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Toward Sustainable Biofuels in the European Union? Lessons from a Decade of Hybrid Biofuel Governance

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Abstract: The European Union (EU) stands at a crossroads regarding its biofuel policies. For more than a decade, the EU sought to create a market for and govern sustainable biofuels for the transport sector, even as debates over sustainability escalated. It did so by devising novel hybrid (public and private) governance arrangements. We took stock of the nature and outcomes of this experiment in hybrid biofuel governance. We relied on qualitative methods of analysis, whereby we reviewed and synthesized the evolution of EU biofuel governance arrangements over time, through detailed document analysis of secondary and primary literature, including EU and related policy documents and private certification scheme websites. Our analysis reveals that, instead of yielding an increasingly stringent sustainability framework, the hybrid EU governance arrangements resulted in a proliferation of relatively lax, industry-driven, sustainability standards, even as the notion of "sustainable biofuels" remained contested in public and political debate. These findings contribute to an ongoing debate about the merits of hybrid (public–private) governance arrangements, and whether a hybrid approach helps strengthen or weaken sustainability objectives. We conclude that a more stringent EU meta-standard on sustainability needs to be developed, to underpin future governance arrangements.

Keywords: biofuels; European Union; Renewable Energy Directive (RED); hybrid governance; sustainability; certification; multi-stakeholder initiatives

1. Introduction

For the last decade and a half, the European Union (EU) experimented with novel, hybrid (i.e., both public and private) governance arrangements for the production, import, and use of sustainable biofuels for its transport sector. It is now at an important juncture in its biofuel policies, with sustainability debates continuing to rage within the EU and beyond, and important changes being considered and implemented with regard to future policy choices.

In this article, we take stock of the nature and outcomes of the EU's experiment in hybrid biofuel governance, in order to draw lessons for future policy directions. This is a very timely moment to do so, given extensive political and societal debate underway about the sustainability of biofuels, and recent responses of EU institutions to such debates. A recent illustration is the decision by the European Parliament (17 January 2018) to phase out the use of palm oil as a feedstock for production of biofuels by 2021. This decision challenges a key element in EU's biofuel policy of the last decade, which laid down that inclusion of particular feedstocks would be based on whether or not they fulfilled the EU's standard for sustainable biofuels. By excluding a particular feedstock, in this case palm oil, regardless of whether it complies with the EU's sustainability requirements or not, the European Parliament

seems to suggest that the standard and procedures developed in the EU's Renewable Energy Directive (RED) do not guarantee the sustainability of biofuels.

The RED directive, adopted in 2009 and covering the period of 2010–2020, was implemented after years of discussion, and is the cornerstone of the EU's hybrid biofuel governance architecture. It prescribes minimum greenhouse gas (GHG) emission reductions for biofuels, relative to the fossil fuel that biofuels are intended to replace. It also prohibits biofuel feedstock production on land with recognized high biodiversity and carbon stocks and on peatland. As proof of compliance, the European Commission (EC) asks for a sustainability certification of biomass-based fuel, independently from whether biofuels are produced within the EU or imported.

With this policy, the EU aimed to replace 10% of all transport fuel consumed within the EU from fossil to bio-fuel by 2020 [1,2]. In responding to increasing controversy over sustainability criteria for biofuels, however, one key change was made in April 2015. In the context of a new directive on the quality of petrol and diesel fuels, and the promotion of energy from renewable sources, the EU agreed to put a cap of 7% on use of first-generation biofuels (i.e., based on agricultural crops), to limit the volume of such crops grown solely for energy consumption [3].

The EU RED directive and associated decisions, regulations, norms, and standards lay the groundwork for a particular, novel (hybrid) governance approach to biofuels within the EU, wherein the EU sets a "meta-standard" (the basic, minimum, sustainability requirements) and leaves it to private initiatives to assess and certify compliance of a particular biofuel with this standard, through private certification schemes. The integration of private certification initiatives with RED created a hybrid biofuel governance landscape within the EU, i.e., a combination of public standards and private certification initiatives to govern access to the EU biofuel market [4].

Extensive research in recent years focused on how private certification initiatives function [4–7]. Many studies discussed, additionally, the sustainability debates around biofuels, including the pros and cons of various measurement tools to assess the (adverse) effects that biofuels might have on changing land use, GHG emissions, and agricultural production, among others [8–10]. Our article adds to these existing studies by examining and distilling lessons from 10 years of hybrid biofuel governance within the EU, wherein the functioning of private certification initiatives is one key (but not the only) element of the analysis. We analyze the links between these private initiatives and EU-devised meta-sustainability standards, which in turn are evolving in response to continued debate and controversy over the sustainability of biofuels as alternatives to fossil fuels. It is the interaction between public and private governance elements that we are interested in, particularly in light of the recent decision by the European Parliament that challenges the long-standing basis of the RED-centered hybrid governance arrangement. This laid down that the sustainability of a particular biofuel is assured if the EU RED sustainability criteria are fulfilled, as verified through private certification processes recognized and accredited by the EU. In this arrangement, any feedstock could be used, as long as it is certified according to EU standards. As this seems no longer to be the case, some critical questions arise. Why does the European Parliament no longer recognize this governance arrangement as a guarantee for sustainable biofuels, and what does this mean for the future of biofuel policy in the EU? We discuss these questions in this paper.

We proceed as follows: the next section conceptualizes hybrid governance, as we use the term here. Section 3 describes the evolution of hybrid biofuel governance in the EU. Section 4 evaluates how these governance arrangements worked in the last decade, and the extent to which they furthered the EU's sustainability goals. We conclude by drawing out the implications of our findings for the future of biofuel policy in the EU. We rely on qualitative methods of analysis, whereby we review, distill, and synthesize the evolution of EU biofuel governance arrangements over the last decade, through detailed document analysis of secondary and primary literature, including EU and related policy documents, and private certification scheme briefs and websites.

Our analysis reveals that, instead of yielding an increasingly stringent EU-wide framework to guarantee use of sustainable biofuels within the EU, the hybrid governance arrangements resulted in a proliferation of relatively lax, industry-driven, sustainability standards, at the cost of more ambitious multi-stakeholder initiatives, even as the notion of biofuel sustainability remains contested in public and political debate. These findings contribute to an ongoing debate in the literature about the merits of hybrid (public–private) governance arrangements, and whether a hybrid approach helps strengthen or weaken sustainability objectives. Our analysis shows that hybridity did not deliver on strengthening sustainability objectives, as envisioned by some advocates of public–private governance. We conclude that a more stringent EU meta-standard on sustainability needs to be developed, to underpin future governance arrangements.

2. Hybrid Environmental Governance

Hybrid governance, or the interaction between private and public sources of authority, was the subject of several studies in the global environmental realm [11]. Much analytical attention was devoted to the emergence of hybrid governance and sources of their legitimacy [5,12]. Related research highlighted the consequences of these developments for the (changing) authority of the state [13,14].

In conceptualizing hybrid biofuel governance here, we build on the interpretation by Ponte and Daugbjerg, who argue that hybridity is a form of mutual dependence between public and private actors [4] (p. 2). They define hybridity as

> "*polyarchic and overlapping governance arenas, where interactions between a variety of mutually dependent private and public actors give rise to hybrid regulatory features, and where collective orders and individuals engage in cross-border rulemaking, implementation, and enforcement activities*" [4] (p. 4).

Working with such a notion of hybridity, a key debate in the literature is how hybrid forms of governance are related to sustainability outcomes, particularly given the proliferation of such arrangements in the sustainability realm. Hybrid forms of governance are especially evident in the issue-areas of forests [15], fisheries [16], and commodities, such as palm oil for biofuels [17]. Whether these arrangements further sustainability, or rather detract from it, remains debated. Some scholars argue that hybrid governance may enhance the governance capability to achieve sustainably goals, including environmental protection (for example, climate mitigation, biodiversity conservation, and indirect land-use change), social advancement (for example, improved labor conditions), and economic prosperity (for example, financial viability and macro-economic effects) [6,18,19] (p. 3). Others consider that hybridity risks undermining sustainability objectives through leaving too much decision-making authority to private actors, and thereby also exacerbating environmental degradation, socially unjust outcomes, or economic hardship [20].

At the very least, this debate in the literature reveals that the contribution of hybrid forms of governance to realizing sustainability objectives remains variable and unstable. The inclusion of private initiatives in state-led governance can, in theory, promote adoption of more stringent criteria and prioritize best practices for a "race to the top". On the other hand, if multiple options are available and competition between private schemes arises, the resultant fragmentation can also undermine sustainability in a "race to the bottom". It is timely, therefore, to examine this relationship for the case of EU biofuel policies, to which we turn below.

3. EU Biofuel Regime: The Emergence of Hybridity Governance

This section describes the landscape of the EU hybrid biofuel governance regime. We firstly outline the emergence of the regime and the sustainability imperatives therein. We then consider the involvement of private voluntary certification schemes in the context of EU biofuel sustainability objectives.

3.1. EU Biofuel Directives: Scope and Sustainability

The first EU "biofuels" directive—to promote the use of biofuels and other renewable fuels for transport—entered into force in 2003 and set a voluntary blending target of 2% in 2005, and a binding target of 5.75% renewable energy in the transport sector by 2010 [21]. There were no strict sustainability standards, but the EC had to report on cost-effectiveness, and economic and environmental aspects of biofuels production and trade, the effect of biofuels on climate change, indirect land-use change (ILUC), and the long-term options for energy efficiency in the transport sector.

Following the implementation of the biofuels directive, the use of biofuels for road transport increased to 2.6% in 2007 [22]. This was partially achieved by a growth in imported bioethanol in the period between 2005 and 2007, due to the lower production costs and higher efficiency of Brazilian sugarcane ethanol at that time [7]. Also, biodiesel trade increased through cheap soybean oil from the United States, where farmers benefited from subsidies [22]. However, this increase in international trade complicated reporting on GHG emissions, an important sustainability indicator.

Official GHG emission savings in this period amounted to 9.7 Mt (2006) and 14.0 Mt (2007) CO_2-eq., but these figures remained debatable because the EU based them on the assumption that biofuels were produced from "abandoned" agricultural land, while indirect land-use change impacts from biofuels (ILUC) were not taken into consideration. By 2006, lobbyists, environmental organizations, and scientists began arguing that the EU's desire to make its transport energy more sustainable led to increased GHG emissions in other countries [8,22], thus undermining the main sustainability objective incorporated in the biofuels directive. They argued that these (in)direct adverse effects should be included as risks to be mitigated in EU biofuel policies [8,23]. The debate became most heated with the 2007–2008 food price crisis, when United Nations (UN) Special Rapporteur on the Right to Food Jean Ziegler called biofuels a "crime against humanity" [24]. After years of deliberations—both in public and behind the scenes—two follow-up EU directives came into effect in 2009: the Renewable Energy Directive (RED) [2] and the revised Fuel Quality Directive (FQD) [1]. These directives called for detailed reports from member states on land-use change and other environmental impacts from increased production of biofuels, thus making sustainability objectives officially part of EU biofuel policies by defining basic sustainability criteria.

RED requires the EU to meet at least 20% of its total energy needs from renewables by 2020, of which at least 10% must come from renewable transport fuels. Biofuels may only be counted if they meet the sustainability criteria set by the EU. These criteria are as follows: (1) biofuels must achieve GHG savings of at least 35% in comparison to fossil fuels and this requirement rose to 50% in 2017 and 60% in 2018 (but only for new production plants); (2) biofuels cannot be grown in areas converted from land with previously high carbon stock such as wetlands or forests; and (3) biofuels cannot be produced from raw materials obtained from land with high biodiversity, such as primary forests or highly biodiverse grasslands [2]. These criteria were further elaborated through detailed standards and norms in order to reconcile diverse national interpretations, for example, European Standard series EN 16214 and associated technical specifications [25]. When biofuels are compliant with these criteria, the EU accepts them as being produced in a "sustainable" manner. Companies can demonstrate compliance by using voluntary schemes recognized by the European Commission.

Despite the sustainability requirements put in place by RED and FQD, debates about the potential adverse effect of biofuels continued. In particular, there were ethical concerns with regard to food versus fuel, an issue immediately related to the land-use change driven by the increasing demand for biofuels [7,26]. Political debates resulted in April 2015 in the agreement that the EU would use a cap of 7% for biofuels derived from crops grown on agricultural land, to be used as part of the renewable energy target for transportation by 2020 [3,27,28]. This agreement also included obligatory reporting on GHG emissions caused by indirect land-use change and an obligation for member states to create incentives for advanced biofuels. Here, we can see that, although the EU shifted considerable governance authority to the private sector when demanding "voluntary schemes" to certify the sustainability of biofuels, more recently, the European Parliament strengthened its baseline

sustainability criteria within its mandatory regulation, given the food vs. fuel debates. This implies a slight "re-centering of the state" [15] in the EU's hybrid approach to biofuel governance, through the enhancement of the sustainability meta-standard.

In November 2016, the EC published a draft proposal for REDII, i.e., a revised biofuel policy for the post-2020 phase. It announced a gradually phasing out of conventional biofuels by 2030. While the proposal includes a call to increase the proportion of renewable energy in Europe to 27% by 2030, it proposes to reduce the contribution from conventional biofuels in transport from a maximum of 7% in 2021 to 3.8% in 2030. It also puts into place an obligation to raise the share of other "low-emission fuels", such as renewable electricity and advanced biofuels in transport, to 6.8%. Furthermore, the Commission suggests that advanced biofuels are those that emit at least 70% fewer GHG emissions than fossil fuels (compared to savings of 60% in 2018 for new production plants by RED).

This appears to signal a trend that the EC will continue encouraging the development of advanced alternative fuels for transport through a blending mandate for fuel suppliers, while progressively phasing out the contribution from food-based biofuels. Such a trend is partly driven by the negative public perception on biofuels as competing directly with food. As Marie Donelly, Director for Renewables, Research, and Energy Efficiency in the Commission's Energy directorate puts it, "we have to be very sensitive to the reality of citizens' concerns, sometimes even if these concerns are emotive rather than factual based or scientific" [29]. As revealed by this statement, the EU's sustainability standard-setting and associated hybrid governance continues to be a subject of contestation and multiple interpretations.

3.2. RED Endorsed Voluntary Certification Schemes

Parallel to the implementation of these EU directives, there was proliferation in the development of private biofuel certification schemes. This was partly because the EU developed its biofuels sustainability standard as a meta-standard [30], leaving compliance with it to be assessed by private actors. One of the key considerations for doing this concerns the limitations the EU encountered as a consequence of international trade regulation [15,31]. The regulations included in the World Trade Organization (WTO) seriously limit the possibility of states to impose regulations and product requirements on other member states [7]. A hybrid governance approach that builds on a meta-standard seems to offer better opportunities to influence non-product-related processing and production methods beyond the EU [4].

This was most evident in the period between the initial adaptation of RED in 2009 and the acceptance of compliance with RED of the first seven private schemes in July 2011 [10]. During this period, the number of schemes available to certify biomass or biofuel as meeting EU criteria increased to 67 [32], including the Biomass Biofuels Sustainability Voluntary Scheme (2BSvs) and the International Sustainability and Carbon Certification (ISCC), which became the most popular schemes issuing certificates for EU RED [33].

From the 67 available schemes, 19 were accepted by the EU as of December 2016 [34]. These can roughly be divided into three categories: (1) roundtable/multi-stakeholder initiatives (e.g., Roundtable on Sustainable Biofuels (RSB), Roundtable on Sustainable Palm Oil (RSPO), Roundtable on Responsible Soy (RTRS)); (2) industry schemes (e.g., 2BSvs, Bonsucro, and Greenergy); and (3) government-supported schemes (e.g., ISCC with initial support from the German government, NTA 8080 with support from the Dutch government) [10,35]. Some schemes have a specific national scope whereas others are potentially applicable worldwide. Also, some cover particular crops and only parts of the biofuel production chain, whereas others cover all biofuel crops and entire production chains.

The Roundtable on Sustainable Palm Oil (RSPO) is an example of such a scheme. The RSPO was founded in Switzerland in 2004 as the result of an informal meeting initiated by the World Wide Fund for Nature (WWF) two years earlier with Aarhus United UK Ltd., Golden Hope Plantations Berhad, Migros, Malaysian Palm Oil Association, Sainsbury's, and Unilever [5]. This private initiative

developed a scheme to certify the sustainability of palm-oil products. For instance, most palm oil is processed into foodstuffs (68%) and cosmetics (27%), and only 5% is used for biofuels (although this share is increasing rapidly) [36]. Certifying palm oil for biofuels required some adaptation because, in the context of palm oil for food, sustainability was not discussed in these terms (e.g., GHG savings).

It took almost two years after RED was published before the EC approved the first voluntary schemes as certifiers of compliance with the EU meta-standard. This caused a regulatory gap between the policy-driven market demand being generated for "sustainable" biofuels, and their (certified) availability on the market [10]. As a result, in the intervening period, various stakeholders sought to fill this gap by creating their own sustainability scheme. For some, this may have been a strategic move, in the hope that the EC would adopt a given scheme as a way to make its sustainability requirements operational, giving the initiators a first mover advantage. For others, the hope was to create an effective multi-stakeholder platform that would develop a baseline of stringent criteria to promote sustainability objectives [10].

The EU continued recognizing new schemes after 2011, but the acceptance of schemes by the EC is temporary (for a period of five years), and, as shown in Table 1, several schemes were not renewed after the expiration of the first five-year period, such as RSPO RED.

Table 1. European Commission's acceptance of voluntary schemes.

Year of Acceptance	2011	2012	2013	2014
Voluntary scheme	2BSvs (Biomass Biofuels voluntary scheme)	Ensus *	Biograce GHG	Gafta Trade Assurance
	Abengoa–RBSA * (Abengoa's Bioenergy Sustainability Assurance Standard)	NTA 8080 * (Dutch Technical Agreement 8080)		HVO (hydrotreated vegetable oil) Renewable Diesel Scheme for Verification of Compliance with the RED sustainability criteria for biofuels
	BonSucro	Red Tractor		KRZ INIG System (System of certification of biofuels and bioliquids)
	Greenergy *	Redcert		Trade Assurance for Combinable Crops
	ISCC (International Sustainability and Carbon Certification)	SQC (Scottish Quality Farm Assured Combinable Crops)		Universal Feed Assurance
	RSB EU RED (Roundtable for Sustainable Biomaterials)	RSPO RED (Roundtable on Sustainable Palm Oil) *		
	RTRS EU RED (Round Table on Responsible Soy)			

* Expired (status December 2017). Source: adapted from NL Agency 2011 [37] (p. 29) with added information from other sources [34,37–40] and https://ec.europa.eu/energy/en/topics/renewable-energy/biofuels/voluntary-schemes (visited 24 July 2018).

To understand the process and proliferation of schemes, one has to look at the timeline of EU policies. The political discourse shifted during the 2007–2008 food price crisis when scholars demystified the "ethanol bubble" [38] and outlined potentially devastating implications for global poverty and food security [39,40]. As a consequence, environmental non-governmental organizations

(NGOs) started fiercely opposing biofuels [5]. Critical NGOs, such as Oxfam and Friends of the Earth, were involved in initial efforts to define sustainability criteria for biofuels, in particular, in the (Dutch) Cramer Commission, a multi-stakeholder initiative initiated in 2006 that resulted in the NTA 8080. However, for a while, WWF remained the only NGO to participate in later initiatives, such as the ISCC (International Sustainability and Carbon Certification) supported by the German government from 2006 till 2012 (ISCC 2016). No NGOs are members of 2BSvs, a collaboration between seven French grain producers in 2012 (2BSvs 2016). This dwindling NGO participation indicates the growing civil society opposition against the weak definition of "sustainability" in these initiatives, as well as against biofuels in general.

A comparative study by WWF [41] found large differences between private certification standards, especially with regards to their performance on environmental and social dimensions, and with regards to the aspects of sustainability covered—whether they were social, economic, and/or environmental dimensions [37,42,43]. Complementing this study, Kemper and Partzsch (2018) found that higher NGO presence in biofuel certification schemes correlated with stronger sustainability criteria. Roundtable/multi-stakeholder initiatives were demonstrated to be more ambitious, compared to government-supported and industry schemes. Partly, this was because, in the EU's hybrid governance system, it was also left open whether these private initiatives needed to draw on evolving EU norms and standards, such as EN 16214 [25], designed to operationalize its sustainability criteria, or whether they could devise their own norms and standards to comply with EU criteria. The EU's norms and standards sought to operationalize a minimum, narrow set of sustainability criteria (mainly environmental considerations). For future research, the analysis can also look at the effect of these norms and standards and include other voluntary standard-setting bodies such as the International Organization for Standardization (ISO), but this is beyond the scope of this paper.

4. Evaluating the Effects of the EU's Hybrid Biofuel Governance System

As we sketched above, the EU's biofuel sustainability certification approach can be characterized as a form of hybrid governance, since it relies on a combination of public–private standard-setting and implementation. We next consider below whether hybrid governance furthers or undermines the fulfillment of the EU's sustainability goals and potentially increases or decreases their stringency.

4.1. The EU Meta-Standard

RED formulated three minimum sustainability criteria (GHG savings, protection of land with high carbon stock, and protection of biodiverse forests and grasslands). To be accepted by the EC as certifiers of compliance with EU's sustainability requirements, voluntary certification schemes have to meet, at least, these three criteria. In addition, since 2015, the EU agreed to put a cap of 7% on conventional biofuels, to limit the quantity of potentially edible crops grown on agricultural land for energy consumption. For REDII, the European Commission now proposes to further strengthen requirements for GHG savings (70% less GHG emissions than fossil fuels compared to required savings of 60% in 2018 for new production plants) and to lower the cap on conventional biofuels to 3.8% in 2030. All other criteria included in an RED-accepted scheme remain voluntary. This implies that the current RED serves as a meta-standard or legal (minimum) baseline for private certification schemes (Figure 1). As a "meta-standard", it is a minimum standard that aims to have a broad reach and exclude (at least) the least sustainable practices.

The timeline of accepted sustainability schemes (see Table 1) reveals that the short-term initial effect of this hybrid governance strategy was a growth in the number of certification schemes. There was also an increase in the number of companies and projects participating in the various schemes. The first schemes were often the result of a broad multi-stakeholder consultation process, with a wide scope reaching well beyond the minimum RED requirements, as they were not yet fixed at the time of their development. Looking at the more recent schemes, the picture is different. These schemes are often led by business conglomerates and offer little more than compliance with the

minimum EU standard. The lack of transparency in the certification and auditing process suggests business as usual, rather than improvements with regards to sustainability objectives on the ground. While the EC is yet to provide a clear long-term vision or a foreseeable increase in the sustainability requirements in the meta-standard (other than GHG emissions and a cap on conventional biofuels), current RED's ambitions for strengthening sustainability in biofuel production is undermined through the expansion of certification schemes containing minimal sustainability standards.

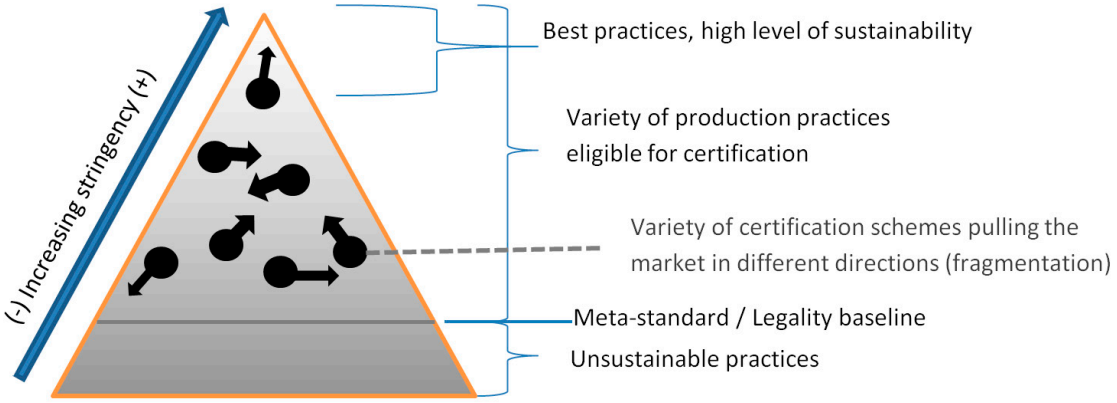

Figure 1. Fragmentation of certification options, according to stringency (developed by authors).

A potential benefit of using a meta-standard approach is the reduced costs for standard development and control, compared to a scenario where the EU would have to carry out certification by itself [18]. The large variability of biofuel resources, production regions, and competition with other markets would have made it very difficult to introduce a simple universally applicable certification scheme. In the present set-up, sectors and companies are able to develop a certification scheme that fits with the specific needs of their markets and industries. This helped improve the speed of diffusion, because these private standards are able to adapt their criteria faster than the EU bureaucracy could do [6]. In particular, voluntary schemes allowed the EU to promote sustainable production and processing methods beyond their own territory, for example, for palm oil production in Indonesia and Malaysia, if this feedstock is processed into biofuel and exported to the EU and included in the 10% transport target [4,26].

While WTO trade rules allow some regulatory scope for environmental sustainability, social sustainability rules are deemed non-compliant. Therefore, the EU refrained from introducing binding requirements on social sustainability criteria in the RED meta-standard [4]. By contrast, voluntary standards may include social sustainability requirements, for instance, minimum wages on biofuel farms [44]. However, even more ambitious schemes, such as the Roundtable for Sustainable Biomaterials (until 2013 known as the "Roundtable on Sustainable Biofuels"), which was one of the earlier and more ambitious multi-stakeholder schemes developed in 2006, only request reporting about social aspects and do not prescribe specific standards. Among the schemes that the European Commission accepted so far, there is little incentive to demand sustainable practices that go beyond the meta-standard.

4.2. Proliferation, Fragmentation, and Competition: Too Many Schemes Dilute Sustainability

RED has not limited the number of private voluntary certification schemes that can apply for acceptance. This means that any scheme that meets the meta-standard sustainability requirements can be accepted. On the one hand, this keeps the market accessible for new applicants. On the other hand, however, this multiplicity and diversity between schemes results in fragmentation and a push toward including only the minimum sustainability objectives from the EU biofuel policy [6,18].

As we showed earlier, after promulgation of RED in 2009, more industry-driven schemes began emerging, such as 2BSvs and Bonsucro/Better Sugarcane Initiative (Table 1). Generally, these schemes

are less stringent and remain close to the minimal EU sustainability meta-standard, even if they are locally successful [45]. Arguably then, by accepting industry schemes, the EU is undermining the likelihood of companies to be certified by the more stringent certification schemes. The increasing spread of certification schemes to choose from, and the competition between them, led to a "race to the bottom", i.e., a "pick-and-choose" system wherein companies avoid schemes that would demand changes in their current production process or that are seen as too stringent. Most companies choose to be certified by industry and government-supported schemes, and hardly any company commits itself to the stricter RSB or RSPO standard [33,46,47]. The ISCC issued more than 13,000 certificates (and only five projects are on the "blacklist") [47]. Often, companies are certified by several schemes; thus, if they lose the certification from a more stringent scheme, for example, RSPO certification, they still remain certified by the less stringent schemes, for example, ISCC [48]. As such, their products can still count toward the EU's 10% transport target. Thus, even companies losing (a specific) certification do not lose their access to the European market. While, at the outset, in an environment of policy uncertainty, hybrid governance helped set the scene by creating elaborate sustainability frameworks, after the adoption of RED in 2009 and its request for certification, this upward sustainability standard-setting process was (partly) undermined by companies demanding lower requirements. New certification schemes rather contributed to business as usual instead of promoting sustainability.

What we can observe with this approach of RED, i.e., a de facto promotion of its legally required sustainability criteria, is that companies reorient their strategies in order to be certified by only the minimum meta-standard, rather than pursuing (even if voluntarily) more stringent best practices with regards to sustainability certification [15]. The ensuing variety and strategic maneuvering of those seeking to be certified also creates fragmentation [6,18]. Such dynamics then do not contribute to promoting more sustainable outcomes on the ground.

Another shortcoming of these dynamics in biofuel sustainability certification is that certification occurs primarily where it is easy to obtain, i.e., at production sites that *already* comply with the required minimal meta-standard. Most of the 19 voluntary schemes that the European Commission accepted for RED are not applicable to developing countries, for example, the Scottish Quality Farm Assured Combinable Crops (SQC) scheme, which certifies only Scottish biomass [49]. Consequently, certification does not serve as a tool to expand the use of best practices, especially when the benefits of becoming certified under a more ambitious sustainability scheme are limited. Less sustainable farms have sufficient alternative export possibilities (beyond access to the EU market) that do not require certification [50,51]. See Box 1 for examples of strategies that may encourage a race to the top. The fact that private certification schemes are not embedded in laws or policies of producing countries might increase this effect even further [52–54]. This would be an argument for a more legality-driven approach to promote sustainability outcomes across a whole sector. For example, the Indonesian Sustainable Palm Oil system (ISPO) is a mandatory national standard that is applicable to all oil palm growers in Indonesia [55]; however, ISPO is yet to be accepted by the EC [49].

Box 1. Top-runner program for sustainable biofuels (developed by authors).

- Japan encourages competitiveness on energy efficiency with a unique program: the Top Runner Approach. The program sets a mandatory meta-standard, based on the most efficient ("top runner") products on the market, for a variety of appliances, equipment, and automobiles. It has been a highly effective program since its adoption in 1998 and is now considered one of the major pillars of Japanese climate policy. By 2009, the program achieved mandatory energy efficiency standards for 21 products [56].
- Likewise, the European Commission could limit the number of accepted biofuel certification schemes and only accept the most stringent schemes for contributions to its 10% transport target. This would prevent earlier and more ambitious schemes to vanish from the market. Companies would be more likely to commit to schemes that are more ambitious and, hence, more likely to stay on the Commission's list.

4.3. Certification and the Stimulation of Best Practices

As we argued above, voluntary certification schemes have become, in part, responsible for the execution of the sustainability requirements of RED. This is controversial due to the nature of many voluntary certification schemes, which are driven by mainly profit-seeking private actors [4,5]. With regards to what constitutes stringent criteria and best practices, biofuel certification schemes reveal a broad variety in governance procedures and standard-setting with regards to coverage, assurance, verification, transparency, quality, and monitoring and reporting mechanisms. Ambitious certification schemes were developed before a discussion started on a mandatory requirement for sustainability certification of biomass-based transport fuels, i.e., specifically before the 2007–2008 food price crisis. The most ambitious schemes were developed for high value-products, for example, palm oil in certified food and cosmetic products. The Rapunzel "HAND IN HAND" program, started in 1992, can definitely be considered a "best practice" (see Box 2) [57]. With regards to biofuel certification, multi-stakeholder initiatives in particular, such as the Cramer Commission and the RSB, demonstrated a broad set-up and inclusion of various sustainably criteria, including environmental and social reporting indicators [46,58]. The government-driven schemes in their early phase of set-up also demonstrated this broader and more stringent approach, in particular, ISCC and NTA 8080 that the Dutch normalization institute NEN developed following the Cramer Commission. However, different to Rapunzel's "HAND IN HAND" program, these schemes never aimed for *organic* biomass production when talking about *sustainable* biomass. Prohibition of genetically modified organisms (GMOs) was an issue in the Cramer Commission [5], but did not enter into any final criteria catalog. Central to the Cramer Commission, which focused on biomass-based fuels, was the GHG balance. The Commission suggested a minimum requirement of 30% GHG reduction for 2007 and 50% GHG reduction for 2011 (and 70% emission reduction in the long run), compared to fossil fuels [58]. RSB requests GHG emission reduction of 50% compared to fossil fuel [46]. The 2009 EU RED criteria are similar: GHG savings of at least 35% in comparison to fossil fuels, 50% since 2017, and 60% since 2018 (but only for new production plants) [2].

The effectiveness of individual certification schemes was the topic of extensive research by academics and NGOs, which demonstrated that there is a large gap between intentions and set-up of many voluntary schemes, and that these schemes have limited (global) impact [32,41,52,53,59]. A related risk of using voluntary schemes is that certification itself is not always a guarantee that standards are actually followed or enforced or that underlying governance issues are addressed [54,60,61]. This means that compliance with a scheme is not the same as achieving the sustainability objectives set out by the policy. The EU's dependence on, and trust in, certification as a tool for improving sustainability might, therefore, fail to deliver on its promises.

Box 2. Best Practice: Rapunzel HAND IN HAND Sustainability Criteria for Palm Oil. Source: Reference [57] (authors' translation from German).

- No clear-cutting of primary forests; protection of the natural habitat of endangered animals and plants
- Promotion of animal and plant diversity also inside palm plantations
- 100% organic cultivation, no combined organic-conventional operations and absolute prohibition of genetically modified organisms (GMOs)
- Integration in locally grown structures, respect of land ownership rights and rights of indigenous people
- Transparent production structures and process chains
- Regular on-site visits of Rapunzel agri-engineers
- Verifiable social standards
- External control and certification of independent agencies

The German organic food company Rapunzel started the HAND IN HAND program in 1992, which certifies palm oil from Ghana, among other raw materials, used in the company's products. The program combines the ideas of controlled organic farming and fair trade.

Most private schemes deal differently with regards to other sustainability criteria, such as biodiversity. For example, the Cramer Commission [58] proposed that plantations must not be located in or in the immediate vicinity of "gazetted protected areas". A core RSB principle is that "biofuel operations shall avoid negative impacts on biodiversity, ecosystems, and conservation values" principle 7, see Reference [47], including that "ecological corridors shall be protected, restored, or created to minimize fragmentation of habitats" principle 7, see Reference [47]. Similarly, the Cramer Commission and RSB asked for environmental reporting, including on the use of agro-chemicals. The EU RED prohibits feedstock production on land with recognized high biodiversity and carbon stocks, and on peatland. There is, however, no ban or need for reporting on the use of agro-chemicals [2]. So, we may argue that more than two decades after the set-up of the "best practice" Rapunzel scheme, the EU's hybrid governance approach is still lagging behind in terms of what is possible regarding sustainability. The examples described above illustrate that hybrid governance may enhance the governance capability to achieve sustainably goals, but only if states include in their meta-standard new or improved "best practices" developed by private schemes that instituted more stringent sustainability requirements [18].

4.4. Assumptions and Characteristics of the Biofuels Market

To understand the governance and sustainability challenges related to the biofuels market, it is important to take the specific characteristics of this market into consideration, because they influence the European governance landscape. Biofuels are not sold on a consumer market like foodstuffs and cosmetics. When people buy gasoline, they have no information about how the blended percentage of biofuels contained therein is certified. There are also no alternatives available at the point of sale, from which a consumer could choose. This also poses a limitation relating to the difficulty of quantifying the amount of certified biomass for biofuels by private initiatives, making it harder to assess their success in comparison with one another.

As outlined above, worldwide demand for biofuels is primarily policy-driven, rather than by economic considerations. An increasing number of countries developed a biofuel-for-transport strategy by using policy or tax incentives/cuts, blending targets, or production subsidies. Only in the United States of America (USA) and the EU are these blending mandates under continuous scrutiny because of sustainability concerns. In other regions, the focus is primarily limited to energy-security aspects [7,62]. The wide availability of alternative markets for non-certified biomass/biofuels has implications for the effectiveness of EU policies, because there are no globally comprehensive biofuel laws and, hence, there is no level playing field for companies with regards to buying and trading biofuel resources. The willingness of companies to invest in this sector is, therefore, affected by uncertainty about long-term policy objectives regarding the insecurity about certification and the continuation of blending requirements [41,62,63].

Another challenge in the case of biofuels is that this term covers many different resources, products, producing countries, etc. This makes a discussion about sustainable biofuels challenging; soy produced in one region might be seen as efficient and sustainable, while soy from another region may be not. This makes it hard to define "sustainable soy" in general terms [64]. The same applies to almost all biofuel crops and producing countries, all of which have their own interpretation of sustainability, with possibly more consideration for social or economic aspects than the EU meta-standard. Brazil, for instance, has its own social development program for the promotion of biofuels that is very different from the environmental sustainability-driven certification requirements of the EU. Instead of requesting GHG savings, protection of land with high carbon stock, and protection of biodiverse grasslands, the Brazilians included also social inclusion ambitions in their biodiesel policy [44]. In addition, Brazilian sugar traders argue that increasing domestic demand made export to the EU less important, together with the lack of price premiums for participation in the EU biofuels market, and the costs of certification. As such, the added value of certification for them is negligible, especially in light of other available markets [10]. It may, therefore, not be surprising that the Greenergy scheme was not renewed after its initial five-year approval by the EC.

The interplay between agricultural and food markets and the energy market is another important issue in considering sustainability standards for biofuels. Beyond the fact that production of biofuels may drive up food prices, it is clear that first-generation biofuels are intimately linked to agricultural and food markets through their reliance on the same resources. Biofuels are, thus, part of a highly international agricultural dynamics with constantly changing trade flows, as well as part of a highly volatile energy market. This creates new forms of competition on many different levels and markets. In addition to the challenges for certification, these characteristics of a biofuel market ensure that there is interference with other institutions that regulate international trade, in particular, the WTO. The EU is restricted in its ability to formulate expansive production process-based biofuel sustainability requirements, without creating non-tariff trade barriers or putting into place unjustified agricultural subsidies as a way to promote production of sustainable biofuels [7]. The large share of biomass that is imported from regions outside the EU is seen as an argument in favor of voluntary certification, as this is where unsustainable practices (environmental degradation, etc.) are witnessed more often. By making use of voluntary certification to monitor farms in non-EU producing countries, the EU avoids conflicts with the dominant free-trade paradigm and can influence production processes outside its own borders without breaking the WTO rules [6].

5. Conclusions

The EU created an elaborate framework to stimulate the production and use of biofuels, while striving for sustainability within its production and supply chain. We have seen that EU biofuel policies evolved over time. While the EU was increasing the share of biofuels and renewable energies and the biomass imports in its transport policies, it was also becoming more cautious about the potential negative side-effects of stimulating biofuel production, in particular, relating to ILUC and food price increases in developing countries.

The EU's main biofuel policy tool, RED, applied a hybrid governance approach that allows the EU to demand sustainable biofuels by setting a meta-standard for sustainability and efficiently outsourcing monitoring and certification obligations to private actors. This approach promised to be flexible and to draw on latest insights into sustainability practices on the ground, as well as to make use of innovative private initiatives. The expectation was that private certification schemes would add their own additional sustainability goals to the mandatory EU meta-standard and, hence, facilitate a shift toward greater sustainability in biofuel production, within and beyond the EU. Our analysis suggests that the hybrid governance strategy relied upon by the EU did offer the potential to increase the impact and stringency of its biofuel sustainability objectives in the manner envisaged above. However, this did not materialize in practice because of the minimal requirements of the EU's meta-standard, which in turn led to a proliferation and fragmentation of available certification options, and a concurrent lack of incentives to search for and be certified against the best available practices with regards to sustainability.

Firstly, given that the EU's hybrid governance approach stimulated the involvement of private actors, the meta-standard turned out to be more crucial than initially assumed. Early sustainability schemes were formulated by multiple stakeholders, including NGOs such as Friends of the Earth and Oxfam, and addressed a broad range of sustainability aspects, reaching well beyond the minimum RED requirements to come. The later industry schemes, however, adhere to the "minimum" of the EU meta-standard. Against this backdrop, we conclude that the meta-standard is set too low and does not encourage a "race to the top" in sustainability standards. It took more than five years after the introduction of RED before the EU addressed the impact of biofuel stimulation policies on food prices, by introducing the 7% cap on the use of first-generation biofuels from crops grown on agricultural land. Now the European Commission proposes to further strengthen this requirement to a 3.8% cap on food-based fuel in 2030. Regarding the planned increase of the biofuels share, however, the overall volume of potential food processed to biofuel and renewable energies might still increase. Contributing

more effectively to all dimensions of sustainability in biofuel production would require the EU to set its meta-standard at a higher level and to also include social criteria.

Secondly, the proliferation of private schemes led to a serious fragmentation of biofuel certification and associated sustainability governance. Companies may choose between several schemes and they may opt for the least demanding and still have access to European market for sustainable biofuels. As there is no economic incentive to commit to more ambitious sustainability standards, there currently is a race to the bottom. Contrary to other studies that show convergence between different standards at a higher level [65], the case of biofuels suggests that the presence of many different schemes results in a fragmentation-induced lowering of standards to a baseline minimum. Explanations for such differences in sectors might be the absence of consumer involvement in the development and use of biofuels standards in general, the absence of NGOs in the more recent standards, and the diversity of biomass materials used for the production of biofuels. Lessons for the setting of biofuel sustainability standards can be learned from the more ambitious standards developed for organic and "fair trade" palm oil processed to foodstuff and cosmetics (e.g., Rapunzel HAND IN HAND).

Thirdly, EU certification requirements lack incentives to strive for "best practices". Ideally, hybridization of market-based and governmental regulation would contribute to achieving real sustainability outcomes [61]. In the current system, however, we found that schemes are forced into competition, primarily motivated by (economic) decision criteria and financial benefit. We found no indications that a learning process is taking place with regards to the development and implementation of ever more stringent sustainability criteria for biofuels. The political and public debate shifted rather to the question of whether the EU should make use of agro-biomass-based biofuels in the first place to achieve its sustainability goals.

Fourthly, food-based biofuels continue to be a public concern. Ongoing debates about the adverse effect of biofuels indicate that neither individual voluntary certification standards nor the EU meta-standard have the governance capacity to address sustainability issues with the magnitude of, e.g., ILUC, thus challenging this hybrid governance approach to sustainability. This is clearly illustrated in the European Parliament decision to propose an end to the use of palm oil for biofuels. It shows the lack of public trust in the effectiveness of the complex hybrid arrangement to prevent the negative effects of biofuel production. The interaction between hybrid governance and sustainability objectives is, thus, revealed again to be delicate and changeable. Existing experience with hybrid forms of governance suggest that the EU RED arguably has little effect on the ground in biofuel-producing countries and might even be hindering the achievement of sustainability objectives. A crucial imperative for future EU biofuel governance is, therefore, to seek appropriate governance mechanisms and incentives that will actively stimulate the development and adoption of best practices. Effectively, this means a more active involvement of public authorities in the design and implementation of specific criteria and standards for biofuels.

In concluding, how do these findings resonate beyond the biofuel issue-area? It is important to note here the specific characteristics that make biofuels a special case of EU hybrid governance. Compared to most other commodity markets, government involvement in this case is high, as the EU sets specific targets for biofuel production and use, and contributed to creating a policy-led international market for biofuel production and trade. Unlike other areas, consumers are not in the front guard of making decisions, since they are not informed about the presence of biofuels in their transport fuel, neither do they have any choice in what to buy. In addition, biofuels can be produced from a broad range of different raw materials, most of which may also be used for other products, complicating the development and application of stringent sustainability criteria. These unique characteristics notwithstanding, our broad conclusions are nevertheless applicable in other domains beyond biofuels as well. Based on our findings, we conclude that hybrid environmental governance requires active state and public involvement, to ensure the application of lessons learned, and effective implementation of sustainability standards on the ground in diverse contexts. Hybrid governance cannot be successful by simply shifting responsibilities for sustainable production and processing

to private actors. For a future research agenda, it will be interesting to see how our findings about hybrid governance apply to sustainability of other agro-food chains. Also, in this paper, we primarily examined the EU approach. Comparing this to how biofuel governance evolved in, for example, the USA or in Latin America could shed further light on when and under what conditions hybrid (public–private) governance can further desired sustainability objectives.

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