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Buying green and social from abroad: Are biomass-focused voluntary sustainability standards useful for European public procurement?

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Buying green and social from abroad: Are biomass-focused voluntary sustainability standards useful for European public procurement?

Tina Beuchelt

Abstract

European public procurement is becoming more sustainable. However, for goods with global supply chains, sustainable procurement faces several challenges. This paper highlights the sustainability challenges for biomass-based products, discusses the suitability of biomass-focused voluntary sustainability standards (VSS) to address them, and identifies experiences and knowledge gaps in the use of VSS in European public procurement. The paper is based on a comprehensive literature review and a case study.

Biomass-based products can have major negative environmental and social impacts in their global supply chains. Biomass-focused VSS using third-party certification, contribute to avoiding such hazards. VSS are used by public procurers to (i) establish sustainability criteria for tender offers, (ii) minimize risks, and (iii) verify compliance with their criteria. Large knowledge gaps exist with respect to increasing sustainability of procurement. The impact of sustainably procured goods as well as of more recently created biomass-based VSS is uncertain. The strictness level of VSS necessary to deliver the desired sustainability effects is not clear. Large data gaps exist, e.g., how frequently which type of VSS is used for which products and for what reasons, and where procurers compromise between desired traits and limited market offers. This information would support a dialogue between procurers, business, and policy makers to stimulate markets towards more sustainable products.

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ABSTRACT

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1 Introduction

Public procurement possesses a large leverage to enhance sustainable consumption patterns and to contribute to sustainable development. Public sector spending is a significant part of national economies, making up 10-25 % of the gross domestic product (Bendell et al., 2011). The public purchase of goods and services in the EU has been estimated to account for 16% of the GDP (European Commission, 2017). Sustainable public procurement is playing an increasingly important role in Europe. It is part of the 'Europe 2020 strategy for smart, sustainable and inclusive growth' as it is one market-based instrument to be used to achieve sustainable and inclusive growth and to enable procurers to make better use of public procurement in support of common societal goals while ensuring the most efficient use of public funds (European Parliament, 2014). So far, the focus of public procurement policy has been on managing the risks associated with procurement, fostering the single European market, and ensuring that the most favourable terms are agreed on for products and services (Hermann, 2017; ISEAL Alliance and ICLEI, 2013). Around the globe, governments are starting to recognize the potential of public procurement to promote national sustainable development goals (Bendell et al., 2011) and foster broader socio-economic objectives such as fair labour conditions, regional development, market access and green growth (ISEAL Alliance and ICLEI, 2013). Through their procurement decisions, governments can influence the market, drive innovation and incentivize businesses towards sustainability.

All purchasing decisions have an impact on the society, the environment and the economy. Sustainable procurement considers the effects of production, use and disposal of a good with respect to the social, ecological and economic dimensions of sustainability, and strives to reduce negative economic, environmental and/or social impacts (ISEAL Alliance and ICLEI, 2013). Sustainable public procurement¹ ensures that public purchasing reflects broader goals linked to resource efficiency, climate change, protection of human rights and the environment, social responsibility and economic resilience (ICLEI Europe, 2016). As some procured (biomass-based) goods – or components of them – are produced in low- and middle-income countries, sustainable procurement must also consider the production conditions in these countries and address the social, environmental and economic impacts of the production process. Not all products are produced sustainably and follow good agricultural practices, respect labour rights or avoid harm to the environment. In Europe, certain labour and environmental standards are required by law. In low- and middle-income countries, these standards do not necessarily exist and even if they do, they are often neither respected nor enforced. From a sustainability perspective, compliance with certain environmental and social production conditions in global supply chains is needed. Also, a growing share of consumers is concerned about negative environmental and social side effects of food and biomass-based products and production processes (Codron et al., 2006; Ponte and Gibbon, 2005). This awareness was prompted by food safety crises and workers' rights scandals starting in the mid 1990s (Codron et al., 2006) and later complemented by environmental and food security problems, e.g. caused by the biofuel boom.

While for a long time it was legally not possible to include environmental and especially social criteria in a public tender, the EU adopted a new regulation on public procurement in 2014, which explicitly allows the use of such criteria. "The main technical challenges that public procurers face in the

¹ Sustainable procurement can be defined as "a process whereby organisations meet their needs for goods, services, works and utilities in a way that achieves value for money on a whole life basis in terms of generating benefits not only to the organisation, but also to society and the economy, whilst minimising damage to the environment. [...] Sustainable Procurement should consider the environmental, social and economic consequences of: Design; non-renewable material use; manufacture and production methods; logistics; service delivery; use; operation; maintenance; reuse; recycling options; disposal; and suppliers' capabilities to address these consequences throughout the supply chain." (Sustainable Procurement Task Force, 2006, p. 10).

implementation of SPP [Sustainable Public Procurement] is the identification of the sustainability hotspots associated with the myriad of products and services they buy, the translation of these concerns into specific purchasing criteria, and verifying that their chosen suppliers have, indeed, met their sustainability requirements. Sustainability standards, certification and ecolabels are some of the tools that procurers can use to deal with this particular set of challenges” (ISEAL Alliance and ICLEI, 2013, p. 21).

Voluntary sustainability standards (VSS) are a means to introduce minimum or even good environmental or social practices in an industry or for a specific product. They usually include a certification system to ensure compliance and often communicate via labels to express their sustainability claim on a product (ISEAL Alliance and ICLEI, 2013). While consumption of certified products started in the food sector as a niche market in industrialized countries in the 1970s, some biomass-based products with sustainability certifications have now reached considerable market shares. A strong proliferation of VSS and related certifications and labels has occurred since then. In the biomass sector, this development was further pushed by the introduction of the EU directive on Renewable Energies (EU-RED), which introduced obligatory environmental criteria for biofuels. Companies can show that they comply with the sustainability criteria through national systems or voluntary schemes recognised by the European Commission. The result is a steadily growing and extremely large market of voluntary standards²; for example, over 50 production standards and certifications exist for biomass³.

Many governments build their hopes on VSS and often treat them as a silver bullet which induces enterprises to voluntarily switch to responsible production and trade (Bendell et al., 2011). Public procurement can "kickstart" markets for more innovative, socially and environmentally-friendly goods and services, and through creating a demand for certified products thus become a driving force for VSS. Though there is a great potential, procurers need to know whether VSS actually deliver the benefits they promise. In general, there is a lack of a well-established methodology for how to best monitor and evaluate the environmental and/or social benefits being created by sustainable products. It is even more difficult to trace those benefits back to purchasers’ interventions (UNEP, 2013). Impact assessment studies are beginning to emerge analysing the VSS contribution to the environment, economy and society. Information on impacts of the diverse range of VSS in low- and middle-income countries is limited. Since certified products are often more expensive, public procurers need credible advice by science about the usefulness, impact and credibility of VSS to decide whether their reliance on VSS and the expenditure is justified.

Additionally, the public procurer has to reduce all possible risks in the procurement processes. If a purchased product is certified and perhaps more expensive and it is suddenly discovered that it does not deliver the expected impact (e.g. protection of labour rights), the procurer may be accused of having wasted or badly invested public money. Public procurers are thus interested in minimizing risks in procurement decisions. Sustainability risks in biomass-based global supply chains and how they are addressed by voluntary sustainability standards have to be understood. Based on the available information, it needs to be judged whether there are still knowledge gaps relevant for European procurement decisions related to products from low- and middle-income countries.

Hence, this research aims

1. to highlight sustainability challenges and risks of biomass-based products in global supply chains,

² The webpage “Ecolabel Index” currently lists 465 ecolabels in 199 countries and 25 industry sectors (see <http://www.ecolabelindex.com/>)

³ Of these, 18 standards are recognized by the EU as fulfilling the environmental criteria requested by the EU Renewable Energy Directive; the other standards could be still used for other biomass-use purposes.

2. to discuss advantages and limitations of voluntary sustainability standards in addressing these challenges and risks from a procurement perspective, and
3. to identify experiences and knowledge gaps in the use of biomass-focused VSS in public procurement.

The methods are briefly described in section 2. Section 3 describes the general public procurement process in Europe and links it to the demand for biomass-based products. Section 4 discusses challenges and risks of biomass-based products in global supply chains and the potentials and limitations of voluntary sustainability standards. These are exemplified by a case study on certified coffee value chains (section 5). Section 6 addresses the experiences in using voluntary sustainability standards in public procurement processes, and identifies relevant knowledge gaps for future research activities, while the final section 7 presents lessons learned.

2 Methods

This research paper is based on a comprehensive literature review. Further information was obtained through discussions and regular meetings with research and non-research partners from the German network “Research and transfer network on sustainable public procurement in North Rhine-Westphalia”. The review is strengthened by integrating a case study that, apart from existing peer-reviewed and grey literature, also draws on previous field research and interviews with standard setters, certification bodies, auditors and NGOs. The case study is an example to underpin the general findings on sustainability challenges and risks of biomass-based products in global supply chains, and to show potentials and limitations of voluntary sustainability standards for a specific publicly procured product.

For the case study, coffee was chosen as it is a product frequently purchased by public procurers, and for which environmental or social standards are being increasingly requested in public tenders. Coffee was one of the first international biomass products to which environmental and social standards were applied (Giovannucci and Ponte, 2005), and where certification effects have been analysed by research. In recent times, many biomass crops have become certified but usually very few to no impact studies are yet available. Hence, coffee is used as an exemplary case and can provide first insights about impacts of other certified biomass crops and about which problems and challenges can be expected.

3 Public procurement processes in Europe and demand for biomass-based products

Public procurement is different from private procurement procedures. For the member states in the EU, the legal framework for procurement is defined by the EU public procurement directive from 2014 (Directive 2014/24/EU) and national procurement laws. The most relevant principles of the directive for procurement are the principles freedom of movement of goods, freedom to provide services, non-discrimination, equal treatment, proportionality and transparency (ICLEI, 2007). Environmental and social criteria can be included in tender documents as long as these principles are followed. Procurement directives and national laws further define where and how environmental and social criteria can be introduced in the procurement process and tender documents (ICLEI, 2007); in some areas, certain environmental and social criteria can even be compulsory (Hermann, 2017).

The public procurement process follows several steps, and environmental and social criteria can be integrated in most steps (Hermann, 2017). First, the procurer estimates the needs and defines the type of product to be purchased. Once the subject matter of the contract is defined, the procurer must translate this into measurable (technical) specifications that the product needs to fulfil. These requirements are compulsory, therefore all offers have to comply with these or they will be automatically rejected. Then, when evaluating the different bids submitted following a call for tender, selection criteria for the candidates are set up that help to check whether a bidder has the capacity and ability to perform the contract it has tendered for. After publishing the call for tender, the bids have to be selected according to contract award criteria. These help to evaluate the quality of the offers according to price and compliance with pre-defined technical specifications and other award criteria. The award of a contract can be based on the lowest price or on the economically most advantageous offer. The latter offers the opportunity to add additional criteria for evaluation such as quality, life-cycles (e.g. durability), environmental or social characteristics which is explicitly supported by the EU procurement directive.

The final stage of the procurement procedure is the contract award. In the contract performance clauses, the conditions of how a contract must be carried out are listed. The EU procurement directive (Directive 2014/24/EU) clearly allows the inclusion of environmental and social criteria in the call for tenders. It further requests that the “control of the observance of the environmental, social and labour law provisions should be performed at the relevant stages of the procurement procedure, when applying the general principles governing the choice of participants and the award of contracts, when applying the exclusion criteria and when applying the provisions concerning abnormally low tenders” (Directive 2014/24/EU §40).

Many publicly procured products in Europe are based on biomass⁴, mainly from the agricultural or forestry sector. As part of the emerging European bio-economy, more and more fossil-fuel-based materials will be replaced by biomass, and it is estimated that the share of biomass-based products in public procurement will significantly increase in future. The following product groups containing biomass are currently important for public procurement in Germany (Deutscher Bundestag, 2012):

Agricultural and forestry-based products

- Food products: coffee, cocoa (chocolate), tea, certain spices, orange juice / juices, vegetables and fruits (bananas, pineapples, citrus fruits), staple crops, sugar, honey, etc.; indirectly: palm oil

⁴ Biomass is defined as organic matter derived from living, or recently living, organisms. It most frequently refers to plants or plant-based materials. It can be used for food or non-food uses such as feed, fibre, fuel, chemicals or other material uses.

- Flowers
- Clothes, textiles, fabrics - cotton, jute, wool (e.g. for carpets)
- Leather goods
- Paper
- Wood-based furniture
- Energy (electricity or heat): palm oil, rape seed and other biomass

Other categories (sometimes based on biomass)

- Office materials
- Toys and sport devices (e.g. football)
- Construction materials

New biomass-based products are emerging such as construction materials, lubricants, office materials, cleaning products or protective coatings made from renewable feedstocks such as wood, straw, sugar, maize, cassava or algae. They are mainly developed in industrialized countries with strong governmental support aiming to support the shift to the bio-economy. The following products are produced predominately in low- and middle-income countries: coffee, cocoa (chocolate), tea, certain spices, orange juice/tropical fruit juices, fruit (bananas, pineapples), rice, palm oil as it is an ingredient in many processed foods and cleaning products, as well as cotton/textiles, flowers, jute, wool (used in carpets), leather goods but also certain toys. It is unclear from where products like sugar, honey, wine or flowers, which are produced in Europe as well as in low- and middle-income countries, are procured. Wood and paper are predominately sourced from European countries (SFC Ad Hoc Working Group IV, 2010).

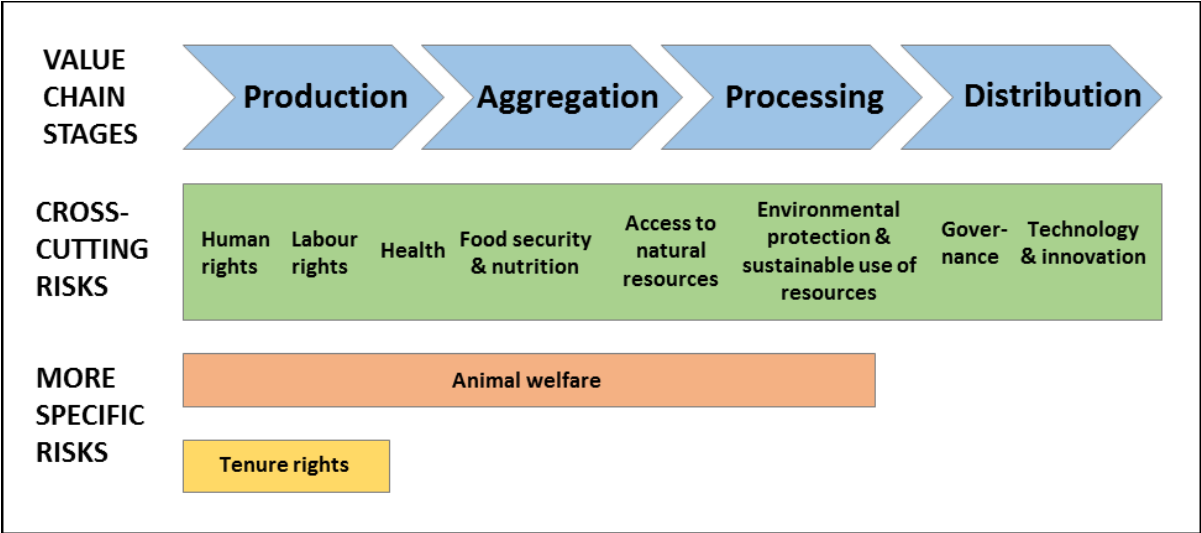
There are no reliable data on the economic value or share of biomass-based products in public procurement. However, biomass-based products are frequently used in public procurement, e.g. uniforms and work clothes are procured for policemen, firefighters or gardeners, food (or catering services) is procured for hospitals, schools, playschools, prisons, retirement homes, office materials and furniture for the employees in ministries and municipalities, and toys for playschools and schools. Many of these products rely on international supply chains, which face major sustainability challenges as shown in the next section. Hence, environmental and social criteria become relevant for the procurement process.

4 Voluntary sustainability standards in global supply chains

4.1 Sustainability challenges of products with global supply chains

In biomass-based global supply chains⁵, environmental and social challenges and risks exist (Figure 1). Some are cross-cutting, i.e. can happen at any stage of the supply chain, and are often the violation of human rights and international labour standards, health hazards or the pollution and degradation of the environment. They can also relate to governance problems such as corruption or disregard of laws, traceability problems, quality defects or increasing use of capital-intensive technologies setting labour off and crowding out smaller and medium enterprises from the market. Some risks are more specific to a certain product or stage in the value chain, e.g. animal welfare or tenure rights are mainly relevant at the production stage of biomass.

Figure 1: Risks at various stages of biomass-based supply chains from low- and middle-income countries



Source: adapted from OECD and FAO (2016)

In addition to these general risks and challenges in global supply chains, not only further challenges but also opportunities for public procurement from low- and middle-income countries exist (Table 1). For the procurer, the challenges include the quest to keep prices low and the responsibility for delivery failures or quality defects. Sustainable public procurement aims to address the challenges and risks, minimise negative impacts and induce positive changes in global supply chains. This becomes an opportunity not only, for instance, for improved environmental protection and resource use efficiencies in low- and middle-income countries but also for improved working conditions and higher salaries. VSS can be one means to address and control these challenges and risks (Bitzer et al., 2008) and are therefore of great interest for the public procurement process.

⁵ A value chain is the interlinkage of activities and actors that realize the various steps from primary production of raw material to the manufacturing, branding and retailing of a consumer-ready product (Kaplinsky and Morris, 2002).

Table 1: Challenges and opportunities of public procurement from low- and middle-income countries

	For the procurer (e.g. community, ministry)	(e.g. with resources and quality defects)	For the environment in low- and middle-income countries	For the society in low- and middle-income countries
General challenges and risks of procurement	<ul style="list-style-type: none"> • Cost/price pressure • Competition • Delivery failure and quality defects • Liability for the procured products 		<ul style="list-style-type: none"> • Environmental problems • Unsustainable resource use • Chemical residues 	<ul style="list-style-type: none"> • Insufficient salaries, extreme working hours • Child and forced labour • Prohibitions of unions • Safety problems at work place • Lacking structures for occupational health and safety
Opportunities through sustainable procurement	<ul style="list-style-type: none"> • Higher reliability and traceability with agreed quality standards • Reduced liability when third-party verification is used • Sustainability communication • Higher social acceptance in producing & procuring country 		<ul style="list-style-type: none"> • Improved environmental conditions • Less waste and chemical residues • Resource use efficiency 	<ul style="list-style-type: none"> • Respect of social standards • Improved working conditions • Higher salaries • Improved occupational frameworks • Income and job opportunities

Source: adapted from GIZ (2013)

4.2 What biomass-focused voluntary sustainability standards can deliver to public procurers

This section summarizes the potentials and limitations of VSS for low- and middle-income countries from the viewpoint of sustainable public procurement. It draws on own experiences, interviews and discussions with certifying organizations as well as their auditors and on literature (Blackman and Rivera, 2010; SCSKASC, 2012). The review aggregates experiences from several biomass-focused VSS; in section 4.3 they are analysed specifically for coffee.

Biomass-focused VSS address in part or fully the above-mentioned challenges and risks in global supply chains (Figure 1 and Table 1). They aim to reduce or eliminate the risks through their criteria, rules, regulations and regular control. Each biomass-focused VSS has its own emphasis and is often constructed for a specific objective, e.g. to protect biodiversity, avoid deforestation and habitat destruction or respect labour rights. Increasingly, social and environmental aspects are considered and especially environmentally focused VSS are starting to include social criteria (Vasileva et al., 2012). The stringency of the technical requirements including different types of control of biomass-focused VSS also vary remarkably (Loconto and Dankers, 2014).

Positive effects of biomass-focused VSS

At production, aggregation and processing level, biomass-focused VSS contribute through their criteria and rules to protect the environment, e.g. through limiting the use of synthetic fertilizers and chemicals, prohibition of toxic/dangerous chemicals, protection of waterways through regulations of how to handle chemicals. They can also protect sensitive natural resources through the identification and protection of sensitive sites and endangered species, introduction of buffer zones or prohibition of hunting (SCSKASC, 2012).

Regarding social benefits, biomass-focused VSS have shown that they can contribute to human development, e.g. through improved labour rights, workers' safety, better living conditions and/or additional income opportunities or training. VSS also induce positive changes beyond certification requirements on and around certified farms when plantation owners, managers or family farmers become very engaged. Management practices regarding planning, monitoring and documentation on farms and at processing facilities then improve, as VSS require much more documentation than typically done. VSS can also enhance transparency and quality, which can contribute to increasing access for producers from low- and middle-income countries to international markets (Loconto and Dankers, 2014).

Where formal laws are insufficient or are not enforced, biomass-focused VSS provide a regulatory framework with certain environmental or social criteria for the production processes. VSS thus encourage management improvements above the minimum level required by law, or are able to insist on the implementation of national laws that otherwise would not be enforced. Thus, they have the advantage that they can be used when local governments and/or markets fail to address environmental and social concerns to guarantee certain production conditions. This is internationally of advantage, as public procurers, and thus purchasing governments, can indirectly use VSS as a tool to work towards their sustainability goals (D'Hollander and Marx, 2014). Additionally, certification standards and structures can help shape and embed global norms. They possess a "transformative character" inducing change in national and global supply chains, which is also desired by sustainable procurement. Two examples: The Fairtrade standard was, besides the existing organic standards, one of the very first biomass-focused VSS. Without its introduction and growing market share, it is much less likely that other ethical and environmental standards would have proliferated and be used as a private governance mechanism in global supply chains as frequently as they are nowadays. Probably partly inspired by the EU renewable energy directive, which requires compliance with certain environmental criteria for biomass used as biofuel, the first middle-income countries have also started to introduce their own sustainability standards, e.g. Indonesia with its obligatory standard 'Indonesian Sustainable Palm Oil System' (ISPO), and Malaysia with a voluntary standard, the 'Malaysian Sustainable Palm Oil' (MSPO).

The system of monitoring and verification of compliance with VSS varies depending on the standard from first- and second-party certifications to third- and fourth-party certifications⁶. Though critique also exists regarding third-party certification, the institutional setting of control is much stricter than with first- and second-party certifications, and it is generally perceived as the highest form of assurance of compliance to a specific set of criteria (Corsin et al., 2007). Except for third-party certification, the other types of compliance proof are problematic, as there is basically little control over what happens along the supply chain, especially in the producing and processing countries where vested interests by the providers exist (Corsin et al., 2007). An example is the involvement of child labour in Indian mines for car colours used by BMW – the official enterprise policy prohibits any child labour along its supply chain but in practice the company has no control over it. This was also

⁶ The process of certification can be classified depending largely on the relationship between the entity being certified and the certification body (Corsin et al., 2007): For the first-party certification, the conformity assessment is performed by the person or organization that provides the product, e.g. producers or producer organizations report on their compliance to a set of standards. For the second-party certification, the conformity assessment is performed by a person or organization that has a user interest in the products, e.g. traders, retailers or consumers and their organizations. For the third-party certification, the conformity assessment is performed by an entity independent of both supplier and consumer organizations which conducts the auditing and issues certificates stating that a product or process complies with a specific set of criteria or standards. The fourth-party certification is less regulated and not mentioned by ISO. It involves governmental or multinational agencies; one example is the UN Global Compact, which lists environmental, labour and human rights principles for companies to follow, and corporations submit online updates for others (e.g. NGOs) to examine (Corsin et al., 2007).

the case for coffee from Nestle and Jacobs Douwe Egberts, who purchased coffee from coffee plantations in Brazil with slave-like working conditions, child labour and other human right abuses despite their ethical guidelines protecting human rights, requesting good working conditions, and prohibiting child as well as forced labour (Danwatch, 2016). In the same direction, research results show that corporate social responsibility policies of European companies do not contribute to the achievement of the sustainability policy goals of the EU, as the desired societal outcomes and impacts are often not achieved (IMPACT Project, 2013).

Limitations of biomass-focused VSS

Though the number of impact studies on biomass-focused VSS is slowly increasing, the effectiveness is not clear-cut proven. The assumption is that changed management practices will lead to intended results (e.g. more income, less poverty, more biodiversity), but compliance with VSS does not necessarily lead to the desired impacts. Impact pathways can be very complex. Biomass-focused VSS often show more impact if additional governmental or donor support exists, e.g. regarding the provision of extension, advice for management, payment of initial investment and certification costs (Loconto and Dankers, 2014).

It can happen that despite adhering to the VSS, there may be no effects on farm or landscape level, i.e. no increased biodiversity, no reduced soil erosion, or no health improvements of workers. For example, one small bird-friendly certified (and thus shaded) coffee plantation in the middle of coffee cultivated in the full sun will hardly bring the songbirds back whose habitat has to a large extent been destroyed. It can also be difficult to isolate impacts of a certified enterprise from other impacts at landscape level, as in the case of biodiversity or pollution.

Biomass-focused VSS can monitor good agricultural practices but are more limited in controlling complex issues such as food security, transparency/informed consent, biodiversity or land rights. Uncertainties over land tenure, property rights, and community rights also continue to exist in certified systems, and land tenure often needs years to be clarified as land registry systems are quite weak in most countries. A frequently mentioned fear is that smallholder farmers, who are not organized in groups or outgrower schemes⁷, might be excluded from accessing international markets if these start to request VSS. Evidence on this is mixed, and the question needs to be asked whether and how smallholders were participating in international markets in the first place. Market access is very context specific, so no generalizations can yet be derived (Loconto and Dankers, 2014).

The market and demand side sets limits to the use of biomass-focused VSS. There are strong links and trade-offs between ease of certification, intended performance (social/environmental effects), related implementation and audit costs and the market demand for biomass-based VSS. The consumer willingness to pay more for voluntary certified products is modest, and certified products have low and in most cases only slowly growing market shares on a global level. To become certified is a cost factor for producers and processors. When there are low price premiums – as for most certified biomass types – producers are less likely to get certified, as they struggle with the financing of certification (Bendell et al., 2011; Vasileva et al., 2012). The costs of transition to certified systems in low- and middle-income countries are often high, as little experience and advice is available, credits limited, and qualified staff not always available. National certification systems often do not exist, making the audit process more costly as foreign experts have to be used. Additionally, a very large market of numerous standards and certifications with different claims exists. This creates uncertainty and confusion among producers and buyers. The low market demand and price incentives often make it unattractive for producers in low- and middle-income countries to change their production system.

⁷ As the certification process is quite expensive, most certification systems offer group certifications for smallholder farmers, who share the certification costs and reduce them through the introduction of an additional internal control system.

Two further limitations are that most VSS (i) do not control all sustainability aspects, and (ii) focus on specific stages in the supply chain but not on the whole chain. Though there is a growing tendency to include both environmental and social criteria in one standard, a specific focus of a VSS still exists. Procurers might have to combine different labels if a broader range of sustainability criteria is to be covered. This is also a necessity when all stages of the supply chain need to comply with sustainability criteria. In the biomass sector, the majority of standards concentrates on production, but a whole range of possibilities is possible from including the first processing stage (such as an oil mill) or certification of an individual or all further supply chain stages, e.g. as in the case of the FSC standard. An exception is the 'Global Organic Textile Standard (GOTS)', which is a textile processing standard including ecological and social criteria in the entire textile supply chain.

4.3 Case study: The coffee supply chain and voluntary sustainability standards

Coffee is a very important primary commodity exported by low- and middle-income countries. Germany imported 609 000 tons of coffee with a supply of Euro 1.5 billion in 2016, coming to a large extent from Brazil and Vietnam (DESTATIS, 2017). Though no figures exist of how much of this was publicly procured in Europe or Germany, coffee is always part of every public procurement system in the EU. Many public procurers already started to buy certified coffee quite a while ago. Fairtrade certified coffee received a lot of attention in the past through solidarity movements, i.e. the "Third-World" and "One-World" initiatives, and became a symbol for a fairer trading system. Additional attention nowadays comes through the globally emerging Fairtrade Towns of which around 1900 exist in 28 countries with 470 in Germany alone. These towns aim to foster the purchase of Fairtrade products and a fair trade system, and to contribute to sustainable (public) procurement. Coffee is one of the key certified food products purchased in sustainable public procurement processes. In contrast to other biomass-based products, coffee has been certified for a long time. Organic standards had already existed for many years, but became more popular around thirty years ago along with the emergence of the Fairtrade standard. This eventually attracted the interest of researchers, and during the coffee crisis fifteen years ago coffee, and especially certified coffee, received a great deal of attention. So, coffee is an interesting example of public procurement to learn from.

4.3.1 Sustainability challenges in the coffee supply chain

In the last 15 to 20 years, certified and differentiated (speciality) coffee markets have emerged in response to changing consumption patterns in consuming countries. The change was induced by increased ethical and health awareness as well as by an increased quality demand (Lewin et al., 2004; Renard, 2005). In contrast to the conventional market and trading of bulk commodities with price being the determinant for traded quantities, differentiated markets are characterized by limited market access and involve other trade rules and market governance mechanisms besides the price. Participation in differentiated markets requires specific investments to meet certification and quality standards. In return, price premiums can be gained because of limited market size and added value, which may lead to increased income margins for chain actors who participate in those markets (Lewin et al., 2004). In that respect, standards are not only technical verification systems, but also strategic instruments (Ponte, 2002a).

The coffee supply chain can be structured in two parts according to the countries where activities take place. Typically, the first part of the supply chain is located in the coffee producing countries and includes coffee production and primary processing. Depending on the study, the share of the final retail price varies between 4% and 16% at the production level and between 8% and 37% at the export level (CIMS, 2004; Fitter and Kaplinsky, 2001; Talbot, 1997). In producing countries, coffee farmers typically undertake activities from planting to harvest and, in most cases, complete the first

processing of the coffee cherries through depulping and pre-drying. After that, the coffee is sold as parchment coffee to intermediaries or directly to a cooperative or an exporter for further processing to dry parchment and finally exportable green coffee. The major supply adding is realized within the branding and retailing process (Daviron and Ponte, 2005). Certified coffee supply chains are typically more complex than conventional supply chains (Kiemen and Beuchelt, 2010). Coffee producers are facing increasing demand regarding the physical quality of their coffee but are also required to provide other values to their product, e.g. by investing in certification schemes (Renard, 2005; Young and Hobbs, 2002).

Challenges in international coffee supply chains

Environmental and social challenges arise in both large coffee plantations and the processing industry as well as among small farmers. Here, we focus on environmental and social challenges related to the general challenges in global supply chains (Figure 1 and Table 1). Other typical production challenges such as the effects of climate change (prolonged rain, wrong timing of rain/drought periods, pests and diseases) or market risks such as coffee price volatility, interest and exchange rates are not discussed here. Environmental and social risks for coffee plantations are less documented by researchers than by journalists and NGOs. For example, just recently, a case-study from Danwatch revealed slave-like working conditions, child labour, use of highly toxic chemicals with little protective equipment on coffee plantations in Brazil (Danwatch, 2016).

Typical environmental challenges at the coffee production and processing level are water pollution arising from wet processing and from dumping coffee pulp in or next to streams and rivers. This can lead to the intoxication of streams and affect water consumers downstream leading to diarrhoea, skin and other health problems (Haddis and Devi, 2008). Further challenges are the increasing forest degradation through the reduction of indigenous shade trees up to the elimination of all trees (monoculture plantings in full sun), which lead to destruction of habitats of songbirds and other species, i.e. a major decline in biodiversity (Bitzer et al., 2008). Together with heavy agrochemical applications, this leads to a decrease in ecosystem service provision such as pollination, pest control, erosion control, watershed management, nutrient cycling, climate control and carbon sequestration (Jha et al., 2014). Incorrect chemical application and storage can further pollute waterways and contaminate soils.

Typical social challenges are that the production of coffee may involve child labour, especially at harvest time (Danwatch, 2016; Ruben and Fort, 2012). This can occur on large plantations as well as among smallholders. Working conditions can be quite poor (Bitzer et al., 2008). Contract security for farm workers is typically lacking, and often only temporary work is offered during the coffee harvest. Payment for farm workers is often very low, and official minimum wages are not respected (Levi and Linton, 2003). Farm workers and smallholders alike lack the necessary individual protection equipment and necessary training for applying agro-chemicals correctly (Danwatch, 2016). Farm lodging during harvest time is often very rudimentary with temporary shelters, lack of basic equipment (storage facilities, mattresses, water access) and insufficient sanitation facilities (Levi and Linton, 2003). Sufficient clean water is not always available (Danwatch, 2016). Small-scale farmers and labourers are often not well organised and have a poor negotiating status. They are most affected by the price fluctuations and hit by recurring low coffee prices, as they usually have only coffee as their major income source. Small coffee producers usually capture little of the added value along the supply chain (Ponte, 2002b) and often live in poverty (Beuchelt and Zeller, 2011).

VSS for coffee aim to address some of the sustainability risks and challenges in coffee production. They hence are helpful for the public procurer to identify necessary criteria for the call for tender to avoid negative effects of the procured coffee. The procurer can decide whether she/he prefers to focus on environmental or social aspects and, depending on the decision, the bidder can use different VSS to prove compliance. Sometimes, even a combination of different standards might be needed to fulfil the procurer's requirements, e.g. applying both the organic and Fairtrade standard. If

third-party certified coffee is purchased for public procurement, then the procurer can be sure that the necessary steps were taken to avoid some of the sustainability risks and challenges. Which risks and challenges are reduced depends heavily on the VSS used, whether it has a more environmental or social focus, how strict the criteria are, and how well it performs. The different VSS are likely to perform differently, but not enough research results exist to be able to say with certainty which standard has which impacts. Many of the effects are also context specific.

4.3.2 *Impacts of voluntary sustainability standards for coffee*

There are around ten VSS which are frequently used for coffee when subsuming all organic VSS as “one” standard. Around 50-70 VSS exist that could theoretically be applied to coffee. Certification schemes in the coffee sector are related to environmental factors, which are specifically addressed by organic, bird-friendly, shade-grown certification, to social criteria like Fairtrade or to a combination of both in the cases of UTZ Certified, Rainforest Alliance and Starbucks CAFE Practices. The majority of the coffee research concentrates on organic, Fairtrade, organic-Fairtrade certifications, but UTZ, Bird-friendly and Rainforest Alliance certification are also included. The research so far addresses mainly smallholders and much less larger plantations. This in part can be attributed to the fact that Fairtrade only certifies smallholders, and that smallholders receive a lot of public and media attention, while the situation of coffee plantation workers is much less known. Most reviewed coffee studies analyse economic and/or social impacts, and much fewer address environmental impacts, except those concentrating only on organic certification. The following summarizes the different findings. Not enough data are available to distinguish the impacts of each certification.

Studies identifying economic and social benefits of coffee certification

- Higher prices paid to farmers (Arnould et al., 2009; Bacon, 2005; Barham and Weber, 2012; Beuchelt and Zeller, 2011; Reynolds et al., 2004; Valkila, 2009; Wollni and Zeller, 2007).
- Higher returns to certified production (Barham et al., 2011; van Rijsbergen et al., 2016) but not always (Beuchelt and Zeller, 2011).
- Consequences of higher prices: better nutrition, increased education, health, improved household sanitation systems, water supplies or cooking stoves (Arnould et al., 2009; Bacon et al., 2008; Becchetti and Costantino, 2008; Reynolds et al., 2004; Utting-Chamorro, 2005).
- Increased social organization and contribution to capacity building of farmers and their organizations (Bray et al., 2002; Reynolds et al., 2004; Taylor, 2005).
- Lower production costs for organic coffee than for conventional coffee (Nigh, 1997; Valkila, 2009).
- Higher shares for Fairtrade but not for organic certified coffee farmers (Daviron and Ponte, 2005). Mendoza and Bastiaensen (2003) indicated only slightly higher producer shares of final retail prices for certified coffees than for conventional ones.
- Positive changes in producer organizations, input use, wealth and assets (Donovan and Poole, 2014; Ruben and Fort, 2012).
- Improved hygiene and safety on farms (safety rules, first aid kits, transport to hospital) (BSD Consulting, 2015)

Studies identifying environmental benefits of coffee certification:

- Higher species diversity in those certification systems that target biodiversity (Mas and Dietsch, 2004)

- Less chemical input use, less/no water pollution (Beuchelt, 2012; Blackman and Naranjo, 2012; SCSKASC, 2012)
- Yield / productivity increases (van Rijsbergen et al., 2016)

Studies identifying mixed effects, little or no economic, social or ecological impact of coffee certification:

- Only small/no price differentials (Bacon, 2005; Kilian et al., 2006; Philpott et al., 2007; Utting-Chamorro, 2005)
- Certified farmers may have higher production costs than conventional farmers (Beuchelt and Zeller, 2013, 2011; Kilian et al., 2006; Mutersbaugh, 2005; Van der Vossen, 2005)
- Low income, household and welfare effects (Beuchelt and Zeller, 2013, 2011; Jena et al., 2012; Ruben and Fort, 2012; van Rijsbergen et al., 2016)
- Higher labour needs, higher labour expenditures (Beuchelt and Zeller, 2011)
- No biodiversity impact of organic or Fairtrade certified farms (Philpott et al., 2007)
- Little to no impact on yield on smallholder farms (Beuchelt and Zeller, 2013; Mutersbaugh, 2002)

Though VSS in coffee aim to address the above-mentioned sustainability risks and challenges, research results show that the change in management practices does not necessarily lead to the desired outcomes measured by the impact studies. However, many impact studies often focus on poverty, income and yield and less on other impacts (e.g. knowledge gain, pollution, health hazards) and which practices have changed. That the pollution of waterways in wet processing is prohibited by basically all standards and that this has a strong impact on the riverine systems is not addressed by researchers at all. Here, of course, we have a good example of a limit of VSS at the landscape level. If half of the coffee producers are certified and do not pollute the waterways while the other half continues with the traditional processing, the ecosystem and humans are still negatively affected. However, VSS are an important step towards a change. Another important point is that the diversity of impact results is likely due to the fact that they are context and country specific. VSS working in one country and one setting may not lead to the same benefits in a different socio-economic or agro-ecologic setting where, for example, soils are less exhausted and functioning governments and cooperatives exist. For a public procurer this is naturally difficult to anticipate.

Research results show that VSS manage to address certain challenges and result in positive albeit slightly mixed impacts. While the evidence base is not always showing large positive impacts, it needs to be highlighted that – in contrast to conventional coffee – no negative experiences for certified coffee are mentioned. While this is too little to say that VSS are effective, they still are a helpful proof for procurers to know that the worst hazards and abuses (see section 4.1) have not occurred. The coffee case shows that for public procurement, VSS make an important contribution to more social and environmental benefits though they may not lead to all the desired impacts.

5 Voluntary sustainability standards: Experience and knowledge gaps in European public procurement

A change from the common procurement process to sustainable procurement calls for considerable efforts, at least for the first tender of a certain product. If a procurer wishes to integrate sustainability aspects in the call for tender, she/he needs to know which challenges and risks exist in a particular product supply chain, which criteria are required, and on which sustainability aspect to focus. This is not always easy to find out. Procurers must have relevant knowledge, capacities and resources, especially time, to identify all necessary details. Institutional and organizational backing and clear policy frameworks to support the change in procurement habits are also necessary (ISEAL Alliance and ICLEI, 2013).

Biomass-focused VSS can be useful for public procurers for identifying which social and environmental criteria should be used in the call for tender (Vasileva et al., 2012). In the procurement process, ecolabels and VSS are mostly used as a reference tool in creating criteria and for verification (UNEP, 2013), as they typically address challenges in the production processes and supply chains. Specific certifications or labels can be named in a call for public tender but are not allowed to be a requirement, as the principles of equal treatment and non-discrimination in German and EU legal frameworks must be followed, i.e. a product must have an equal chance when it uses another label complying with the same criteria (D'Hollander and Marx, 2014; European Parliament, 2014). In other countries, the direct naming of a certification is possible (UNEP, 2013).

Public procurers usually focus more on environmental aspects than on social criteria (Beck and Schuster, 2013; ISEAL Alliance and ICLEI, 2013). Social labels are used less as they are seen to be related to the production process as opposed to the final product, and partly because they are difficult to operationalize or to verify (Beck and Schuster, 2013). There is still a degree of legal uncertainty around when and how to use sustainability standards, especially regarding social standards (Beck and Schuster, 2013; ISEAL Alliance and ICLEI, 2013). For this, clearer policy frameworks and institutional support as well as capacity building are needed.

According to ISEAL Alliance (2013), VSS are often considered as a relatively easy tool to use. Still, the process to identify differences between the various biomass-focused VSS and to develop appropriate criteria for a public tender takes time. Standards might only cover some elements (e.g. environmental aspects but not social aspects), and not meet all elements required by a procurer. Information about what constitutes a good, credible standard and how it works, what is its scope, coverage and verification method is not always available, and the reliability of the sources providing information needs to be screened. Initiatives like “Standards Map”⁸ of the International Trade Center or the German “Kompass Nachhaltigkeit”⁹ aim at increasing comparability and transparency between the different standards and certifications but still have a long way to go to fill their databases according to the needs of a procurer.

Procurers can also face incompatibilities between their needs and the design of standards, or find that there are no or not enough suppliers on the market for their desired product characteristics (ISEAL Alliance and ICLEI, 2013). It is important to have sufficient offers that meet the required criteria in the procurement process, as competitiveness and efficiency objectives also have to be

⁸ The Sustainability Standards website, available at www.standardsmap.org, provides comprehensive, verified and transparent information on voluntary sustainability standards and other similar initiatives covering issues such as food quality and safety. The main objective is to strengthen the capacity of producers, exporters, policy makers and buyers, to participate in more sustainable production and trade.

⁹ Kompass Nachhaltigkeit is a German open access online platform with information for public and private procurers aiming to procure sustainably: <http://www.kompass-nachhaltigkeit.de/>

met; procurers cannot use strict criteria when there are not enough suppliers in the market (ISEAL Alliance, 2013). Higher costs for certified products do not necessarily occur, and public procurement experience has shown that the purchase of certified products made no financial difference. For example, if durability or a life cycle analysis is applied instead of the cheapest price, additional costs can rapidly be recovered through whole life cost savings (Forum for the Future, 2007). Well documented examples, including the listing of possible additional costs or savings, are generally limited and few in the biomass sector, though many short descriptions of best practice cases all around Europe exist. Likewise, experiences and documents on procured certified coffee are difficult to find. The reason may be that coffee is a simple, straightforward case for procurement – fair trade criteria are mostly requested – so no need is felt for presenting examples or documenting cases¹⁰.

For enterprises, biomass-focused VSS and certifications are a means to show compliance with requested environmental and social criteria, standards and production conditions of the call for tender (D'Hollander and Marx, 2014). Several proofs of fulfilment are possible in a public tender, ranging from self-declarations, first- and second-party certifications to third- and fourth-party certifications. The procurer has to verify whether products fulfil the desired requirements of the call for tender. The advantage of third-party certification is that public procurers need to invest much less time in order to verify compliance with their requested sustainable practices (ISEAL Alliance and ICLEI, 2013). The monitoring system is set up in a way that the procurer can be sure about compliance. This also reduces the costs for the procurer for the in-depth post-contract monitoring otherwise needed, for expert opinions, and for reports to analyse other proofs of compliance and technical documents (D'Hollander and Marx, 2014; Vasileva et al., 2012). It is not clear how frequently procurers rely on self-declarations and first- and second-party certifications to check the fulfilment of the requirements of the call for tender; no data was found on this matter.

To solve identified challenges and increase the benefits of European sustainable public procurement in low- and middle-income countries, existing knowledge gaps need to be overcome. They can be grouped in two categories, i.e. around the (i) impact of various biomass-focused VSS, and (ii) the processes of public procurement.

Impacts of biomass-focused VSS in low- and middle-income countries

As biomass-focused VSS vary widely in their principles, strictness, ex-ante conformity assessment and ex-post verification procedures, differences in impacts and effectiveness of VSS are very likely. A broader scanning of the research on other biomass types other than coffee showed that most research on biomass-focused VSS concentrates on a few products (mainly horticulture, tea, cocoa, some on palm oil) and on a few certification systems (mainly organic, Fairtrade and GlobalGAP) (Jawtusich et al., 2011; Loconto and Dankers, 2014). A large knowledge gap exists with respect to the socio-economic and ecological impacts of other biomass-focused VSS (e.g. ISCC, RSPO) and biomass products such as flowers, honey, sugar, meat, palm oil, and biomass for bioenergy (Blackman and Rivera, 2010; Loconto and Dankers, 2014).

In addition, many impact studies are methodologically weak. While qualitative research is abundant, especially for coffee, only few rigorous quantitative impact assessments controlling for selection bias and ensuring adequate sample sizes exist, and these often fail to use qualitative methods to establish their analytical models and explain findings. Most studies do not provide any further estimation of how the sample size was determined (e.g. estimation of effect size, power), so non-existent differences might also be attributed to an inappropriate sample size. There is still a major gap in systematic, rigorous impact assessment studies that ideally compare several standards of one biomass-type in different agro-ecological and socio-economic settings with the same method. Most quantitative studies fail to explain well the reasons why and when certifications have positive effects,

¹⁰ This was the result from screening the internet. The Fairtrade towns are committed to procure only fairly traded coffee (<https://www.fairtrade-towns.de/mitmachen/die-fuenf-kriterien/>).

what are the socio-economic and agro-ecological settings that foster or prevent positive effects. For example, as coffee research shows, low yields can explain the low socio-economic benefits of certifications, as the production level is simply insufficient to generate a living income from coffee (Barham and Weber, 2012; Beuchelt, 2012; Beuchelt and Zeller, 2011). Compensating for low productivity levels is not the objective of any certification. The socio-economic and institutional settings of the countries where the certification is issued are also hardly taken into account although they are likely to influence the outcome. Such analysis could begin with a systematic review of existing impact studies and then be complemented by case studies.

How much the monitoring and verification system influences the impacts needs to be better identified. What is the impact of self-declarations, and of first- and second-party certifications regarding, for example, the respect of labour rights, wages and working hours or environmental pollution? Do self-declarations lead to any changes in the supply chain, especially in low- and middle-income countries? More research is also required to better understand which biomass-focused VSS types contribute most to development keeping in mind the often limited willingness to pay for high standards. The hypothesis exists that lower standards might benefit more workers as they can be more easily implemented and thus, due to lower costs, of more interest to industry (Linton, 2005). However, it is not very clear which criteria lead to which effect. More interesting is the system of monitoring and control, as these are permanent costs. Typically, lower standards also have less stringent control systems. Research needs to address the question whether less strict or more strict requirements achieve a stronger development impact on a large scale, and which type of control system (in quantity and quality) under the given current constraints of limited market demand and willingness to pay for certified products should be implemented.

A great deal of research concentrates on smallholders, while certified plantations are far less investigated. Based on feedback by certifying organizations, impact differences are expected to be actually more explicit for plantations than for smallholders, as more workers benefit from changes in, for example, occupational safety, improved housing conditions, stable work contracts, working hours and conditions, and workers' rights compared to non-certified farms. The impact on individual income and well-being however might likewise not be that obvious and equally difficult to measure, and probably materializes over longer time frames. Research financing hence needs to be sufficient to create panel data sets over many years with large enough sample sizes to also detect smaller differences, and a mix of quantitative and qualitative methods to be better able to explain the findings should be encouraged.

In practice, there is still a gap between expectations of what VSS *should* deliver and what they realistically *can* deliver given the criteria in their standard, and between the desired impact and consumers' willingness to pay. Research should ask which impacts from biomass-focused VSS standards within short and long-term time frames can realistically be expected. Are biomass-focused VSS able to satisfy expectations regarding more complex problems, which are also related to governmental failures such as biodiversity, food security, land tenure or basic human rights? Are expectations too high given the low willingness to pay more for certified products? It is sometimes pointed out that poorer countries or smallholders in low- and middle-income countries might be excluded from global supply chains when (strict) VSS become more common in international markets (Bendell et al., 2011). Based on experiences related to food quality and safety standards in the horticultural sector, it is argued that biomass-focused VSS increase fixed production costs and transaction costs related to conformity assessment, and thereby create economies of scale and advantages for larger suppliers (Beghin et al., 2015; Reardon et al., 2009). Much less experience exists in other sectors and for other biomass-focused VSS. There are also research results that point in the opposite direction While smallholder farms continue to be suppliers, biomass-focused VSS can lead to higher rents from participation or enable more direct access for smallholders to global supply chains (Beghin et al., 2015; Reardon et al., 2009). More research needs to address this question and

identify whether VSS in the biomass sector include or exclude smaller producers from international markets and under which conditions this takes place.

Public procurement processes

There are several stages in the procurement process where environmental and social criteria could be introduced (see section 3). One open research question is: for which biomass-based products do procurers request VSS, which VSS are requested and used for which reason? Furthermore, for which product groups are VSS missing or are there insufficient numbers of suppliers so that stricter environmental and social criteria cannot be requested. This information would help to identify appropriate measures to support more sustainable products, for example, whether more capacity building or resources are needed, whether VSS still have to be developed or improved, or innovative procurement processes have to be started to create a market supply.

The effects of sustainable procurement for products with global supply chains should be quantified and qualitatively better defined, and the effects on the environment and societies in low- and middle income countries should be described in detail. Currently, there is little data showing or quantifying these effects. Exact data and hence more clarity about the leverage of procurement helps to encourage procurers, policy makers and organizational leaders to increase efforts towards sustainable procurement.

The rules and regulations around public procurement are manifold and some uncertainty among procurers is frequently mentioned. As there are several ways to show compliance with the requested sustainability criteria of the public tender, what is the relationship between self-declarations, first- and second-party certification, and provision of certificates with third-party certification of submitted offers? Which system of proof is finally bought by the procurer? How often are self-declarations or first- and second-party certification accepted, what would have been alternatives, for which reasons were they chosen? How do procurers ensure compliance, how time and cost-intensive is this process? Given limited budgets and the quest to not waste public money, a research question is whether there is a preference of procurers towards 'sustainably' labelled products with lower performing, less strict biomass-focused VSS or self-declarations as these are cheaper instead of stricter, higher performing biomass-focused VSS? This requires data on how frequently self-declarations are used, whether there were alternative offers, and what were the reasons to select the product with the self-declaration? The products or product categories where procurers most frequently have to compromise between desired sustainability traits and limited market offers are not well known. This information could be used for a dialogue between procurers, business and policy makers to stimulate markets towards the development of more sustainable products, for example through the development of standards for the requested product or through public policy incentives to create a larger diversity of offers.

6 Lessons learned for public procurement and conclusions

European public procurement regulation nowadays places a focus on sustainability. Biomass-based products from Europe and abroad are important in public procurement processes. This paper highlights the sustainability challenges and risks of biomass-based products in global supply chains. Environmental and social challenges and risks exist at each stage of the supply chain; they relate, for example, to the violation of human and labour rights, workers' safety, or environmental pollution. Biomass-focused VSS and certification systems are of interest in the public procurement process as they are one means to address these challenges and risks especially for products with global supply chains from countries with weak governmental structures. As efficacy is important for public procurers and they need to justify their expenditure, this paper reviews the impacts of biomass-focused VSS. Summing up, biomass-focused VSS can have positive effects especially regarding agricultural practices and production systems. The evidence for substantial impacts on environmental and social sustainability, however, is still weak. In part this can be explained by the research setting, as researchers work in relatively homogenous settings, mainly with specific socio-economic standards, e.g. accessibility of the research site, security of staff. They work much less in production areas where major risks and challenges in international supply chains exist. Therefore, hazardous production conditions are usually revealed by NGOs and journalists, not by researchers. If compared to the sometimes disastrous production conditions found in the conventional system, biomass-based production certified with VSS does make a significant difference. VSS can be also regarded as a means to ensure minimum human and environmental standards which otherwise might not be respected in countries where laws are not sufficiently enforced. While in the uncertified system the procurer cannot be sure whether the purchased product was produced respecting social and environmental standards, this is possible when the product is certified. The case study on conventional and certified coffee supply chains also illustrates this. Experiences gained in the case of certified coffee is, with some caution, transferable to other biomass types and other biomass-focused VSS, as they are also similar to the findings in the general review on potentials and limitations of biomass-focused VSS.

Biomass-focused VSS are used by public procurers for three reasons: (i) to establish sustainability criteria for tender offers, (ii) to minimize risks in procurement, and (iii) to ease the process to verify compliance. Though VSS usually do not cover the whole supply chain or all sustainability aspects, they address some of the major risks and challenges in the supply chains. Through requesting environmental and social criteria for a product, a public procurer can at least address individual stages of a supply chain and ensure that the worst environmental and social offenses are avoided. The procurer can also combine different VSS, so that a wider range of sustainability aspects and supply chain stages can be covered. However, this probably affects product costs, and there might not be many suppliers. Some caution regarding biomass-based VSS needs to be applied as different standards have different requirements, stringency and verification systems. VSS with third-party certification are more reliable than codes of conduct, self-declarations, and first- and second-party declarations. These declarations are very difficult for the procurer to control. They allow the final and intermediate producers some green and social washing, as they can always say that their policy establishes the environmental and/or social criteria requested by all their suppliers. That they have no reliable system in place to monitor the compliance with their criteria along their full supply chain of course saves costs in the production process. Hence, as long as self-declarations and first- or second-party certifications are acceptable, an unlevelled playing field exists in the procurement process for those products with third-party certifications. To understand these differences, determine the adequate criteria, ensure how these are monitored and verified, and which VSS possibly fulfil the desired criteria, is not easy. Public procurers require adequate knowledge, training and resources, especially time, but also institutional backing. A general limit to the use of sustainability standards in public procurement can be a low supply of such products, so research

activities should identify in which areas this is the case and how to best to stimulate the market development.

There are still knowledge gaps around the impacts of VSS which are of relevance for public procurement. For example, hardly any impact studies exist for many of the biomass-based VSS that have emerged in the past 10 years. As the VSS vary in criteria, have stricter or less strict requirements and differences in the monitoring and control system, more research is needed to determine under which conditions most impacts can be expected; this will help procurers in their choice of criteria and VSS. Large data gaps also exist in the procurement process. For example, there is no data on how frequently biomass-based VSS are used, for which products, and how frequently procurers rely on self-declarations, and first- and second-party certifications compared to third-party certifications. The question also is whether there is a tendency towards lower performing, less strict biomass-focused VSS or self-declarations given the limit public budgets and the principle of choosing the most economic offer. More data about the leverage potential of procurement could encourage procurers, policy makers and organizational leaders to increase efforts towards sustainable procurement. Research should hence quantify the effects of sustainable procurement in low- and middle income countries. Likewise, studies should be carried out to determine for which products or product categories procurers have to compromise between desired traits and limited market offers. Research further needs to identify which level of strictness of VSS is actually sufficient to create the desired sustainability effects of public procurement. This information could be used for a dialogue between procurers, business and policy makers to stimulate markets towards the development of more sustainable products.

The identified knowledge gaps need to be addressed to improve the sustainable procurement process, increase the use of biomass-focused VSS, and further ensure the intended impact of sustainable procurement. Filling the gaps will further help to identify whether the procurers need more capacity building or resources, whether new biomass-based VSS still have to be developed or existing ones improved, or whether innovative procurement processes have to be started to create a market demand and increase the supply of sustainable biomass-based products.

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