, and when it merely increases the cost burden for producers. Finally, since the overall impact of certification is shaped by the combined economic, environmental and social outcomes that certification standards produce in specific contexts, there is an increasing need for studies which examine all three pillars simultaneously and assess the potential synergies and trade-offs between them. Such an approach would align with the growing use of systemic methods to understand the interconnections and interdependencies within the entire food system, and better address the complex sustainability challenges faced today, particularly those related to transparency and oversight mechanisms, to ensure that VSS do not entrench existing power asymmetries. VSS will not resolve on their own the sustainability challenges, but with the right institutional environment they can contribute in meaningful ways, particularly by shaping norms, improving practices and enhancing transparency in supply chains. The challenge now is to move from isolated interventions to integrated strategies that link VSS with public goods, regulatory reform and inclusive rural development.

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Annex 1. Descriptive statistics of the evidence base

The evidence base for this paper consists of 76 primary studies, in addition to 32 reviews. Approximately three-quarters of the primary studies focus on a single pillar of sustainability – most commonly the environmental and economic dimensions, which each account for around 30 percent of the total. Only about a quarter of the studies examined two or more sustainability pillars simultaneously (Figure 1). A disaggregation of multi-pillar studies shows, again, a predominant focus on the economic and environmental aspects, with comparatively less attention given to the social dimension (Figure 2).

Figure A1

Primary studies by sustainability pillar (%)

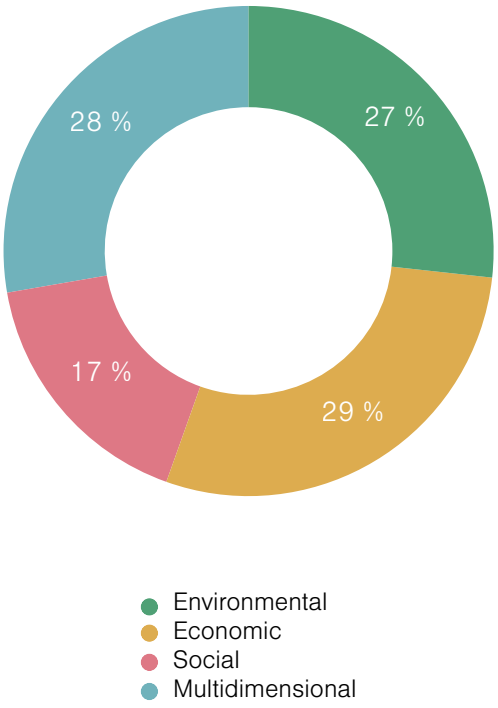
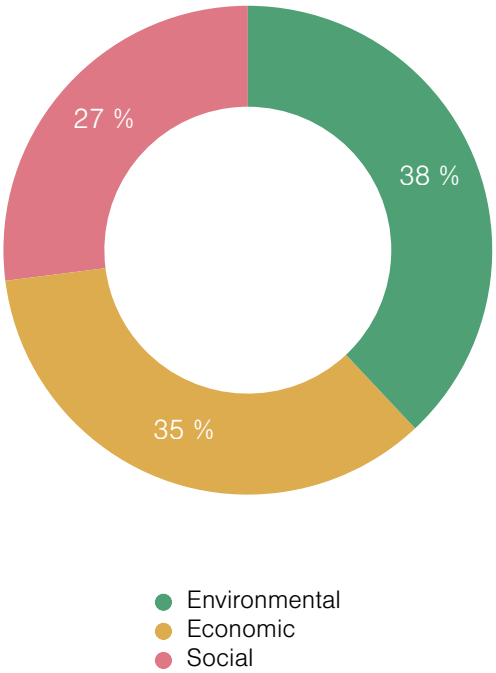


Figure A2

Breakdown of primary studies with multi-pillar approach, by type of sustainability outcome (%)



Among the studies that address all three pillars of sustainability, many employ the Sustainable Livelihoods Approach (SLA). This framework assesses the impact of VSS adoption on smallholders' assets across five dimensions: physical, financial, human, social and environmental capital. SLA thus emerges as a valuable framework for analysing trade-offs between sustainability dimensions. However, it is important to note that most studies using SLA rely primarily on qualitative data and self-assessments rather than objective measurements.

The most studied commodity is coffee (38 percent of studies),[1] followed at a considerable distance by forestry (19 percent), palm oil (16 percent), cocoa and horticulture (11 percent). Tea and fisheries are the least studied, with only one study each. Other commodities – grouped under "other" due to limited representation – include nuts and spices (Figure 3). This commodity focus on coffee is reflected also in the predominance of certain VSS, namely Fairtrade (30 percent), often studied in combination with organic (23 percent) (Figure 4).

Figure A3

Primary studies by sector or commodity (%)

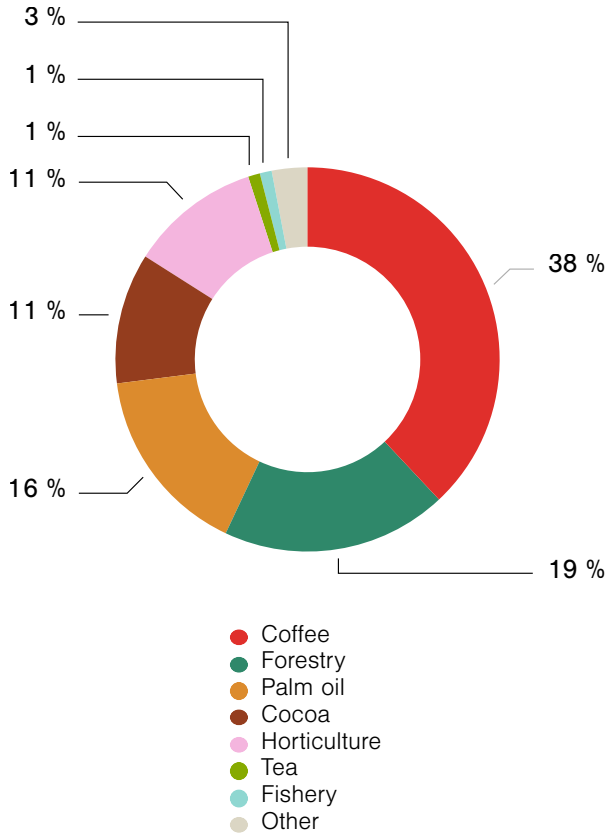
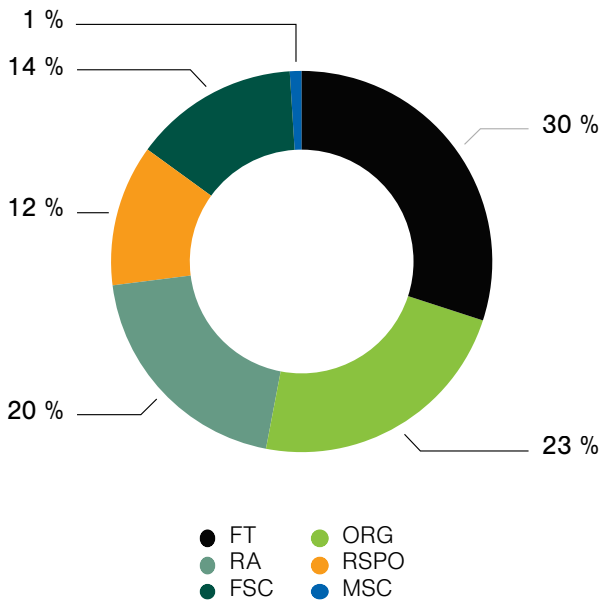


Figure A4

Primary studies by VSS (%)

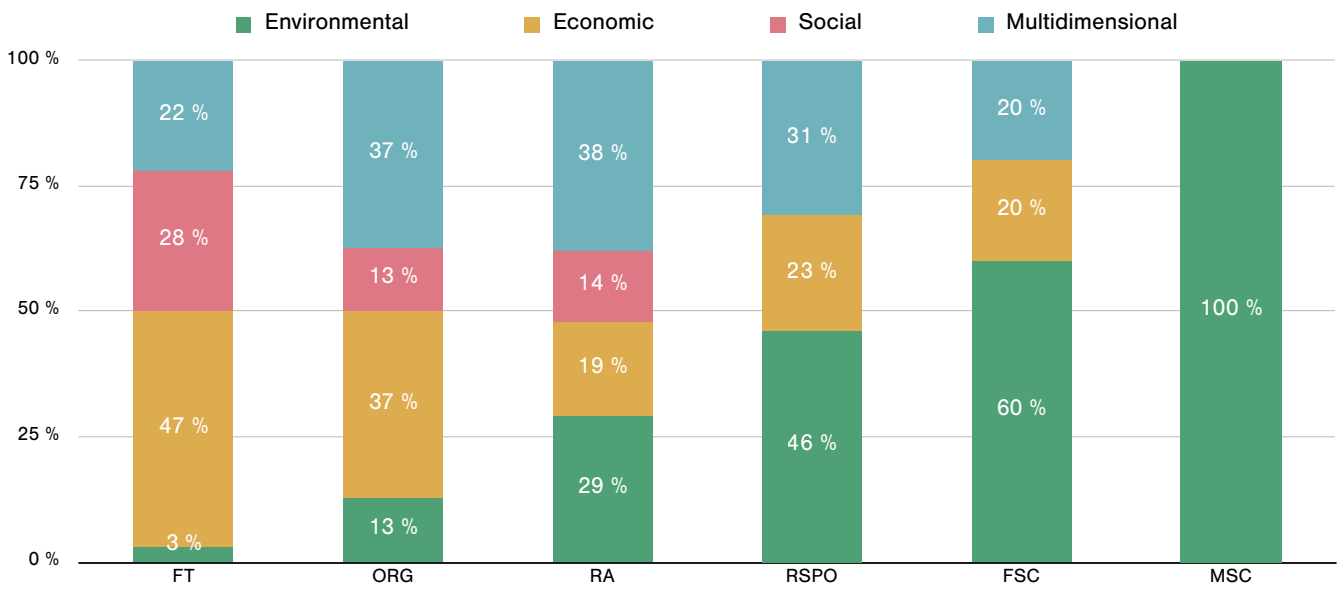


The analysis also indicates that primary studies on FSC and RSPO tend to focus primarily on environmental impacts, whereas those examining the Fairtrade and organic standards are more oriented toward economic impacts. Social aspects are most frequently analysed in relation to Fairtrade, and to a lesser extent, Rainforest Alliance and organic. While it might seem somewhat surprising that studies on organic are concerned with social impact (considering the lack of social criteria in this particular VSS), it should be borne in mind that organic is often implemented jointly with other standards, such as Fairtrade and Rainforest Alliance, as part of dual or multiple certification schemes. Among the studies reviewed, those focused on Rainforest Alliance exhibit the most balanced coverage across all three pillars of sustainability. The focus of multi-pillar studies is quite evenly spread across VSS, although Rainforest Alliance and organic rank higher (each accounting for 38 percent of multi-pillar studies).

[1] It is important to note that many studies assess multiple crops, standards or countries simultaneously; therefore, the totals presented reflect the number of instances or mentions across studies, not the number of unique studies.

Figure A5

Primary studies by sustainability pillar (%)



Finally, the geographical focus of the studies is highly concentrated: just eight countries – Indonesia, Uganda, Ghana, Peru, Nicaragua, India, Ethiopia and Brazil – account for 60 percent of all mentions, and Indonesia alone accounts for the 14 percent of studies (10 primary studies).

Annex 2. **Database search string**

For the database search described in section 2.2, a title, abstract and keyword search was performed in the Scopus database, using the following extensive string to cover a wide range of VSS:

(TITLE-ABS-KEY ((“certificat*” OR “sust* standard” OR “voluntary sustainability standard” OR “third-party certificat*” OR “organic farm*” OR “organic agri*” OR “organic food” OR “organic label” OR “demeter” OR “biodynam*” OR “fair trad*” OR “Fairtrade” OR “equitable trade” OR “commerce equitable” OR “comercio justo” OR “Rainforest Alliance” OR “UTZ” OR “UTZ Kapeh” OR “GlobalGAP” OR “RSPO” OR “Sustainable Palm Oil” OR “RTRS” OR “Responsible Soy” OR “4C” OR “Global Coffee Platform” OR “C.A.F.E practices” OR “CAFE practices” OR “Cotton made in Africa” OR “Bonsucro” OR “FSC” OR “Forest Stewardship Council” OR “Marine Stewardship Council” OR “PEFC” OR “Programme for the Endorsement of Forest Certification” OR “ASC” OR “Aquaculture Stewardship Council” OR “Max Havelaar” OR “Fair Handel” OR “Fairtrade USA” OR “direct trade” OR “Bean to Bar” OR “Farm to table”)) AND TITLE-ABS-KEY (“Impact” AND “Sust*”)) AND PUBYEAR > 2012 AND PUBYEAR < 2025 AND (LIMIT-TO (SRCTYPE , “j”)) AND (LIMIT-TO (DOCTYPE , “ar”)) AND (LIMIT-TO (SUBJAREA , “SOCI”) OR LIMIT-TO (SUBJAREA , “ENVI”) OR LIMIT-TO (SUBJAREA , “AGRI”) OR LIMIT-TO (SUBJAREA , “BUSI”) OR LIMIT-TO (SUBJAREA , “ECON”).

Annex 3. Full list of studies

Table A1. **Primary studies**

REFERENCE	SUSTAINABILITY PILLAR	STANDARD	COMMODITY/ SECTOR	COUNTRY/ REGION
Akoyi & Maertens (2018)	Economic	FT, ORG, RA	Coffee	Uganda
Akoyi, K. T., Mitiku, F. & Maertens, M. (2020)	Social	FT, ORG, RA	Coffee	Ethiopia, Uganda
Alveira, M., de Bustos, S. & Tálamo, A. (2023)	Environmental	FSC	Forestry	Argentina
Asigbaase, M., Lomax, B. H., Dawoe, E. & Sjogersten, S. (2021)	Multi-pillar	ORG	Cocoa	Ghana
Azhar, B., Saadun, N., Puan, C. L., Kamarudin, N., Aziz, N., Nurhidayu, S. & Fischer, J. (2015)	Environmental	RSPO	Palm Oil	Malaysia
Babin, N. (2015)	Economic	FT	Coffee	Costa Rica
Blackman, A., Goff, L. & Rivera Planter, M. (2018)	Environmental	FSC	Forestry	Mexico
Blockeel, J., Schader, C., Heidenreich, A., Grovermann, C., Kadzere, I., Egyir, I.S., Muriuki, A. *et al.* (2023)	Multi-pillar	ORG, RA	Cocoa and macadamia nuts	Ghana, Kenya
Bocci, C. & Fortmann, L. (2023)	Environmental	FSC	Forestry	Guatemala
Bocci, C., Fortmann, L., Sohngen, B. & Milian, B. (2018)	Economic	FSC	Forestry	Guatemala
Boonaert, E. & Maertens, M. (2023)	Economic	FT, ORG	Coffee and banana	Peru
Brako, D.E., Richard, A. & Alexandros, G. (2021).	Multi-pillar	FT, ORG	Palm oil and cocoa	Ghana
Campos Cerqueira, M., Mena, J.L., Tejeda Gómez, V., Aguilar Amuchastegui, N., Gutierrez, N. & Aide, T.M. (2020)	Environmental	FSC	Forestry	Peru
Carlson, A. & Palmer, C. (2016)	Economic	FSC, MSC	Forestry and fishery	Developing countries
Carlson, K.M., Heilmayr, R., Gibbs, H.K., Noojipady, P., Burns, D.N., Morton, D.C., Walker, N.F. *et al.* (2018)	Environmental	RSPO	Palm oil	Indonesia

REFERENCE	SUSTAINABILITY PILLAR	STANDARD	COMMODITY/SECTOR	COUNTRY/REGION
Cattau, M.E., Marlier, M.E. & DeFries, R. (2016)	Environmental	RSPO	Palm oil	Indonesia
Chiputwa, B., Spielman, D. & Qaim, M. (2015)	Multi-pillar	FT, ORG	Coffee	Uganda
Da Silva, R.F.B., Batistella, M., Palmieri, R., Dou, Y. & Millington, J.D. (2019)	Environmental	FSC	Forestry	
d'Albertas, F., Ruggiero, P., Pinto, L.F.G., Sparovek, G. & Metzger, J. P. (2023)	Environmental	RA	Coffee	Brazil
De Vos, R.E., Suwarno, A., Slingerland, M., Van Der Meer, P.J. & Lucey, J.M. (2021)	Environmental	RSPO	Palm oil	Indonesia
Dietz, T., Grabs, J. & Chong, A.E. (2021)	Multi-pillar	FT, ORG, RA	Coffee	Honduras
Dinh, H.H., Le, L.T. & Wesseler, J. (2024)	Economic	FSC	Forestry	Viet Nam
Doremus, J. (2019)	Multi-pillar	FSC	Forestry	Congo
Dröge, S., Verbist, B., Maertens, M. & Muys, B. (2024)	Environmental	FT, ORG, RA, RSPO	Cocoa, coffee, tea, palm oil, banana	Global (67 tropical countries)
Estrella, A., Navichoc, D., Kilian, B. & Dietz, T. (2022)	Economic	FT	Coffee	Honduras
Eyhorn, F., Van den Berg, M., Decock, C., Maat, H. & Srivastava, A. (2018)	Economic	ORG	Rice	India
Fenger, N.A., Bosselmann, A.S., Asare, R. & de Neergaard, A. (2016)	Multi-pillar	RA	Cocoa	Ghana
Francesconi, G.N. & Ruben, R. (2014)	Economic	FT	Coffee	The United Republic of Tanzania
Garcia, E., Corral, J. J., López, P. M., Cubbage, F., Ramírez, H., Cervantes, J. A. & Montiel, E. (2023)	Multi-pillar	FSC	Forestry	Mexico
Gutiérrez, N.L., Valencia, S.R., Branch, T.A., Agnew, D.J., Baum, J.K., Bianchi, P.L., Cornejo-Donoso, J. *et al.* (2012)	Environmental	MSC	Fishery	Global

REFERENCE	SUSTAINABILITY PILLAR	STANDARD	COMMODITY/SECTOR	COUNTRY/REGION
Hafizuddin-Syah, B.A.M., Shahida, S. & Fuad, S. H. (2018).	Economic	RSPO	Palm oil	Malaysia
Haggar, J., Soto, G., Casanoves, F. & Virginio, E.D.M. (2017)	Multi-pillar	FT, ORG, RA	Coffee	Nicaragua
Hamid, A.H., Nugroho, A., Pospos, T.H. & Suherman, G. (2023)	Economic	FT, ORG	Coffee	Indonesia
Hardt, E., Borgomeo, E., dos Santos, R. F., Pinto, L. F. G., Metzger, J. P. & Sparovek, G. (2015)	Environmental	RA	Coffee	Brazil
Heilmayr, R., Carlson, K.M. & Benedict, J.J. (2020)	Environmental	RSPO	Palm oil	Indonesia
Heredia-Telles, A., López-Serrano, P.M., Molinier, M. & Wehenkel, C. (2023).	Environmental	FSC	Forestry	Mexico
Jena, P.R. & Grote, U. (2017)	Economic	FT	Coffee	India
Jena, P.R.(2012)	Economic	FT	Coffee	Ethiopia
Jena, P.R., Stellmacher, T. & Grote, U. (2017)	Economic	FT, ORG	Coffee	Nicaragua
Jena, P. R. & Grote, U. (2022).	Economic	FT	Coffee	India, Ethiopia, Nicaragua
Kalonga, S.K. & Kulindwa, K.A. (2017)	Economic	FSC	Forestry	The United Republic of Tanzania
Kang, S., Frick, F., Ait Sidhoum, A., Sauer, J. & Zheng, S. (2023)	Multi-pillar	ORG	Vegetables	China
Kangile, J.R., Kadigi, R. M., Mgeni, C.P., Munishi, B.P., Kashaigili, J. & Munishi, PK. (2021)	Multi-pillar	FT, ORG, RA	Coffee	The United Republic of Tanzania
Kehou, S.T., Daïnou, K. & Lagoute, P. (2021)	Environmental	FSC	Forestry	Cameroon
Kleemann, L. & Abdulai, A. (2013)	Environmental	ORG	Pineapple	Ghana

REFERENCE	SUSTAINABILITY PILLAR	STANDARD	COMMODITY/SECTOR	COUNTRY/REGION
Knößlsdorfer, I., Sellare, J. & Qaim, M. (2021)	Social	FT	Cocoa	Côte d'Ivoire
Krumbiegel, K., Maertens, M. & Wollni, M. (2018)	Social	FT	Pineapple	Ghana
Lee, J.S.H., Miteva, D.A., Carlson, K.M., Heilmayr, R. & Saif, O. (2020)	Multi-pillar	RSPO	Palm oil	Indonesia
Meemken, E., Sellare, J., Kouame, C. & Qaim, M. (2019)	Social	FT	Cocoa	Côte d'Ivoire
Meemken, E.M, Spielman, D.J. & Qaim, M. (2017)	Social	FT, ORG	Coffee	Uganda
Meemken, E.M. & Qaim, M. (2018)	Social	FT	Coffee	Uganda
Minten, B., Dereje, M., Engida, E. & Tamru, S. (2018)	Multi-pillar	FT, ORG	Coffee	Ethiopia
Miteva, D.A., Loucks, C.J. & Pattanayak, S.K. (2015)	Multi-pillar	FSC	Forestry	Indonesia
Mitiku, F., De Mey, Y., Nyssen, J. & Maertens, M. (2017)	Economic	FT, ORG, RA	Coffee	Ethiopia
Morgans, C.L., Meijaard, E., Santika, T., Law, E., Budiharta, S., Ancrenaz, M. & Wilson, K.A. (2018)	Multi-pillar	RSPO	Palm oil	Indonesia
Navichoc, D., Alamneh, M., Batistic, P.M., Dietz, T. & Kilian, B. (2024)	Economic	FT, RA	Coffee	Honduras
Panlasigui, S., Rico-Straffon, J., Pfaff, A., Swenson, J. & Loucks, C. (2018)	Environmental	FSC	Forestry	Cameroon
Parvathi, P. & Waibel, H. (2016)	Economic	FT, ORG	Black pepper	India
Rico-Straffon, J., Wang, Z., Panlasigui, S., Loucks, C.J., Swenson, J. & Pfaff, A. (2023)	Environmental	FSC	Forestry	Peru
Rijsbergen, B.V., Elbers, W., Ruben, R. & Njuguna, S.N. 2016	Multi-pillar	FT	Coffee	Kenya

REFERENCE	SUSTAINABILITY PILLAR	STANDARD	COMMODITY/SECTOR	COUNTRY/REGION
Rueda, X. & Lambin, E. F. (2013)	Multi-pillar	RA	Coffee	Colombia
Rueda, X., Thomas, N.E. & Lambin, E.F. (2015).	Environmental	RA	Coffee	Colombia
Sanderson-Bellamy, A., Svensson, O., van den Brink, P.J. & Tedengren, M. (2016)	Environmental	RA	Banana	Costa Rica
Santika, T., Wilson, K.A., Law, E.A., St John, F.A., Carlson, K.M., Gibbs, H. & Struebig, M.J. (2021).	Multi-pillar	RSPO	Palm oil	Indonesia
Saswattecha, K., Kroeze, C., Jawjit, W. & Hein, L. (2015)	Environmental	RSPO	Palm oil	Thailand
Schuster, M. & Maertens, M. (2016)	Social	FT, RA	Horticulture	Peru
Schuster, M.,. & Maertens, M. (2017)	Social	FT, RA	Horticulture	Peru
Sellare, J., Meemken, E.M. & Qaim, M. (2020)	Multi-pillar	FT	Cocoa	Côte d'Ivoire
Suroso, A.I., Tandra, H. & Wahyudi, I. (2021)	Economic	RSPO	Palm oil	Indonesia
Tankam, C. & Djimeu, E.W. (2020)	Environmental	ORG	Fruits and vegetables	Kenya
Thompson, W., Blaser-Hart, W., Joerin, J., Krütli, P., Dawoe, E., Kopainsky, B. *et al*. (2022)	Environmental	ORG, RA	Cocoa	Ghana
Tritsch, I., Velly, G.L., Mertens, B., Meyfroidt, B., Sannier, C., Makak, J.S. & Houngbedji, K. (2020)	Environmental	FSC	Forestry	Congo Basin
Valkila, J. (2014)	Economic	FT	Coffee	Nicaragua
Vanderhaegen, K., Akoyi, K.T., Dekoninck, W., Jocqué, R., Muys, B., Verbist, B. & Maertens, M. (2018)	Multi-pillar	FT, ORG, RA	Coffee	Uganda
Zhang, L., Liu, D., Yin, Q. & Liu, J. (2024)	Economic	ORG	Apple	China

REFERENCE	SUSTAINABILITY PILLAR	STANDARD	COMMODITY/SECTOR	COUNTRY/REGION
Abdul Majid, N., Ramli, Z., Md Sum, S. & Awang, A.H. (2021)	Multi-pillar	RSPO	Palm oil	Global
Barreto Peixoto, J.A., Silva, J.F., Oliveira, M.B.P.,. & Alves, R.C. (2023)	Multi-pillar	All/unspecified	Coffee	Global
Bray, J. & Neilson, J. (2017)	Multi-pillar	All/unspecified	Coffee	Global
Dammert, A.C. & Mohan, S. (2015)	Multi-pillar	FT	Unspecified	Global
DeFries, R.S., Fanzo, J., Mondal, P., Remans, R. & Wood, S.A. (2017)	Multi-pillar	All/unspecified	Banana, cocoa, coffee, oil palm and tea	Global
Di Girolami, E., Kampen, J., & Arts, B. (2023)	Environmental	All/unspecified	Forests	Global
de Melo, M.T.G., da Silva Barros, J.M., Ribeiro, A.R.B., Lima, T.L.D. A. & Sobral, M.F.F. (2024)	Multi-pillar	MSC	Fishery	Global
Garrett, R.D., Carlson, K.M., Rueda, X. & Noojipady, P. (2016)	Environmental	RSPO, RTRS	Soybean, palm oil	Main producing countries
Garrett, R.D., Levy, S.A., Gollnow, F., Hodel, L. & Rueda, X. (2021)	Multi-pillar	All/unspecified	Coffee, oil palm, soy	Global
Jones, K., Njeru, E.M., Garnett, K. & Girkin, N. (2024)	Multi-pillar	FT, ORG, RA	Coffee	Global
Lambin, E.F., Gibbs, H.K., Heilmayr, R., Carlson, K.M., Fleck, L.C., Garrett, R.D., le Polain de Waroux, Y. *et al.* (2018)	Environmental	All/unspecified	Forestry	Global
Martins, K.F., Teixeira, D., & de Oliveira Corrêa, R. (2022)	Multi-pillar	All/unspecified	Unspecified	Global
Marx, A., Depoorter, C. & Vanhaecht, R. (2022)	Multi-pillar	All/unspecified	Unspecified	Global
Marx, A., Depoorter, C., Fernandez de Cordoba, S., Verma, R., Araoz, M., Auld, G. & van der Ven, H. (2024)	Multi-pillar	All/unspecified	Unspecified	Global
Meemken, E.M., Barrett, C.B., Michelson, H.C., Qaim, M,, Reardon, T. & Sellare, J. (2021)	Multi-pillar	All/unspecified	Unspecified (excluding forestry, fishery and garment)	Global

REFERENCE	SUSTAINABILITY PILLAR	STANDARD	COMMODITY/SECTOR	COUNTRY/REGION
Meemken, E.M. (2020).	Economic	All/unspecified	Unspecified	Global
Ogahara, Z., Jespersen, K., Theilade, I. & Nielsen, M. R. (2022)	Multi-pillar	All/unspecified	Palm oil	Global
Oya, C., Schaefer, F. & Skalidou, D. (2018)	Multi-pillar	All/unspecified	Unspecified	Global
Pérez-Ramírez, M., Castrejón, M., Gutiérrez N.L. & Defeo, O. (2016)	Economic	MSC	Fisheries	LAC
Rahmat, S.R., Khan, H.H., Badaruddin, R.F.R., Mohamad, M.F. & Samsurijan, M.S. (2021)	Economic	ORG	Paddy	Malaysia
Rosdin, R., Cheah, W.Y. & Moslim, R. (2023)	Economic	RSPO	Palm oil	Global
Rossi, C., Shen, L., Junginger, M. & Wicke, B. (2024)	Multi-pillar	All/unspecified	Palm oil, cotton, sugarcane, soybean, forestry	Global
Ruben, R. (2017)	Multi-pillar	All/unspecified	Coffee, tea, banana, cocoa, cotton	Global
Rubio, D.I.C., Delgado, D.R. & Amaya, A.O. (2023)	Multi-pillar	RA	Coffee	Colombia
Rusli, A.L. & Fatah, F.A. (2022)	Economic	All/unspecified	Cocoa	Global
Ruysschaert, D. & Salles, D. (2014)	Environmental	RSPO	Palm oil	Indonesia
Schleifer, P. & Sun, Y. (2020)	Social	All/unspecified	Unspecified	Global
Tey, Y.S., Brindal, M., Djama, M., Hadi, A.H.I.A. & Darham, S. (2021)	Economic	RSPO	Palm oil	Global
Traldi, R. (2021)	Multi-pillar	All/unspecified	Unspecified	Global
Tscharntke, T., Milder, J.C., Schroth, G., Clough, Y., DeClerck, F., Waldron, A., Rice, R. *et al.* (2015)	Environmental	All/unspecified	Coffee, cocoa	Global
Wolff, S. & Schweinle, J. (2022)	Multi-pillar	FSC	Forestry	Global

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