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Biodiversity Protection through Networks of Voluntary Sustainability Standard Organizations?

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Abstract: This paper explores the potential for voluntary sustainability standards (VSS) organizations to contribute to policy-making on biodiversity protection by examining their biodiversity policies, total standard compliant area, proximity to biodiversity hotspots, and the networks and partnerships they have in place that can support policy-making on biodiversity protection. The analysis undertaken is based on Social Network Analysis data, in combination with information from the International Institute for Sustainable Development (IISD) Standards and Biodiversity Review and the International Trade Centre (ITC) Standards Map on the focus and operation of VSS organizations. The significance of agriculture-focused private governance for global biodiversity policy and their relationship towards other forms of nongovernmental, governmental, and inter-governmental biodiversity policy are examined and described. We argue that, at present, a number of key agriculture-focused VSS organizations are important policy actors to address biodiversity because of their elaborate biodiversity policies, total compliant areas, and proximity to biodiversity hotspots. However, at present, most of these VSS organizations have relatively few ties with relevant governmental and inter-governmental biodiversity policymakers. The actor composition of their inter-organizational networks currently reflects a focus on nongovernmental rather than governmental organizations while substantively they focus more on development than on environmental protection issues.

Keywords: biodiversity; standards; sustainability; networks; hotspots; agriculture

1. Introduction

Policymakers and academics alike are interested in the degree to which Voluntary Sustainability Standard (VSS) policies can contribute positively to biodiversity and/or prevent harm to biodiversity [1]. Issues for discussion include halting deforestation, protecting particular animal and plant species, and preventing soil erosion and its consequences. This interest, at least in part, can be explained by the perceived stalemate in the development of inter-governmental policy-making on

biodiversity [2]. VSS organizations, as policy actors developing and governing sustainability-standards, are among a variety of actors and institutions believed to potentially be more active in promoting cross-border advances in biodiversity. VSS organizations may, therefore, potentially be a more dynamic and effective hands-on global biodiversity protection and promotion practice than inter-governmental decision-making has achieved.

Conversely, studies on contemporary agricultural VSS organization efforts to protect biodiversity signals that they are limited to what they can achieve. VSS organization interventions are limited to the agricultural land supporting standard compliant production [3]. VSS organization biodiversity policy, therefore, is constrained in its scale and its contribution to protection [4]. This implies that VSS policymakers cannot go it alone when it comes to addressing biodiversity. VSS organization policy-making efforts to protect biodiversity should therefore be assessed by their potential for collective action and ability to engage with other governance organizations and institutions.

This study takes inspiration from a burgeoning literature studying VSS organization interactions and public-private interactions in the sustainability standard-setting [5–9], and examines the degree to which VSS organizations' current connections with one another, with other non-governmental parties, and with (inter-)governmental treaties, laws, and organizations allow for collectively advancing biodiversity goals. Using policy document and social network analysis [10], the paper assesses the stringency of current VSS biodiversity criteria, compliant land areas and their proximity to biodiversity hotspots, and the degree to which VSS organizations are embedded in networks that allow for collective action in tackling barriers to scaling up and strengthening biodiversity protection.

The study first draws from datasets from Fransen et al. [5], which focused on VSS organizations governing global agro-commodity chains, such as coffee, tea, cocoa, sugar, palm oil, cotton, soy, and flowers. Information from these datasets is then complemented by data on these commodities from the International Institute for Sustainable Development Sustainability Standards Initiative report on standards and biodiversity [1], the International Trade Centre's Standards Map data, and the recent groundbreaking study by Tayleur et al. [11] on the location of agriculture-focused VSS organization standard-compliant areas. As is the convention in academic and grey literature on VSS [1,5,11], we focus on multiple crops, given how many VSS organizations themselves focus on various crops and are therefore expected to affect policy-making on various crops. Combining these four data sources allows us to analyze 11 relevant VSS focused on agro-commodities. To our knowledge, this is the first time that large-N network, geographic data, and VSS organization performance data are combined in this way to make sense of VSS organizations' collaborative potential and potential to cross-fertilize with (inter-)governmental organizations and other actors on an issue area, such as biodiversity.

We argue that a few key agriculture-focused VSS organizations are important policy actors to address biodiversity because of their elaborate biodiversity policies, total compliant areas, and proximity to biodiversity hotspots. However, at present, most of these VSS organizations have relatively few ties with relevant governmental and inter-governmental biodiversity policymakers. Currently, their policy networks, in terms of actors, reflect an orientation towards nongovernmental rather than governmental organizations, and, substantively, an orientation towards developmental rather than environmental protection issues.

The following section examines the literature on VSS organizations and biodiversity. Section 3 presents the datasets and methodological approach that were used for the analysis. Section 4 discusses VSS organization biodiversity policies, coverage, and their networks while Section 5 provides some concluding thoughts.

2. Transnational Private Sustainability Governance Organizations and Biodiversity Policy

2.1. The Emergence of Agro-Commodity Focused VSS

The first wave of agricultural VSS organizations arose via individuals concerned with the impacts of industrialized and intensive forms of agriculture [12,13]. In the US, many individuals were connected

via their readership of The Rodale Institute's magazine, Organic Farming and Gardening [14]. In 1972, national organizations working on organic agriculture launched the International Federation of Organic Agriculture Movements (IFOAM) to facilitate information exchange on organic practices and the development of common principles [15]. Fairtrade certification is similarly rooted in diffuse communities interested in alternative trade organizations in Europe and North America since the 1950s. The European Fair Trade Association was formed in 1987 to help national fair trade initiatives share experiences and ideas [16]. By 1997, the Fairtrade Labeling Organizations International (now Fairtrade International or FLO) was established, which now coordinates the standards and labeling work of over a dozen national initiatives [17].

Following a different process, more recent VSS have included dominant actors (e.g., certain Non-Governmental Organizations (NGOs) and retailers) that decide to establish a VSS alone or with a small group of partners and because of multi-stakeholder platforms that have emerged in specific agro-commodities. The WWF has been prominent in this role; it has played a role in establishing initiatives for palm oil (the Roundtable for Sustainable Palm Oil, RSPO) [18], soy (the Roundtable for Responsible Soy) [19]), sugar, and cotton (Bonsucro and Better Cotton Initiative, BCI) [20,21]. Retailers, government development agencies, and philanthropic foundations have helped launch VSS organizations, such as Utz Certified and Cotton made in Africa [20,22].

Recently, scholars have turned their attention to the degree to which VSS organization interactions with other VSS organizations may shape the effects of VSS on sustainable production, rather than studying the effects of VSS on production in isolation [23].

Scholars emphasize that the proliferation of VSS has led to coordination problems, making collective action more complicated. First, competitive interactions may arise when VSS organizations have a similar policy focus and address similar sectors. Competition among VSS organizations may stimulate standard revisions that could benefit effective governance [24], but competition may also lead to implementation challenges, rising costs, and stakeholder confusion [25,26]. Second, VSS organizations that have different policy foci may be less productive in addressing issues that surpass their respective sustainability scope [3]. Authors argue that embedding VSS organizations in networks may help foster more collaborative responses to these challenges [27].

In contemporary VSS policymaking, understanding interactions among organizations descriptively may help us assess the potential for VSS organization's collaboration with other relevant governance actors to address complex sustainability challenges [5]. This is also in line with an evolving research agenda looking at the interactions between VSS organizations and (inter-)governmental policymakers. Interactions studied include partnering among public actors and VSS organization's representatives [28], delegation of or orchestration of (inter-)governmental rules towards VSS [6,9], meta-governance of VSS by governments and international organizations [29], and lobbying by VSS organization representatives towards governmental organizations and vice versa [8].

2.2. VSS and Biodiversity

Collective action among VSS organizations, and interactions between VSS organizations and inter-governmental policy-making, is of special concern in light of their potential for contributing to biodiversity protection. VSS are viewed by policy makers and analysts as a relatively flexible approach to biodiversity protection with some promise. Decades of inter-governmental policy-making have left the world with a set of treaty texts on biodiversity that are mutually inconsistent, lacking in enforcement mechanisms, and prone to varied interpretation by signatory states [2]. Moreover, because of the successful institutional development of international trade governance through the World Trade Organization, and particularly the judicialization of trade dispute resolution among member states, environmental concerns politically tend to lose out relative to the efforts at governing the free flow of goods across borders [30]. Non-state actors, such as VSS organizations, working towards biodiversity protection are perceived as more meaningful, hands-on, and a vehicle for implementing treaties.

VSS organizations focused on agro-commodities are especially relevant given how the agricultural sector, operating on large tracts of land, impacts biodiversity.

Recent studies have therefore sought to gain insight into the potential for VSS to protect biodiversity. Studies focused on VSS organizations operating in the forestry, fisheries, and agro-commodity sectors offer slightly different results regarding biodiversity policy focus and impact. The literature identifies biodiversity protection in the policies and criteria of agricultural VSS organizations [31,32]. In terms of observed impacts, there is evidence that standard compliant farms are more biodiversity-friendly than non-standard compliant farms. However, this claim is not tested for the selection-effect: Farmers that are in a better position to advance biodiversity may opt for certification more than farmers that are less able to do so [33,34]. Observed positive effects include less deforestation, higher species richness, and healthier riparian zones [35,36].

The literature also signals limits to the biodiversity protection policies of VSS organizations, related to the main purpose of VSS as market actor-dependent-instruments. VSS generally are more focused on and better at promoting practices of conservation at the farm than beyond [33], and do a better job of preventing biodiversity harm than promoting biodiversity benefits [34]. They can struggle to offer direct economic benefits to farmers, which may reduce farmer enthusiasm for biodiversity protection [31]. As largeholders have more resources to become certified compared to smallholders, VSS policies are less likely to impact smallholder farms. Moreover, standard-compliant largeholder farms contributing to forest conservation often cannot contribute to habitat conservation [32,37]. Finally, VSS organizations' stakeholders' focus on expanding economic activities that transform natural resources limits the ability to implement policies that limit these transformations [38].

The International Institute for Sustainable Development (IISD) published a report [1] comprehensively dealing with VSS potential to impact biodiversity. To examine how VSS criteria are enabling biodiversity protection on agricultural landscapes, it uses the Biological Impact Indicators for Commodity Production (BIICP) developed by the Secretariat of the Convention on Biological Diversity and its partners. The report finds, first, that at present pace, the VSS examined will represent 10% of production volumes in eight markets (bananas, coffee, cocoa, tea, sugar, palm oil, soybean, and cotton) by 2020, but the agricultural area dedicated to these commodity sectors constitute less than 12% of the global agricultural land area. This means that significant presence in other crops is needed for VSS organizations to have a more meaningful impact on biodiversity protection; second, while most VSS analyzed have a clear emphasis on habitat conversation, only a few focus on climate change, another important driver of biodiversity loss; third, most standards prescribe practices rather than performance outcomes when it comes to biodiversity protection; fourth, it would appear that VSS organizations may not be operating in zones where there are the greatest threats to biodiversity and the absence or proprietary nature of geographic information system data on standard compliant farms prevents a more accurate assessment.

For this reason, many studies propose that the VSS approach to biodiversity protection should be complemented by other policy instruments that ensure that a broader set of biodiversity criteria is addressed, other lands are targeted, or biodiversity is addressed at the landscape rather than the farm level, enabling a more holistic approach to biological protection [32,39]. Complementary interactions should be sought with domestic law and enforcement and other government initiatives in producing countries, as well as with ecosystem service payment initiatives, public-private partnerships, and development assistance policies [40].

2.3. The Importance of Ties among VSS

Academics and policymakers focused on VSS organizations' biodiversity policy stress the relevance of VSS organizations' connections with each other and with other biodiversity-relevant governance organizations [1,5]. Similarly, the IISD report recommends a collaborative approach among various actors for the proper implementation of developing VSS biodiversity criteria, sharing data, researching impacts, and assuring VSS organizations' credibility to protect biodiversity.

For this reason, it is relevant to examine how VSS organizations develop ties with each other and with other policy-relevant organizations. VSS organization interactions with each other are important to reduce certification costs and to encourage policy learning that can result in more effective biodiversity protection policies. Moreover, VSS organizations' interactions with other institutions and actors may contribute to improved biodiversity protection, and biodiversity impacts on larger scales [1]. While recent studies systematically look at linkages among VSS policy-makers and other institutions [5,6,9,28,41], so far, none of these studies have assessed policy networks focused on biodiversity protection in particular. Moreover, so far, none of the studies have viewed the significance of linkages among VSS organizations and other organizations from the perspective of VSS organizations' potential to contribute to biodiversity protection policy-making given its policies and performance.

3. Materials, Analytical Approach, and Methods

3.1. Sample

The agricultural transnational VSS organizations examined were selected based on the availability of data from Fransen et al. [5,41], the IISD Standards and Biodiversity Review [1], and the ITC Standards Map providing data on VSS organizational network structures, policies, and operations. The Fransen et al. dataset sample is based on previous studies, interviews with VSS organization and business professionals conducted between 2010 and 2012. The sampling process led to a final selection of the 11 VSS organizations shown in Table 1 for which we have available data. Because many VSS organizations focus on various crops, and their policy impact is therefore expected to extend beyond single crops, we follow both academic [5,41] and policy-maker studies [1] in casting the net widely and analyzing many crops that have a variety of possible consequences for biodiversity protection. Our sample involves both VSS focused on single crops and VSS focused on many crops and there is overlap in crop focus across many of the VSS organizations.

Table 1. Key Voluntary Sustainability Standard (VSS) organization characteristics. Data from Fransen/Schalk/Auld [41] and Potts et al. [1].

VSS	Sustainability Problem Definition	Product Focus	Development History	Year of Development	Country of Head Offices
IFOAM	Environmental farming practices	Food consumer products	Consumer-local producer movement	1972	Germany
Utz	Farm-level comprehensive standard	Food consumer products	Multinational brand/retail with international NGO	1997	The Netherlands
Rainforest Alliance	Conservation/Biodiversity	Food consumer products	Environmentalists/Science	1987	USA
Better Cotton	Farm-level comprehensive standard	Cotton	Multinational brand/retail with international NGO	2005	Switzerland
Global Coffee Program (4C)	Farm-level baseline standard	Food consumer products	Multinational brand/retail with international NGO	2002	Germany
FLO (present with two standards for hired labor and smallholders)	Equitable development	Food consumer products	Consumer-local producer movement	1997	Germany
CmiA	Equitable development	Cotton	Multinational brand/retail	2005	Germany
Round Table Responsible Soy	Farm-level baseline standard	Food ingredients	Multinational brand/retail with international NGO	2005	Argentina
RSPO	Farm-level baseline standard	Food ingredients	Multinational brand/retail with international NGO	2002	Malaysia
RSB	Farm-level comprehensive standard	Energy	Multinational brand/retail with international NGO	2006	Switzerland
Bonsucro	Farm-level comprehensive standard	Food ingredients	Multinational brand/retail with International NGO	2005	UK

3.2. Analyzing Biodiversity Criteria and Geographic Operations

To gauge their significance, we rank VSS organizations according to three criteria: The amount of hectares covered by a VSS in terms of standard-compliant areas; the proximity of standard-compliant areas to so-called biodiversity hotspots, i.e., regions with significant biodiversity under threat of destruction; and the stringency of biodiversity criteria in the implementation of a given VSS. By doing so, we continue in a tradition of policy research that compares environmental and labor criteria quantitatively [42–45].

For stringency, we create an average stringency score for each VSS organization based on the IISD measure. The IISD report measures the breadth of standards in terms of biodiversity issue coverage, in combination with the degree of obligation associated with requirements on biodiversity in the standard ([1], p. 27). The focus is on so-called critical requirements, i.e., requirements that producers need to meet before being deemed compliant with the standard (as opposed to other requirements that may be met after certification). For this paper, we, in turn, create an aggregate score for this biodiversity stringency per VSS. Both the IISD measures and the aggregate measure have been created in a process using inter-coder reliability and tests with alternative measurements. For the aggregate measure, we report on this below. For IISD operationalization and checks on reliability, we refer to their report [1].

Table 2 shows stringency measures and ranks the VSS organizations according to the average score across the biodiversity indicators. Note that the sample is larger than in the main analysis of the paper because it includes some organizations not covered by ITC data or the data by Fransen et al., and because Fairtrade uses two different standards. The indicator-level ranking is based on the 9 indicators of biodiversity identified by IISD. This is based on 61 sub-indicators, where the organizations can score from 0–5. This means that an organization can score a total of 305 'points'. To robustly see if measuring it based on sub-indicators would have different implications, the sub-indicator level ranking is based on sub-indicators (RSB, for example, scores only 40% on indicator 5 that only has 5 sub-indicators, but scores 100% on indicator 3, which has 11 indicators).

Table 2. Stringency scores of VSS on biodiversity.

Organization	Indicator Level (Ranked)	Sub-Indicator Level (Ranked)	Difference
RSB	85.30% (1)	89.51% (1)	+4.21%
IFOAM	83.05% (2)	77.05% (4)	−6.00%
Proterra	79.72% (3)	80.00% (2)	+0.28%
RSPO	77.03% (4)	79.02% (3)	+1.98%
Utz	70.50% (5)	68.52% (6)	−1.98%
Fairtrade Hired Labor	69.81% (6)	68.13% (7)	−1.68%
Ethical Tea Partnership	69.37% (7)	67.21% (9)	−2.16%
Bonsucro	69.06% (8)	68.85% (5)	−0.21%
Rainforest Alliance	67.29% (9)	67.87% (8)	+0.57%
Global GAP	66.85% (10)	60.00% (10)	−6.85%
RTRS	61.11% (11)	60.00% (11)	−1.11%
BCI	56.48% (12)	50.16% (12)	−6.31%
Fairtrade Smallholders	50.30% (13)	49.84% (13)	−0.46%
Cotton Made in Africa	35.34% (14)	34.43% (14)	−0.91%
Global Coffee Platform	32.00% (15)	32.00% (15)	0.00%

Measuring on the sub indicator level versus on the indicator level does not change the results considerably. The ranking mostly remains in the same order too, only in the middle-part, there are some slight alterations. These changes are caused by organizations scoring high on indicators with not so many sub-indicators or vice versa.

VSS organization coverage is captured in terms of hectares of standard compliant area, based on Standardsmap data.

Biodiversity hotspot data is obtained from the Ecosystem Partnership Fund. To qualify as a biodiversity hotspot, a region must meet two strict criteria: Contain at least 1500 species of vascular plants (>0.5% of the world's total) as endemics (species found nowhere else on Earth) and have lost at least 70% of its original habitat (Critical Ecosystem Partnership Fund). Together, the VSS organizations in our sample certified 430,864,233 hectares, of which 36.3% (156,452,483 hectares) are in countries that contain biodiversity hotspots and 63.7% (274,411,750 hectares) in other countries.

For robustness purposes, we cross-check our estimation of VSS organization compliant areas proximate to hotspots with Tayleur et al. [11]. Their study, due to use of geo-positioning data, offers more precise measurement of proximity to hotspots, but cannot distinguish among different VSS, instead emphasizing commodities being certified by aggregate VSS data. We therefore check whether there is a match between reported compliant areas for a particular VSS organization, the commodity focus of this VSS organization, and the areas detected by Tayleur et al. as being used for farming such a commodity near a hotspot. This matching shows that generally our proxy for biodiversity relevance by using country-level data is good as it, in almost all cases, signals standard-compliant areas near hotspots in these countries. Below, we also report on particular insights from the Tayleur et al. studies where these have important implications for our network analysis findings.

Like the IISD authors, we hold that rankings in terms of stringency, coverage, and hotspot proximity are not a signal of VSS quality or success. A lower amount of hectares covered may, for instance, mean that a VSS organization has chosen to focus on a particular crop, region, or producer type. A lower degree of stringency may mean that a standard has deliberately chosen a narrow set of sustainability requirements for which it considers its intervention meaningful, or that a VSS organization is seeking to offer baseline certification to poor producers that may otherwise not enter certification processes. A VSS organization with many standard-compliant areas near biodiversity hotspots similarly may reflect VSS organization strength in focusing on particular geographic areas without interventions in such hotspots as the VSS organization's core mission.

Nevertheless, a higher or lower position in such rankings indicates a VSS organization's importance in a network of organizations and professionals that could be meaningful in promoting collaboration on biodiversity policy. This is because a VSS organization-node with a high amount of hectares covered may represent a lot of influence on farmers and their environment, as well as many governance activities pertinent to biodiversity; because a VSS organization with strict biodiversity requirements may provide expertise on a wide array of biodiversity-related issues and interventions; and because a VSS organization with relatively more activities close to hotspots can offer both knowledge of activities and conditions in these hotspots as well as potentially meaningful impact on the ground at these hotspots.

Moreover, we are interested to know whether ranking high in terms of stringency, total standard-compliant areas, and proximity to biodiversity hotspots are in any way related. A positive relationship between these three variables would mean that there are VSS organizations with exceptional relevance for biodiversity policy for which we need to closely examine their ties to other organizations. We are therefore interested to learn if higher scores in one ranking leads to higher or lower scores in another (see Figure 1). Are more stringent VSS biodiversity criteria conducive to uptake leading to a higher level of standard compliant hectares for a given VSS organization? Does more standard compliant area translate into greater coverage near or within hotspots? Additionally, do more stringent VSS criteria imply that VSS organizations operate close to or within hotspots?

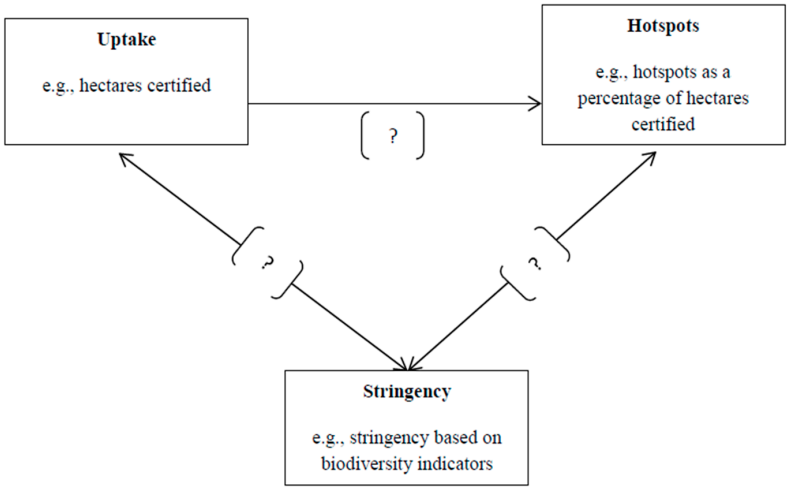


Figure 1. Stringency-uptake-hotspots' relations diagram.

3.3. Gathering Network Data

We examine three different relationship types between the 11 VSS organizations, which we all derive from Fransen, Schalk, and Auld [5,41] in terms of their definition, sample, and operationalization, but nevertheless update so that we can analyze the relationships of VSS organizations in the year, 2017. Social ties can be defined in numerous ways [10,46]. In our methodology, we do not use name generators or a snowball procedure, but rather let the data speak for itself, i.e., network membership is defined based on the appearance of organizations in secondary data obtained from multiple sources that were generated by VSS and other stakeholders, as described below. The main reason for this is that our focus is global, i.e., it transcends individual projects and a single VSS. Most studies on stakeholder management and social networks in biodiversity conservation have a project focus, often a specific region with a specific problem (see e.g., Cohen et al. [47] about Coral reef types targeted in the prioritization of marine areas for the Solomon Islands, or Prell et al. [48]). For such individual projects and case studies, it makes sense to depart from a researcher-defined core network, and ask this smaller subset of key actors, who are important in day-to-day operations.

In our network boundary definition, by contrast, we do not place restrictions on who is a member of the network based on our, or respondents', perceptions of the salience of actors/organizations for the policy at hand. This is because our main interest is not in identifying who is crucial in biodiversity conservation, but in what the overall global patterns of interdependence between VSS and associated organizations look like, and what they may mean for hotspots, stringency, and uptake. In this overall network structure, actors that are unimportant at face value can play a critical (structural) role. In mapping social networks, exhaustiveness and completeness is thus important for our analysis to be meaningful. This is also the reason that we analyze multiple types of relationships rather than a single one. Our approach, however, does come at the cost of losing the more fine-grained information of specific policy issues and actor positions for specific biodiversity projects. Our analysis should be seen as exploratory: We connect the overall VSS network structure to variations in stringency, hotspots, and uptake, without making strong causal claims on network effects.

The first relationship, the existence of actual partnerships and collaborations, we examine by searching across all available online VSS organization documentation in 2017, such as policy documents, annual reports, and newsfeeds, to identify links between VSS organizations and other sustainable agriculture organizations, including NGOs, governments, international organizations, businesses, and academic institutions [25]. Like Fransen et al., we code all these ties as belonging to the same category of partnerships and collaborations, while acknowledging that it is difficult to separate loose one-off partnerships from more institutionalized longer term relationships. It was too time-consuming to track and research each and every partnership individually, and the assumption

is that if the VSS themselves find a partnership or collaboration important enough to mention in key documents, like their year reports as an organization, it is significant, and comparable in this sense. Moreover, in hand-coding the documents, multiple coders were involved who discussed projects and collaborations if doubts were raised about their significance. The resulting partnerships and collaborations network thus conveys the existence of collaborative relationships between VSS organizations and other organizations.

Second, using information from 2017 provided by the ISEAL Alliance, the Global Social Compliance Programme, the Ethical Tea Partnership, the Dutch Sustainable Trade Initiative (IDH), the Global Food Safety Initiative (GFSI), and the World Cocoa Foundation, we constructed meta-governance networks, which indicate participation of VSS organizations, NGOs, governments, intergovernmental organizations, academic institutes, and businesses in these seven meta-governance initiatives. Ties examined here include membership and governance roles in meta-governance, as well as voluntarily subjecting standards and policies to equivalence processes, so that standards become comparable. The meta-governance network thus consists of VSS organizations and other organizations, in which a relationship between two actors represents the number of shared memberships across the different initiatives (maximum of six).

Third, like Fransen et al., we analyze VSS policy documents from 2017 for references to other organizations as the basis of standard policies. We structurally compare documents detailing prevailing standard-setting policies. This includes the following categories of documents that are available online and that are comprehensive in their coverage of VSS organization operations (and functionally similar across the sample) in verifying compliance with sustainability requirements: Substantive requirements for businesses and how these should be weighted, auditing policies, policies assuring the origin of a product, and policies regarding the VSS organization's internal governance activities.

Fransen et al. [41] also apply network analysis to employment ties, forming a network of VSS organizations and their affiliated organizations, in which a relationship between a VSS organization and another organization is based on the number of employees who were, or still are, affiliated with both organizations, based on an analysis of the online resumes of the VSS organization employees (in the period of 2002–2012). We find these resumes too dated (2012) to include in the present study. Results are available on request, but do not upset the patterns described here on the basis of the other investigated ties.

We report on measures of these cross-references per organization (including all mentioned VSS policy documents). We code references to different policies and ideas for organizational sub-units within the same organization as it occurred in a VSS policy-document set (specifically the United Nations (UN), International Labor Organization (ILO), International Organization for Standardization (ISO), and the European Union (EU)). For the UN, we differentiated for example between UNDP, UNCTAD or UNHRC. The resulting references' network consists of VSS organizations and other organizations, in which a relationship constitutes the existence of a reference between two actors.

Finally, we use organization profiles from their websites to divide the organizations with ties to agro-commodity-focused VSS organizations into four generic groups: Government and Politics, Non-profit, Business, and VSS. Our analysis may include references to VSS organizations that are not part of our initial selection if the 11 VSS organizations analyzed have ties with them via, for instance, the partnerships or policy references.

4. Results

4.1. Biodiversity Criteria, Coverage, and Proximity to Biodiversity Hotspots

Table 3 shows descriptive statistics of the stringency scores (the average, the highest, and the lowest score per indicator) based on data from the SSI report. RSB is ranked highest most often, while the Global Coffee Platform (4C) and Cotton Made in Africa are ranked lower. As noted, we do not treat this as an indicator of success. Indeed, GCP's score mirrors its ambition to be a baseline standard,

and CmiA's score is consistent with its ambition to be focused on social and developmental issues. Across the issue areas, RSB and IFOAM have the most aligned and have the most stringent biodiversity criteria for biodiversity protection.

Table 3. Stringency scores for VSS.

Indicator	Average Score	Highest Score	Lowest Score
1. Percent Farm Area in Land Classes of Different Habitat Quality	65.8%	RSB (100%)	Global Coffee Platform (34%)
2. Conversion/loss of natural habitat cover (land use change over time)	76.67%	RSB and RSPO (100%)	GG (36.67%)
3. Area-based conservation management	64.24%	RSB (100%)	BCI (41.82%)
4. Water Use per Unit Product	81.87%	BCI, Bonsucro, IFOAM, and RSB (100%)	Global Coffee Platform (44%)
5. Synthetic Pesticides and Fertilizer Use per Unit Area or Product	54.67%	IFOAM (100%)	Global Coffee Platform and CMA (24%)
6. Biological Oxygen Demand at Sampling Sites	60.95%	RSB (100%)	CMA (8.57%)
7. Soil Organic Matter	57.67%	IFOAM (100%)	Global Coffee Platform (0%)
8. Fossil Fuel Use per Unit Area or Product	72.80%	Bonsucro and IFOAM (100%)	CMiA (33.33%)
9. Carbon Footprint of Product and Land Use	49.20%	RSB (86%)	CMiA (10%)
Total	64.87% (average)	RSB IFOAM, Bonsucro, RSPO, BCI	Global Coffee Platform and CMiA, BCI

Table 4 reports the average stringency scores for all VSS organizations across the nine BIICPs in Table 3. Table 4 presents the descriptive statistics for standard-compliant area and proximity to biodiversity hotspots and network relationships. The VSS organizations for which we miss network indicators are ranked for other indicators.

Table 4. Descriptive statistics of the IISD, ITC, and network indicators of the VSS organizations.

Organisation	Stringency	Hectares	Hotspots Hectares	Partnership (Degree)	References (Degree)	Meta-Governance (Degree, Weighted)
4C	32.00% (11)	1,424,838 (6)	1,424,838 (6)	24 (1)	20 (5)	123 (2)
BCI	56.48% (9)	1,612,000 (4)	1,612,000 (4)	21 (2)	16 (6)	123 (2)
Cotton Made in Africa	35.34% (10)	585,339 (9)	585,339 (8)	18 (3)	12 (8)	123 (2)
FLO (hired labor)	69.81% (5)	1,295,379 (7)	1,295,379 (7)	7 (7)	26 (2)	123 (2)
IFOAM	83.05% (2)	31,536,885 (1)	28,691,726 (1)	5 (8)	11 (9)	123 (2)
Rainforest Alliance	67.29% (7)	1,431,383 (5)	1,431,383 (5)	12 (6)	23 (4)	251 (1)
Roundtable on Sustainable Palm Oil	77.03% (3)	2,619,436 (2)	2,619,436 (2)	16 (4)	31 (1)	123 (2)
Roundtable on Responsible Soy	61.11% (8)	483,934 (10)	480,204 (9)	0 (9)	16 (6)	251 (1)
Utz Certified	70.50% (4)	1,690,604 (3)	1,690,604 (3)	15 (5)	14 (7)	251 (1)
Bonsucro	69.06% (6)	963,990 (8)	n.a.	18 (3)	25 (3)	123 (2)
RSB	85.30% (1)	n.a.	n.a.	18 (3)	12 (8)	123 (2)
Global Gap	66.85%	1,849,086	1,551,725	n.a.	n.a.	n.a.
ProTerra	79.72%	1,215,349	1,212,849	n.a.	n.a.	n.a.

Overall, VSS organizations with a higher standard compliant area are most active in countries with biodiversity hotspots. We can therefore assume that VSS organizations with a larger coverage in terms of hectares will also matter for biodiversity.

Comparing the scores for standard stringency and standard-compliant areas in biodiversity hotspots suggests that some of the VSS organizations with more stringent standards are also active near biodiversity hotspots, in particular the members of IFOAM, as well as RSPO and Utz. In network terms, we would expect these VSS organizations to prove interesting organizations to link up to, offering both potential impacts as well as varied expertise and experience in terms of promoting biodiversity. An interesting outlier on this list is BCI, with a relatively less stringent standard, but a high proximity to hotspots.

Throughout this study, we must critically ask ourselves whether IFOAM, as the head organization of the organics movement, has a similar status as a transnational organization as the other VSS, in terms of its governing capacity relative to its national chapter organizations. We have reason to believe that much of the politically significant "action" when it comes to organics may take place elsewhere, in comparison to the head organizations of Utz, Rainforest Alliance, and RSPO.

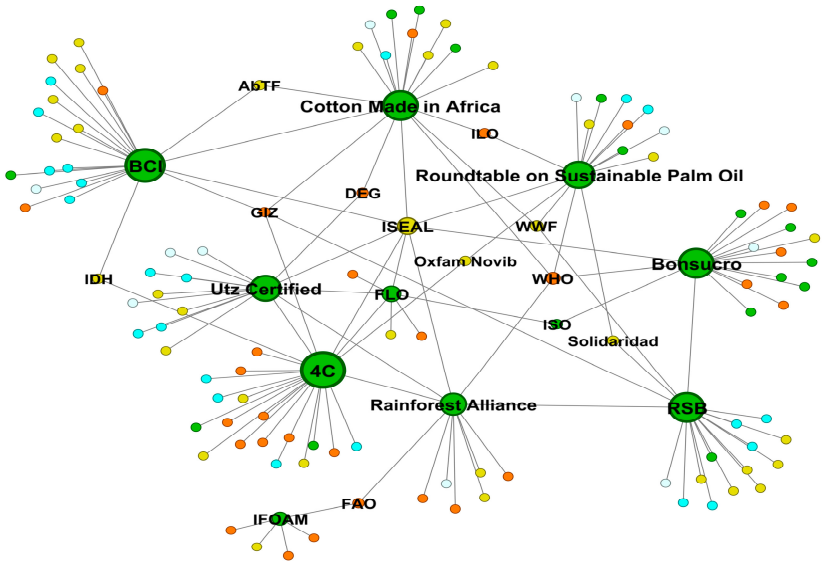
The data by Tayleur et al. [11] confirm this, but add interesting commodity-specific insights. Palm oil certified data (including RSPO's), for instance, position certified areas concentrated in Indonesia and Malaysia, particularly in areas closer to towns and with lower levels of poverty. In biodiversity terms, these areas, compared to non-certified areas, have higher levels of tree loss, and lower coverages of IBAs and protected areas. Coffee and cocoa (the core commodities for Utz, and significant commodities for IFOAM), are certified across Asia, Africa, and Latin Americas in areas relevant for birds, more than in areas that are not certified. For coffee, in particular, areas also included high conservation areas for birds and mammals, more than non-certified areas. Certified tea (also a commodity certified by Utz and covered by IFOAM) production may occur in Asia, Africa, and Latin America in areas with amphibians, and in the study, is more associated with greater protected area coverage than areas without certification. In sum, geographic data shows that VSS organizations with stringent biodiversity policies have certified practices relevant for protected areas, high conservation value areas, birds, mammals, and amphibians. Their policies and activities are therefore geared towards impact on these issues.

4.2. Network Analysis Results

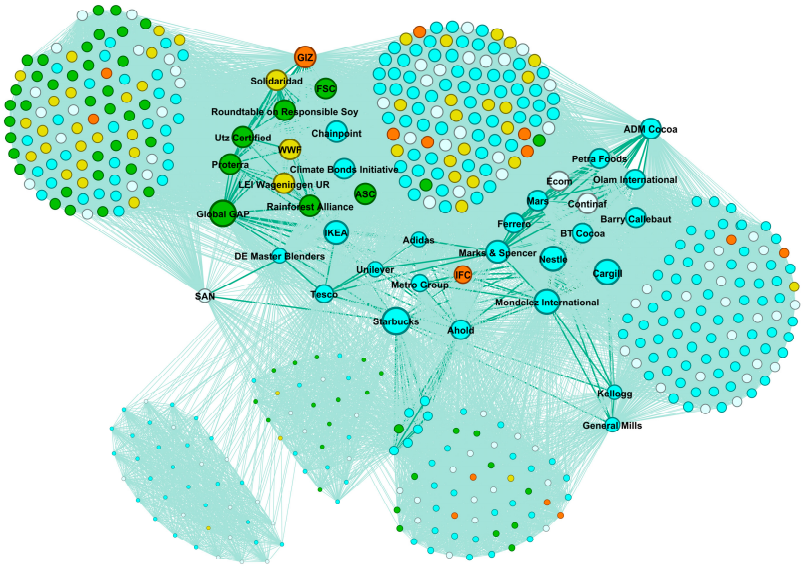
We proceed to describe the VSS organization networks for the four different types of relationships (see Section 3.3). We do so in a non-technical way. For a more elaborate description of the data manipulation and social network techniques applied, we refer the reader to Fransen, Schalk, and Auld [5,41], because the data structure for the networks is the same.

The networks are shown in Figure 2. In all three networks, each node represents an organization. Nodes with more ties are proportionately larger. The type of organization (VSS organization, Non-profit Private, Business, or Government and Politics) is represented by a specific color, according to the legend. When the edge weight is higher—meaning that a tie between two organizations has a higher value—the tie is proportionately thicker in Figure 2b Variation in edge weights only exists for the meta-governance networks. Recall that a link in the meta-governance network constitutes the number of shared memberships. Thus, organizations can have a stronger weighted tie if they share memberships of more meta-governance institutions. In contrast, because of our coding strategy (see Section 3.3), a partnership or a reference either exists or it does not, and thus has no weight. Compared to the other two networks, the meta-governance network is relatively dense (many of the ties between actors that could theoretically exist, actually do exist). This is because a tie between all pairs of organizations is created that are a member of a single meta-governance institution. With a substantial number of member organizations in each institution, the network shows a high level of density overall (in Figure 2b, roughly represented by the different clusters or 'clouds'). Apart from Figure 2, Table 3 provides the number of ties each of the 11 VSS organizations in our sample has in

each of the networks, or their 'degree centrality' ([10], p. 178). For the meta-governance network, degree centrality is computed as the sum over all tie values, thus taking into account the edge weights. For all three networks, the higher an organization's centrality, the higher its structural prominence.

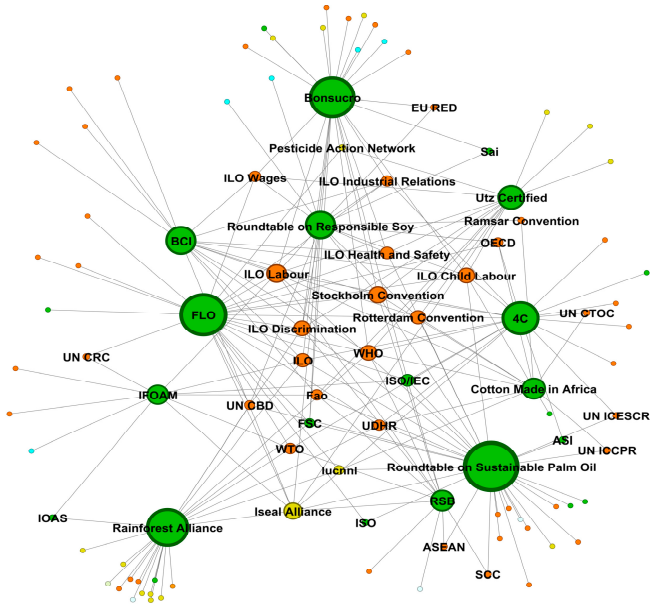


(**a**) Partnerships and collaborations



(**b**) Meta-governance

Figure 2. *Cont*.



(**c**) References

Figure 2. The VSS networks for partnerships and collaborations, meta-governance, and references. Legend. Node size represents degree centrality. Color represents type of organization: Green = VSS, yellow = non-profit private, blue = business, red = government and politics, light-blue = missing. Edge weight represents the number of shared memberships (meta-governance). Node labels only shown for more central organizations.

A number of tentative interpretations can be derived from Figure 2. First of all, the different networks show different levels of activity, and specific central organizations. The partnership network is relatively sparse, which is most likely a consequence of the effort required: VSS organizations must choose their partners strategically because, due to resources' constraints, it is likely that VSS organizations can only establish a limited number of partnerships. We assume that partnering among VSS organizations can be substantively meaningful, assuring information exchange and building trust, which could be used for collective action purposes [5]. Table 3 shows that GCP and BCI have the most partnerships.

The meta-governance network is relatively dense, but one can question to what extent information exchange actively takes place within each dyad (i.e., pair of organizations). After all, among many of the meta-governance initiatives we studied, substantive exchange and coordination among policy-makers is expected, but not required. Policy-makers from VSS organizations and other governance organizations may not meet [5]. In this network, Rainforest Alliance, Utz, and Roundtable on Responsible Soy have most shared memberships with other organizations. At the same time, a number of VSS organizations not in the core sample of 11 are central in this network, namely Global Gap, ProTerra, and FSC. Finally, the most active 'referencers' are FLO and RSPO.

Second, it appears that more stringent and active VSS organizations are not necessarily more central in the three networks. Recall that IFOAM, RSPO, and Utz are, overall, the most stringent and active (in the stringency percentage, hectares, and activity near biodiversity hotspots). When we look at IFOAM, we observe in Table 3 that it is not central in any of the three networks, compared to the other VSS. This is notable, and signals that the organics movement is in terms of its policy ideas, partners, and employment pool, in a class of its own relative to the other, more mainstream business focused VSS. It also signals that collective action among VSS that includes the organics movement may be harder, also with regard to biodiversity objectives.

RSPO is most central in the reference network, but ranks lower in the other three. Utz is perhaps the most noticeable VSS organizations: Although it ranks lower than IFOAM and RSPO on the

biodiversity indicators overall, it is very central in the meta-governance network, and moderately central in the partnership network. A possible contender for Utz in this sense is BCI, which is an interesting outlier in terms of stringency and activity—with a relatively less stringent standard, but a high proximity to hotspots and a dominant role in terms of centrality in the employment ties and partnerships and collaboration networks. The Tayleur et al. data does not cover cotton, which is why we are not able to provide more context on geography here regarding BCI.

Next, we explore the network positions of IFOAM, RSPO, and Utz for the significance of their ties to other organizations claiming to specifically address biodiversity protection in their policies. We then see that IFOAM does have a set of partnerships with international organizations relevant for biodiversity, most notably the Food and Agriculture Organization (FAO), unlike RSPO and Utz.

Furthermore, the three networks are characterized by quite different compositions when it comes to the types of organizations. Most evidently, VSS organizations tend to predominantly refer to government and policy organizations. Among these, the various sub units of the ILO, the Stockholm Convention, and the World Health Organization (WHO) are most popular. The dominance of government and policy partners in this network is most likely indicative of the desire of VSS organizations to legitimate their organization, and to be perceived as a reliable VSS organization regardless of their private nature. Alternatively, it could reflect an effort to be aligned with internationally recognized directives from UN agencies to leverage existing governance efforts from these agencies. Relevant for our purposes here, the links to governmental actors and international organizations within this network signal more of a "developmental" focus of the VSS, rather than a "biodiversity"-focus. Safe for the Stockholm, Rotterdam, and Ramsar convention, most IO treaties referenced seem to focus on social and economic issues reflecting more development despite their potential for biodiversity protection.

The meta-governance network is dominated by business organizations. The most important among these are IKEA, Starbucks, Unilever, Marks & Spencer, Cargill, and Mondelez International. These are significant actors for addressing biodiversity protection in global supply chains, but their linkage to VSS organizations does not imply collective biodiversity protection activities. Solidaridad, IUCN, and the WWF are relevant organizations for VSS organizations across the networks, and, especially the latter two, may prove useful partners in developing biodiversity activities.

In sum, networks of relevant actors in biodiversity protection are relatively sparse. Within the partnership network, deemed most relevant for biodiversity protection, the ties are sparser and not focused on relevant biodiversity policy-makers. Despite being the most significant VSS organization in terms of policies and standard compliant areas, IFOAM does not play a central role across these networks, but does have some relevant partnerships with the inter-governmental biodiversity policy-making world, while Utz and RSPO have mostly links to nongovernmental actors. Overall, the ties between VSS organizations and other types of organizations across the networks seem to exhibit a focus on development rather than on biodiversity protection.

Utz has recently announced a merger with Rainforest Alliance, another important VSS organization in our sample. It remains speculation what consequences this will have for Utz's relevance for biodiversity policies, but if the present links that Rainforest Alliance has in our network analyses remain intact, then this would mean that Utz would reduce its distance towards relevant biodiversity-related organizations, such as FAO.

5. Discussion

With increasing interest in the potential of VSS organizations to contribute to biodiversity protection and policy-making on biodiversity, we have investigated VSS organization standards, operations, locations of certified areas, and network ties. Based on analysis of standard stringency, coverage, and proximity to biodiversity hotspots, we first tentatively conclude that a few VSS organizations are in a promising position to potentially contribute through their policy-making to biodiversity protection goals. At the same time, based on analysis of network positions, VSS

organization links to relevant biodiversity actors and institutions are still quite scarce, signaling that their ability to engage in collaborative policy-making and policy exchange with relevant biodiversity policymakers is, at present, limited. Possibly as a heritage of their initial policy focus, VSS organization links to the developmental policy world and to private parties are more prevalent than to the most well-known and relevant public biodiversity policymakers and policies. So, while VSS organizations, such as Utz, the organics movement, and RSPO, should be reckoned with as biodiversity actors, our results still reveal a gap between their activities and policies and the (inter-)governmental biodiversity policy world.

Previous research [48,49] has demonstrated that centrality is important in networks of organizations that seek to steer environmental policy and resource management. We suggest, based on 11 cases, that those in a promising position with regard to their biodiversity criteria, their proximity to hotspots, and total compliant areas are not necessarily the best-connected ones. Further research must (a) substantiate these empirical associations and (b) look at causal effects of network position and stakeholder strategy for project/organization success (e.g., targeting specific actors that were previously unknown in the network). Ours is a first step in the challenging task to 'collate, integrate, and analyse the large amounts of fragmented and diverse biodiversity data to determine the current status and trends of biodiversity in order to inform the relevant decision makers' ([50], p. 50).

While our insights pertain to the agriculture-focused VSS organizations and their relationship to biodiversity, scholars of public-private interactions and policy communities in environmental policy-making may draw broader lessons from our study. First, substantively, our findings suggest that the strategic perspective of agricultural VSS organizations is still developmental focused, despite VSS policymakers engaging with issues, such as climate change and water use. Second, analytically, our paper demonstrates that it may be useful to combine policy document analysis with geo-positioning and social network analysis when discussing the relevance of policy interactions. Arguably, these approaches reinforce each other, and enable us to pinpoint the relevance of actors and policies on a range of different dimensions.

Further research could investigate our observations in more detail. Our approach has limits in terms of its ability to develop social network analysis only for indicators where data gathering can be close to exhaustive. This means that avenues of exchange among biodiversity-relevant actors that are harder to describe completely and reliably (including informal meetings among policy actors, individual presence at conferences, and so on) are hard or impossible to analyze with our methods, and yet may be important for the exchange of ideas and points of view on biodiversity protection. Moreover, the particulars of the combination of datasets forced us to exclude some standards and organizations that are relevant to enrich our understanding of VSS organizations' potential in biodiversity policymaking. New studies may look at the characteristics of these. Next to this, our research offers only a view from the "VSS organization cockpits" when it comes to relevant strategic links to other organizations in the networks. Conversely, we are at present not able to see what links non-VSS organizations, such as the Convention on Biological Diversity (CBD) secretariat, develop by themselves, next to their affiliations to VSS. A further, very relevant avenue for research is therefore to create a more complete picture of the public and private policy network on biodiversity. Obviously, we also encourage much further research on how exchange, collaboration, and coordination efforts at biodiversity protection may or may not have effects on the ground in farms, at plantations, and their environments. We are interested in studies that examine the degree to which interactions among biodiversity-relevant actors and VSS organizations may or may not have the expected positive impacts on biodiversity protection. While the present study cannot directly engage with this issue, it does provide empirical insights that describe the potential for such impacts in the near future.

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