Biofuels and Indirect Land-Use Change

VSS responding to the food-versus-fuel debate

State of Sustainability Initiatives

Commentary Report

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Biofuels and Indirect Land-Use Change (ILUC)

A key component of the U.S. and EU responses to climate change concerns was the introduction of a target for the inclusion of biofuels in the road transport sector to reduce greenhouse gas (GHG) emissions. As biofuel consumption rose, so too did concern that the use of agricultural land to produce its feedstocks could lead to a reduction in available land for food production, potentially leading to increased food price volatility and the conversion of natural land, such as forests, grasslands or peatlands (Ecofys, 2013)[1].

The displacement of food crops by fuel crops motivated research on the indirect land-use change (ILUC) impacts of biofuel production[2]. It was found that factoring in potential GHG emissions associated with the conversion of natural lands for food production can increase emissions associated with the production of biofuels significantly (Searchinger, et al., 2008). These findings led to the eventual incorporation of ILUC considerations in U.S. and EU biofuel consumption policies (European Parliament, 2015a; Schnepf & Yacobucci, 2010).

Voluntary Sustainability Standards (VSSs) operating in the biofuels sector have adopted some ILUC risk measures to maintain market access. Since 2011, the EU recognizes a number of VSSs[3] involved in biofuel production and its feedstocks (Potts et al., 2014). The five major international VSSs examined in this paper include the Roundtable for Sustainable Biomaterials (RSB), International Sustainability and Carbon Certification (ISCC), Roundtable for Responsible Soy (RTRS), Roundtable for Sustainable Palm Oil (RSPO) and Bonsucro.

This commentary examines ILUC associated with biofuels in the United States and the EU and how the major international VSSs are addressing ILUC risks associated with biofuels. In doing so, the challenges and opportunities of developing standards for biomaterials that have low ILUC risks are highlighted.

Addressing Indirect Land-Use Change

Concerns regarding ILUC and biofuels began to crystallize in 2008 following a report by Searchinger et al. (2008). Unlike previous studies, the paper looked at the emissions impacts of converting grassland and forest to agricultural production as a response to land diversion

[1] Links have been made between riots in North Africa and the Middle East in 2011 (the Arab Spring) and peaks in global food prices influenced partly by shifting land use from edible crops to energy feedstocks for biofuel production (Lagi, Bertrand, & Bar-Yam, 2011; Stadlen, 2011).

[2] The land use change is indirect in the sense that it occurs outside the boundary of the biomaterial feedstock production operations and is driven by the increased demand for biomaterial and food feedstock.

[3] ISCC-EU (International Sustainability and Carbon Certification): Multi-feedstock; Bonsucro EU: Sugar cane; RTRS EU-RED (Round Table on Responsible Soy EU-RED): Soy; RSB EU-RED (Roundtable on Sustainable Biofuels EU-RED): Multi-feedstock; 2BSvs (Biomass Biofuels voluntary scheme): Multi-feedstock; RBSA (Abengoa RED Bioenergy Sustainability Assurance): Multi-feedstock; Greenergy (Greenergy Brazilian Bioethanol verification program): Sugar cane; Ensus voluntary scheme under RED for Ensus bioethanol production: Wheat; Red Tractor (Red Tractor Farm Assurance Combinable Crops & Sugar Beet Scheme): Multi-feedstock; SQC (Scottish Quality Farm Assured Combinable Crops scheme): Winter wheat, maize, oilseed rape; Red Cert: Multi-feedstock; NTA 8080: Multi-feedstock; RSPO-RED (Roundtable on Sustainable Palm Oil RED): Palm oil (Potts et al., 2014).

from agricultural to biofuel production. The negative impact on emissions that it found raised concerns among the NGO community regarding biofuels targets. Searchinger's paper further motivated policy-makers to address ILUC in biofuel consumption policies to further ensure that they result in net GHG emission reductions.

ILUC Regulations in the United States

The Energy Policy Act of 2005 introduced the Renewable Fuel Standard (RFS), which bolstered the role of biofuels in the U.S. energy mix by focusing on displacing fossil fuels in the transportation sector by renewable fuels such as ethanol and biodiesel (Schnepf & Yacobucci, 2010). The Energy Independence and Security Act (EISA) of 2007 modified the RFS by establishing a biofuel consumption target of 140 million cubic metres by 2022 that needed to result in a 20 per cent reduction in lifecycle GHG emissions from both direct and indirect emissions—including from ILUC (Schnepf & Yacobucci, 2010).

The Environmental Protection Agency (EPA), mandated to address the challenge of developing the metrics for implementing the RFS under the EISA, maintained that GHG emissions from land conversion could be recovered over time (EPA, 2009). The EPA used a 30-year payback period at a 0 per cent discount rate to estimate if the biofuel could meet the 20 per cent GHG emission reduction threshold (EPA, 2010). The approach, finalized and released in early 2010, led to the approval of a number of biofuels, including corn-based ethanol and biobutanol to meet U.S. biofuel consumption targets (EPA, 2010). Although the approach was deemed acceptable by the biofuels industry, their objections to incorporating ILUC risks persisted. The American Clean Energy and Security Act of 2009, narrowly approved by the House of Representatives but rejected by the Senate, would have mandated the EPA to exclude ILUC for five years, allowing more reliable ILUC emission models and methods to be developed.

In addition to federal efforts to address ILUC, some states also incorporated it in their legislation. The California Air Resource Board included ILUC risk-reduction considerations in the California Low-Carbon Fuel Standard (LCFS) adopted in 2009 (Associated Press, 2009). Additional GHG emissions associated with land-use change were included for existing and potential alternative fuels. The approach used by the LCFS resulting in Midwest corn-based ethanol failing to yield GHG emission reductions when factoring in ILUC risks, while Brazilian sugar cane ethanol passed (Galbraith, 2009; World-Wire, 2009). The incorporation of ILUC into the LCFS was met with much resistance, as lobby groups argued that it put the national ethanol market at risk (Power, 2009).

ILUC Regulations in the European Union

The EU Renewable Energy Directive of 2009 included a set of sustainability criteria for biofuels centred around greenhouse gas emissions savings and direct land-use change only. Since then, the body of evidence has been growing, both from the NGO community and from the European Commission, and points to the negative effects of ILUC on food security, poverty and GHG emissions. Concerns have also been raised that the sustainability criteria included in the EU Renewable Energy Directive and Fuel Quality Directive do not effectively address ILUC (Marelli, Edwards, & Mulligan, 2011; Bowyer, 2011; Charles, et al., 2013; Croezen, Bergsma, Otten, & van Valkengoed, 2010).

Biofuels policy in the EU dates back more than a decade. A blending target was first introduced in 2003 with the Biofuels Directive and required a 5.75 per cent share of biofuels in the EU's transport sector by 2010 (European Commission, 2003). In 2009 a further target was introduced as part of the EU 2020 Climate and Energy Strategy—the Renewable Energy Directive (RED) required 10 per cent of road transport consumption to be from renewable energy by 2020. At the same time, an amendment to the Fuel Quality Directive (FQD) introduced a mandatory target of a 6 per cent reduction, by 2020, in the GHG intensity of fuels used in road transport and non-road mobile machinery. To help achieve these targets, biofuel subsidies were put in place with production being subsidized through market price support mechanisms and through excise duty exemptions for transport fuels (European Parliament, 2015b). These policies had the effect of increasing biofuel consumption: from 2006 to 2009 consumption in the EU27 increased in every year by more than 50 thousand barrels per day (EPA, 2015).

Following an impact assessment carried out in 2012, the European Commission submitted an amendment to the RED and FQD with the aim of reducing the impact of ILUC. This amendment proposed a capped target of 5.5 per cent for first-generation biofuels[4] by 2020. The amendment also proposed measures to improve forest protection, increase energy efficiency of road transport and a target for the use of renewable electricity in transport of 2 per cent of total consumption. It also included a reporting requirement for ILUC emissions (European Commission, 2012). The 2012 proposals also sought to take account of emissions from ILUC in the sustainability criteria of RED, but this was removed from the final legislation. In 2015 following negotiations the final target adopted was a 7 per cent cap on first-generation biofuels and a non-binding target of 0.5 per cent for individual member states for advanced biofuels

[4] Defined here as "biofuels produced from cereal and other starch-rich crops, sugars and oil crops and from other crops grown as main crops primarily for energy purposes on agricultural land."

(European Parliament, 2015a; Voegele, 2015). Because of potential ILUC effects, the European Commission has made it clear that beyond 2020 it doesn't see a role for first-generation biofuels in reducing emissions and that there will be no target for renewable energy in the transport sector or greenhouse gas intensity of fuels. Furthermore, it suggests that beyond 2020 policy should be focused on improving the efficiency of the transport system, further development and deployment of electric vehicles, second- and third-generation biofuels and other alternatives (European Commission, 2014).
markets.

Improving ILUC Regulations

ILUC risks can be addressed by either factoring in additional GHG emissions associated with potential ILUC or by mitigating potential ILUC risks at the project level (World Wildlife Federation U.K. [WWF U.K.], 2016). The level of concern over ILUC has created a drive to identify biofuels and biomaterials that can act as substitutes for fossil fuels used in transport while having a low risk of driving GHG emissions elsewhere. For instance, understanding which crop groups or regions are associated with the greatest emissions impact in terms of ILUC could lead to more appropriate regulations. This was the aim of the European Commission when it introduced legislative proposals in 2012 that require accurate and detailed estimates be made for the resulting policies to be effective.

The MIRAGE model is a computable general equilibrium model developed to measure the impact of EU biofuel policies. The 2014 model analysis suggested that the ILUC emissions reported in the EU's policy proposal may have been conservative (Laborde, Padella, Edwards, & Marelli, 2014). Wider concerns have also been raised about the robustness of the results for setting emissions factors based on the levels of uncertainty for some key assumptions (Delzeit, Klepper, & Lange, 2014). Ultimately, emissions factors were not included in the final legislation, only an observation that the EU Commission should report on "possibilities for introducing adjusted estimated indirect land-use change emissions factors into the appropriate sustainability criteria."

Delzeit, Klepper, & Lange (2014) argue that the only way to measure ILUC effectively is to be able to understand the causal chain of land-use changes in relation to biofuels and by carbon accounting for the whole of the agricultural system. This is supported by research conducted by Babcock and Iqbal (2014) who found that farmers tend to intensify their use of agricultural lands before investing in expanding. Consequently, comprehending whether or not the production of biofuels correlates directly with ILUC is imperative and may only be possible by having an understanding of the whole agricultural system.

Voluntary Sustainability Standards and ILUC

Voluntary sustainability standards (VSSs) operating in the biofuels sector can be divided into those that have developed standards for multiple feedstocks and those that have developed standards for single feedstocks. The Roundtable for Sustainable Biomaterials (RSB) is currently the only VSS that has adopted provisions to address potential risks associated with ILUC directly. The others have adopted criteria to prevent or limit the conversion of natural lands for fuel crop expansion (direct land-use change as opposed to ILUC). The ones covered in this report are global in nature and represent the major VSSs operating in the biofuel sector. All have developed provisions aligned with the EU Renewable Emissions Directive.

Did you know?

The way that ILUC risks have typically been handled is by estimating the additional carbon that would be emitted as a result of potential natural land conversion for agricultural purposes driven by the cultivation of fuel crops instead of food crops and by mitigating ILUC risks associated with biofuel projects (WWF U.K., 2016). The first approach requires making important assumptions and the second can result in additional project costs.

Due to the major challenges in adequately addressing ILUC risks, a number of NGOs are advocating for an end to the use of biofuels and have campaigned for the removal of targets for biofuel use in transport altogether. For example, Transport and Environment want to see the removal of overall targets for biofuels, but want to keep ILUC factors included in the EU Fuel Quality Directive to ensure sustainability (Transport and Environment, 2012).

Multi-Feedstock Biofuel Standards

There are a number of multi-feedstock biofuel standards, but the two most prominent and global in nature include the Roundtable for Sustainable Biomaterials (RSB) and the International Sustainability and Carbon Certification (ISCC). In 2015 the RSB published the RSB Low ILUC Biomass Criteria and Compliance Indicators designed to identify biomaterials that have a low risk of indirectly causing land-use change and thereby leading to negative environmental impacts from the production of biomaterials. It is to date the only VSS that has developed a specific provision in its standard to address ILUC risks directly. The ISCC requires environmental impact assessments for certain projects and the avoidance of the deterioration or conversion of natural habitats. The ISCC has specific provisions to comply with the EU RED to access the European market.

Roundtable for Sustainable Biomaterials

The RSB is an international initiative composed of farmers, companies, NGOs, experts, governments, and intergovernmental agencies concerned with ensuring the sustainability of biomaterials production and processing. RSB was originally established in 2007 to ensure sustainability of biofuels but expanded its scope to include other biomaterials. The RSB published Version 1 of the RSB standard in 2009 and Version 2 in 2010. As of June 2015, 18 operators have been certified. The process of development and refinement continues to maintain an "ever-evolving" standard to reflect current environmental, technical and social issues.

RSB and other organizations supported processes to address the concern over indirect emissions by participating in a process that led to the development of the Low Indirect Impact Biofuels (LIIB) approach. This approach offered criteria to identify biomaterials that could be produced with a low risk of significant ILUC (Ecofys, 2013). The central idea behind the LIIB approach is that it is possible for individual farmers to produce biomass that doesn't result in ILUC, as long as the additional feedstocks are produced without displacing the production of food.

At the 2015 Annual Meeting of the General Assembly, RSB presented version 0.3 of the RSB Low-iLUC-Risk Biomass Criteria and Compliance Indicators (RSB, 2015).[5] The assembly adopted indicators that are to be reviewed after the first three certifications.

The indicators are based on three of the four categories of low-risk ILUC biomaterials described in the LIIB approach and focuses on trying to define how biomass might be produced without displacing food production rather than trying to estimate a value of the magnitude of the impact on indirect land-use change. The three eligible categories are for biofuels that have been produced from:

1. Yield increase: Biomass yields have increased compared to a reference scenario without any additional land conversion.
2. Unused or degraded land: Biomass has been produced on land that was not previously used for food production, compared to a reference year.
3. Waste and residues: Biomass is derived from existing supply chains without requiring additional production from arable lands.

The criteria and compliance indicators define a series of principles and how they are to be measured by providing guidance and example calculations for determining whether operators fit into one of the three proposed categories. The indicators are designed to be applied in combination to the RSB certification process and would result in the operator being permitted to make a "low ILUC risk" on-product claim.

International Sustainability and Carbon Certification (ISCC)

Started in 2006, the International Sustainability and Carbon Certification (ISCC) certification system focuses on sustainability and the reduction of greenhouse gas emissions, within the food, feed, chemicals and energy sectors (ISCC, n.d.). The ISCC was recognized by the European Union in 2011 as one of the first VSSs to comply with the EU RED (ISCC, n.d.). The global scheme that certifies a broad range of biomass covers entire supply chains from field to consumer and offers full traceability.

The ISCC production requirements specify that biomass cannot be produced in areas with high biodiversity value, high carbon stocks and that high conservation value areas must be protected (ISCC, 2015). Specific details are provided for areas with high biodiversity value such as forest areas, grasslands, areas designated by law for nature protection and areas that support rare, threatened or endangered ecosystems or species. Producing biomass in areas with high carbon stocks is to be avoided and is specifically defined within wetlands, forests and peatlands. All conversion must adhere with the ISSC Principle 1: Biomass shall not be produced on land with high biodiversity if areas are converted after January 2008 (International Sustainability and Carbon Certification, 2015).

In addition to establishing areas where biomass cannot be produced, the ISCC lays out specific requirements for biomass production to prevent negative environmental impacts (ISCC, 2015). Environmental impact assessments must be undertaken for any new projects associated with intensive agricultural cultivation on uncultivated lands (including semi-natural areas), water-related management, and livestock operations. The assessment must address a project's potential direct and indirect impacts on human populations, fauna and flora, soil, water, air, climate and the landscape, material assets and cultural heritages and interactions among all these factors (ISCC, 2015).

[5] "In 2015, RSB introduced the first certification module to enable alternative fuel producers to demonstrate their fuels have a 'low ILUC risk,' building on the Low Indirect Impact Biofuel methodology developed by WWF, EPFL and Ecofys" (WWF UK, 2016, p. 13).

Single Feedstock Biofuel Standards

The main single feedstock biofuel standards include the Roundtable for Responsible Soy (RTRS) operating in the soy sector, the Roundtable for Sustainable Palm Oil (RSPO) operating in the oil palm sector and Bonsucro operating in the sugar sector. The RTRS Standard Version 2.0 refers to avoiding soy cultivation on lands cleared of natural habitat after May 2009 and where unresolved land-use claims remain. The RSPO has provisions for environmental impact assessments and the protection of land with high conservation values. Bonsucro has provisions for identifying land with high biodiversity value, high carbon stock or peatlands to prevent planting sugarcane in these areas after January 1, 2008.

Roundtable for Responsible Soy (RTRS)

Founded in 2006, the Roundtable for Responsible Soy (RTRS) is a member-based initiative functioning as a multistakeholder platform that works toward achieving responsible soy value chains. The initiative develops and manages standards for responsible soy production by offering a generic set of principles and criteria explicitly designed to apply to genetically modified, conventional and organic production systems. RTRS units are reassessed for certification each year by third-party accredited auditors. RTRS offers a separate Chain of Custody certification and applies the segregation and mass balance models of supply chain traceability to its products to ensure accountability of compliance claims in the marketplace.

The RTRS only addresses ILUC risks associated with soy-based biofuel production. It requires its standard-compliant producers to undertake environmental impacts assessments for offsite projects associated with soy production to mitigate potential negative impacts. It also requires the responsible expansion of soy production by specifying timeframes and lands types that soy cultivation can expand onto (Roundtable for Responsible Soy, 2016).

Soy cultivation cannot expand onto land cleared of native habitat after May 2009 unless indicated on a RTRS-approved map. In addition, there is to be no expansion into native forest or expansion into non-native forests aligned with zoning maps and outside of priority conservation maps (Roundtable for Responsible Soy, 2016). If approved RTRS, zoning or conservation maps don't exist, a High Conservation Value Area (HCVA) assessment must be undertaken prior to clearing so as to avoid conversion of potential HCVAs. Furthermore, land conversion cannot be undertaken without the agreement of both parties where there are unresolved land-use claims under litigation.

Roundtable for Sustainable Palm Oil

Founded in 2004, the Roundtable on Sustainable Palm Oil (RSPO) is a member-based initiative that aims to achieve mainstream market uptake of sustainable palm oil production and processing. To this end, the Task Force on Smallholders was initiated to promote smallholder participation in the RSPO. The initiative develops standards and provides certification services to ensure sustainable palm oil production among its members. RSPO-compliant enterprises undergo annual surveillance audits during the five-year certification period. All audits are conducted by third-party accredited auditors. RSPO offers a separate supply chain certification and applies all four models of supply chain traceability—identity preservation, segregation, mass balance, and book-and-claim—to its products.

The RSPO adopted a set of principles for sustainable palm oil production focused primarily on both the direct and indirect land-use impacts associated with palm oil production (Roundtable for Sustainable Palm Oil, 2013). All oil palm development projects must go through a sustainability environmental impact assessment to ensure that direct and indirect impacts are minimized.[6] The RSPO also prevents the conversion of primary forests and habitats with high conservation values, including peatlands, stating "There shall be evidence that no new plantings have replaced primary forest, or any area required to maintain or enhance one or more High Conservation Values (HCVs), since November 2005" (RSPO, 2013, p. 50). Oil palm production can only go ahead if management measures are adopted to prevent damage to natural habitats.

Although the RSPO does not address ILUC risks generally, its standard prescribes undertaking a social and environmental impact assessment (SEIA) to identify and mitigate both the direct and indirect negative impacts of oil palm production on natural environments. These measures are especially important since the rapid expansion of palm oil has primarily occurred in the tropical forests of southeast Asia which has resulted in significant GHG emissions due to the conversion of forests and peatlands into oil palm plantations (Schrier et al., 2013; Union of Concerned Scientist, n.d.). It must also be noted that oil palm cultivation benefits from higher yields per area compared to other vegetable oil crops imparting it with potential for enabling food as well as energy security.[7]

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[6] The SEIA must examine and aim to mitigate potential direct and indirect negative impacts on a variety of aspects affecting stakeholders such as natural ecosystems, watercourses and wetlands, access to resources (i.e. water and land), soils, land ownership and rights, livelihoods and GHG emissions (RSPO, 2013).

[7] Oil palm generates 3.74 tonnes per ha in a year of vegetable oil while soybeans, sunflower seeds and rapeseed generate 0.38, 0.48 and 0.67 tonnes per ha in a year (soyatech, n.d.).

Bonsucro

Founded in 2008, Bonsucro is a multistakeholder initiative operating in the sugar cane sector across seven countries. Bonsucro offers a unique credit-trading scheme to provide efficient certification across a homogenous commodity. Once compliance is approved, the certified products (or credits) can be traded. The initiative operates on a business to consumer basis, developing standards and a marketing label to ensure sustainable sugar cane practices among its members. To verify compliance throughout Bonsucro's three-year certification validity period, all Bonsucro-compliant enterprises are required to undergo surveillance audits, with all audits performed by third-party auditors. Separate Chain of Custody certification is offered, and the initiative applies both the mass balance and book-and-claim models of supply chain traceability to its products. The initiative is funded primarily by membership fees.

Bonsucro has provisions in its standard for protecting biodiversity and ecosystem services as well as mandatory requirements for biofuel production under the EU RED and FQD. Principle 4 – Actively manage biodiversity and ecosystem services specifies that cultivating sugarcane on areas considered to be of critical or high conservation value or legally protected is not allowed after January 1, 2008 (Bonsucro, 2015). It also specifies that an environmental impact management plan must be in place and must assess and mitigate the potential impacts of sugarcane cultivation on biodiversity and ecosystem services. Principle 6 - Additional mandatory requirement for biofuels under the EU Renewable Energy Directive (2009/28/EC) and revised Fuel Quality Directive (2009/30/EC) specifies that the warming burden per unit of energy from sugarcane ethanol must account for GHG emissions associated with land-use changes that have occurred after January 2008 (Bonsucro, 2015). It also specifies that land with high biodiversity value, high carbon stocks or peatlands cannot be planted to sugarcane after January 1, 2008.[8]

Although the Bonsucro standard complies with the EU RED, it focuses primarily on the impacts of sugarcane cultivation and expansion without addressing ILUC risks more generally. For this reason, it has been criticized (Mechielsen, 2013). Since sugarcane ethanol is one of the most prevalent and cost-effective biofuels in the world, addressing ILUC risks in the Bonsucro standard could provide a strategic advantage in accessing new markets.

[8] This includes primary forest and wooded lands, areas designated by law and international agreements, highly biodiverse grassland and new nature protection areas (Bonsucro, 2015).

Moving Toward Biofuels With Low ILUC Risks

As governments, including those of Brazil, the United States and the EU, adopted biofuels as a climate change mitigation strategy to lower GHG emissions from the road transportation sector, agricultural lands once dedicated to growing food started being used for fuel crops. This significant shift in agricultural land use led to potential ILUC risks associated with converting natural lands (i.e., forests, grasslands, wetlands, peatlands) to accommodate new food production. Central to the food-vs.-fuel debate[9], ILUC risks significantly changed the accounting calculations associated with the potential GHG emissions of biofuels. Developing robust methodologies that factor in biofuel ILUC GHG emissions could enable biofuels to lower GHG emissions compared to fossil fuels, effectively enabling policy-makers to devise biofuel expansion strategies that minimize potential externalities.

The United States and the EU have established biofuel consumption targets that take ILUC risks into account.[10] Biofuels are likely to remain an important GHG emission reduction strategy in the short to medium terms, as fuel switching allows for the continued use of existing transportation fleets and infrastructure while allowing alternatives (i.e., electric vehicles, efficient public transportation, etc.) to be further developed, adopted and rolled out. For this reason, it is imperative to ensure that the biofuels that are produced and consumed result in GHG emission reductions and net co-benefits.

For instance, the International Civil Aviation Organization (ICAO) members adopted carbon offsets and sustainable alternative fuels (biojet fuel) with sustainability co-benefits as their climate change mitigation strategy. The ICAO's climate measures are linked to the UN's Sustainable Development Goals (SDGs), and "must deliver on climate action (Goal 13) while supporting, and in no way undermining, related SDGs such as zero hunger (Goal 2) and life on land (Goal 15)" (WWF U.K., 2016, p. 4). Biofuels that have been produced in a manner that mitigates ILUC risks could play a role in ensuring that GHG emission reduction efforts made by the commercial airline sector result in net GHG emission reductions—while enabling other sustainable development co-benefits to reach the Sustainable Development Goals'

[9] The food-vs.-fuel debate stems from dedicating agricultural lands to grow fuel crops that may contribute to global food insecurity leading to social instability. For instance, some researchers have linked biofuel production in the United States and political instability in the Middle East and North Africa (Lagi et al., 2011).

[10] The EU adopted a 7 per cent upper limit on the use of first-generation biofuels for its member countries to meet biofuel targets while the United States adopted an upper 42 per cent limit of cornstarch-based biofuels to meet its 2022 biofuel consumption target (Schnepf & Yacobucci, 2010; Voegele, 2015). These measures are taken to limit competition between food and fuel crops for agricultural land leading to the potential for indirect land-use change.

national GHG reductions as well as commitments made in Paris at COP 21.

The role of VSSs in enabling the production of biofuels with low ILUC risks becomes increasingly important as biofuel consumption increases with time. As it stands, the RSB is the only VSS offering a standard with provisions for explicitly taking ILUC risks into account. Most of the other global VSSs in the biofuels sector (ISCC, RTRS, RSPO and Bonsucro) have adopted provisions that align with the EU RED to access the European market, which also has provisions for ILUC risks that are (with exception of the ISCC) typically limited to the expansion of the specific crops that they work in. All the VSSs covered are poised to develop additional provisions for addressing ILUC risks in-step with additional measures taken by the EU.

To date, RSB-certified low-ILUC-risk biofuel has yet to be produced, but the impending demand for such a product by the transportation sector (and more specifically by the aviation sector) will likely lead to a ramp up in its production in the near future (WWF U.K., 2016). It must be noted that if biofuels are to replace fossil fuels, their GHG emissions (including those from direct and indirect land-use change), must be convincingly and significantly lower. In this way, RSB low-ILUC-risk biofuels represent a starting point for biofuels to realize their full climate change mitigation potential.

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