CERTIFICATION FOR BIOFUEL: A MEANS TO SUSTAINABLE DEVELOPMENT?

BY

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THESIS

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ABSTRACT

In recent decades, many countries, including the U.S., have adopted policies to promote greater use of biofuel, with the hope that biofuel can be used to meet the sustainability goal of reducing carbon emission associated with conventional fossil fuel. However, biofuel production, if not implemented with care, can bring about lots of environmental and social problems itself. The growing of feedstock can exacerbate land degradation, water pollution or even cause indirect emission of greenhouse gas. In addition, it is claimed that biofuel demands fueled human rights abuse such as forced labor or economic exploitation. For continued expansion of global biofuels industry, it is critical to address these environmental and social concerns in a timely manner.

Biofuel certification is designed as a means to guarantee that fuel crop cultivation and biofuel production adhere to certain sustainability standards. Such programs have been used in many other industries, such as timber, finishing and mining to influence the way in which these businesses are operating and the products are producing. By building trust between the economic operators along the supply chain, certification programs are favored by market players and governments as a means to reduce the negative externalities of biofuel production and promote better practices in biofuel industry. Nevertheless, the effectiveness of these biofuel certification schemes are now facing serious challenges, as studies observed that the sustainability criteria set by some organizations fail to take into account important factors such as food security, land conflicts and labor conditions, so biofuels certified under such programs are not sustainable at all. In addition, some reports revealed that the assurance process of certification, though done by independent certifier/auditor and thus can offer greater level of credibility, was not as transparent and reliable as it claims.

This paper discusses the main factors that contributes to the failure of certification schemes in ensuring sustainable development of biofuels: first, the economic operators are reluctant to participate in certification program, as they can gain little if any competitive advantage in the market by being certified. The situation is worse for small farmers in developing countries, because the processes to adapt the sustainability standards could impose high transaction costs on them. In addition, implementation of sustainable criteria and certification system could raise questions as to whether the certification in place would violate WTO trade rules and principles, such as General Agreement on Tariffs and Trade (GATT) and Agreement on Technical Barriers to Trade (TBT). Third, the certifications schemes may fail to provide a rigorous approach on some environmental or societal impacts of biofuel production. For example, indirect land-use change is loosely addressed in most certification systems as it is rooted in micro-economic mechanism, making it difficult to measure at the level of individual projects. In addition, due to the lack of harmonization between different schemes, individual or corporations may prone to choose certifications programs with lower requirements, thereby creating a "race to the bottom" phenomenon. Lastly, there is no oversight on third-party certifiers who are integral to the legitimacy of certification. Certification schemes generally involves two processes: establishing comprehensive and measurable sustainability criteria and inspecting whether biofuel production meet these criteria, which are administered by the standard-setter and the certification bodies respectively. Therefore, to ensure sustainable certification are delivering real social, environmental and economic results, it is necessary to ensure the auditors are doing their jobs.

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CHAPTER 1: INTRODUCTION

Biofuels are booming in the modern society. From highly-industrialized places such as the U.S and Europe, to major developing economies such as China and Brazil, new plants are gearing up and policies favoring biofuel production and consumption have been formulated in order to meet the rising global biofuel demand (Hill et al., 2006). Biofuel advocates frequently praise this energy source as an ideal alternative to conventional fossil fuels. They argue that the use of biofuels enhances energy security as it allows oil importers to diversify their energy sources, without imposing additional burden on Earth's already fragile climate system. In addition, as biofuels are derived from crops or energy plants that are can be harvested annually, the supply of biofuels is theoretically unlimited and their production can stimulate rural development by supporting farmer incomes (Hill et al., 2006). Further, the physical and chemical properties of biofuels, especially biodiesel, are similar to those of petroleum-based conventional fuels, and therefore they can be used in a pure form or as a blending component in either modified or unmodified engines (Hill et al., 2006). Nevertheless, the potential of biofuels as renewable alternative to fossil fuels is now under strict scrutiny as the governments who support mass biofuel production are beginning to find out that they may fail to incorporate the adverse impacts associated with biofuels into their calculation of the total emissions from biofuel production and use. For example, as biofuel production needs a considerable amount of land to grow feedstock, it can indirectly lead to conversion of forests, grasslands, peat lands, wetlands, and other carbon rich ecosystems to agricultural use, which will result in substantial release of greenhouse gas (GHG) from the soil and removed vegetation, and make biofuels even more damaging than fossil fuels in respect to global warming (Ottinger, 2009). Further, intensified farming practices accompanied with biofuel expansion can exacerbate other environmental problems, including eutrophication in water bodies, soil erosion, loss of biodiversity (Ottinger, 2009). It is also argued that rising demand for the production of feedstock crops such as corns and oilseeds has contributed to the surging food-commodity price worldwide in recent years.

To counter the externalities, state authorities and operators in biofuel supply chain are turning to voluntary certification schemes to demonstrate their environmental and social responsiveness. At the very beginning, Biofuel certification schemes were introduced as a tool to guarantee that biomass feedstock cultivation and biofuel production adhere to certain social and environmental sustainability standards addressing greenhouse gas emissions, conservation of biodiversity and natural landscapes, the quality of surface and ground water source, human and labor rights, social and economic development in local community and so on. For many years, various certification programs have been proposed by state authorities, non-state actors, or combination of the two and used in major biofuel production countries as an effective means to reduce unwanted environmental and social impacts of biofuel sector (Gaebler, 2014). Proponents of biofuel certification believe that such private governance mechanisms can help prevent the adverse social impacts and environmental catastrophes that result from unscrupulous business practices and careless human attitudes during biofuel production. Conventional regulation by the nation-state, such as the command-and-control approach frequently used in U.S. environmental legislation, may face constraints of being costly, inefficient, unilateral, and discouraging technological innovation (Rivera, 2000; Potoski & Prakash, 2004). Instead, voluntary initiatives can promise a superior regulatory outcome for both the government and players along the supply chain, as they have lower transaction and abatement costs and involve less conflict between regulators and the regulated. In addition, since certification schemes sometimes can make up for the area where governmental regulations and aspirations are lacking, or go beyond minimum requirements set by the states, biofuel producers can derive competitive first-mover advantages through engagement in certification which adds value to their product.

However, sustainability certifications, which are proposed as an instrumental arrangement to manage the potential risks of biofuel development by ensuring that the manufacturing process adheres to a given set of criteria, turn out to be faltering as an adequate measure and effective stewards of environmental and social sustainability. Voluntary sustainability certification scheme for biofuels first appeared in EU Renewable Energy Directive (RED). The core of RED is a mandatory goal that requires each Member State to use, by 2020, at least 10 percent of renewable energy in all forms of transport. Under RED, EU Member States can use biofuels certified by Commission-recognized voluntary schemes to count towards the transport target, in order to ensure that biofuels placed on the EU market are truly sustainable. However, on July 21st, 2016, the European Court of Auditors (ECA), the independent EU body in charge of auditing the finance of the EU, published a special report on the European Commission's biofuel sustainable certification rules, which straightforwardly pointed out that "the EU certification system for the sustainability of biofuels is not fully reliable" due to "weaknesses in the Commission's recognition procedure and subsequent supervision of voluntary schemes." (ECA, 2016). The auditors found that the voluntary certification schemes, as well as the original sustainability criteria set up in RED, did not "adequately cover some important aspects necessary to ensure the sustainability of biofuels." In particular, the Commission did not require voluntary schemes for biofuels to assess adverse socioeconomic effects such as land tenure conflicts, forced or child labor, poor working conditions for farmers and dangers to health and safety. Further, the impact of indirect land-use changes (ILUC), known to cause significant GHG emission that can more than offset the direct GHG savings by replacing conventional fossil fuels with biofuels, was not taken into consideration in determining sustainability (Edwards et al., 2008; Khanna et al., 2011; Delucchi, 2010; Berndes & Cowie, 2011). Indeed, this is not even the first time EU's voluntary certification schemes on biofuel sustainability have been challenged as not credible enough to guarantee sustainability. Similarly, research published by Larson et al (2014) with regard to the oil palm sector in Central Kalimantan shows that the design and implementation of EU RED and existing certification schemes have had no bearing on safeguarding local livelihoods and water resources in Central Kalimantan Province. It highlighted that certification schemes, such as the Roundtable for Sustainable Palm Oil offer only cosmetic tools at present and are insufficient to address deep structural governance issues. For example, although the village complaints had been expressed to RSPO auditors in cases where the operations of the companies did not comply with RSPO guidelines, none of certifications for the companies in question, one of which has even been previously blacklisted by the world's largest buyers of palm oil, Neste Oil and Unilever, has been withdrawn by RSPO. In fact, the study pointed out that RSPO has never revoked certification from any company due to noncompliance.

For biofuel certification schemes to truly act as an effective strategy to ensure sustainable biofuel production and a practical instrument for operators in biofuel supply chains to undertake their environmental and social responsibility to both internal and external stakeholders, it is crucial to thoroughly examine and analyze the existing framework and the limitations of voluntary certification schemes. This paper is organized as follows. Section II introduces the developmental history of sustainability labelling and certification system in general and reviews the emergence and industrialization of voluntary certification schemes in the biofuel sector.

Section III discusses the overall framework of the biofuel certification system and how it is designed to ensure biofuel production methods adhere to social and environmental sustainability standards. Section IV examined the reasons why voluntary certification schemes, though often perceived as an institutional arrangement that could counter negative externalities of biofuel production, fail to address these important social and environmental sustainability issues from several key points, including lack of incentives from biofuel producers to get certified, inherent design flaw of conventional certification system, and the reliability of third-party certifier and possibility of greenwashing. Finally, Section V presents the concluding remarks.

CHAPTER 2: SUSTAINABILITY CERTIFICATION AND LABELING SCHEME IN THE BIOFUEL SECTOR

2.1 Emergence and Boom of Sustainability Certification

Sustainability labeling and certification schemes are a form of voluntary, usually third-party verified standards or norms that adopted by private (e.g. companies, industry association) or public entities (e.g. national or local government) to demonstrate that their performance or products have meet certain predefined criteria in environmental, social or ethical issues. These issues are commonly overlooked by conventional labeling programs, but are now increasing recognized by actors (e.g. manufacturers, consumers, distributors) in the market place, since businesses are increasingly judged by consumers based on their environmental and social performance in addition to their financial achievements (Carroll, 1999; Diller, 1999). Following this paradigm shift in businesses, the trend of sustainability labeling and certification started with the introduction of Ecolabel for organic food in agriculture in 1970s. During the 1990s, due to the failure of the states to enact national regulations promoting less environmentally-damaging timber harvesting practices and the unsuccessful attempts by international advocacy groups to form a global forestry treaty, forest certification, as a new form of governance, was adopted as a preferred tool to mitigate the sustainability issues in forest industry (Barry et al., 2012). In 1993, a voluntary non-profit organization named the Forest Stewardship Council (FSC) was established with the coalition of Worldwide Fund for Nature (WWF) and other leading environmental organizations, which became one of the first large-scale programs worldwide to address social, economic, and environmental challenges related to deforestation, mainly in the tropics (Perera & Vlosky, 2006). The model soon spread to other industry sectors where the impacts of the business activities on natural and human communities were huge but states or intergovernmental organizations were reluctant or unable to intervene,. This led to the emergence of a series of certification and labeling systems, such as the Marine Stewardship Council (MSC), and the Rainforest Alliance/Sustainable Agriculture Network (RA-SAN) (Barry et al., 2012). Today, the realm of sustainability certification scheme has already expanded to variety of economic sectors, including agricultural commodities, mining, tourism, and construction, and the proliferation of sustainable certifications and labels has dramatically reshaped the structure and characteristics of commodity flow in the market (Ponte & Cheyns, 2013). According to a 2012 report on voluntary standards and certification, 7 percent of wild landings of fish for human consumption, 9 percent of the world's productive forests, and 17 percent of coffee produced globally were certified by the end of 2011 (Barry et al., 2012).

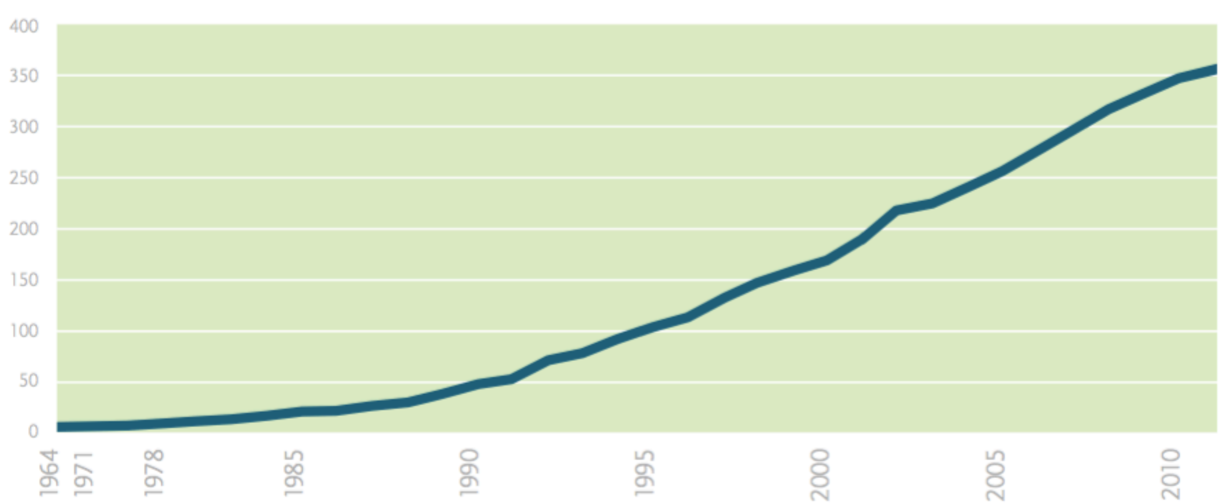

Figure 1. Total Number of Ecolabel by year of Launch (Barry et al., 2012)

This data is from Ecolabel Index, the largest global directory of ecolabels and environmental sustainability certifications. The website currently tracks 465 ecolabels in 199 countries, and 25 industry sectors (Figure 1).

2.2 Policy Drivers and the Expansion Biofuel Industry

Since the 1990s, governments in both the North and the South have started to promote biofuels as a means to achieve greenhouse gas reduction, foster energy security and support rural development (European Commission, 2005). Governmental incentives such as output target, subsidies and import tariffs have been introduced in several countries (Brazil, the United States and the EU) to facilitate the expansion of the emerging industry. The United States first implemented obligatory biofuel consumption targets by establishing the Renewable Fuel Standards (RFS1) in the Energy Policy Act of 2005 (Schnepf & Yacobucci, 2010). The objective was later revised and refined in the Renewable Fuel Standard program (RFS2) under the Energy Independence and Security Act (EISA) of 2007, which require an aggregation of 36 billion gallons of renewable fuels to be used in transportation sector and 50 percent and 20 percent life-cycle GHG reductions for advanced and standard biofuels respectively by 2022 (Schnepf & Yacobucci, 2010). Renewable Fuel Standard (RFS): overview and issues. In CRS Report for Congress (No. R40155). Economic incentives for biodiesel and cellulosic biofuels in the United States were guaranteed through enactment of tax credits, a financial support expiring at the end of 2014 but now extended by the U.S Congress through the close of 2016 (Bergner, 2013). Likewise, the EU established several key legislative instruments since 2003, forging the foundation for formal biofuel policy in the EU level. In March 2003, Parliament and Council adopted the Directive 2003/30/EC, popularly known as the “Biofuel Directive”, setting indicative targets for Member States to replace 2 percent of all petrol and diesel for transport in the EU (calculated on the basis of energy content) with biofuels by 2005 and 5.75 percent by 2010 (European Council, 2003a). In order to achieve the proposed target in the biofuels directive, the Council subsequently adopted Directive on energy taxation (2003/96/EC), providing member states with regulatory discretion to use tax policy, such as a total or partial exemption of taxation, to foster the penetration of biofuels in the markets (European Council, 2003b). In addition, a special subsidy for energy crops of €45 per hectare (up to a limit of 1.5 million hectares) was introduced as part of the Common Agricultural Policy (CAP) reform in 2003 (Pacini, Silveira & da Silva Filho, 2013). The support was later increased to 2 million hectares, which effectively established a maximum available budget of €90 million for energy crops in the EU (Pacini, Silveira & da Silva Filho, 2013).

Driven by favorable policies, recent years have witnessed an increasing market share for biofuels in the global transportation sector and an expanding international trading of biomass stock and biofuel. As of 2015, about 74.84 million metric tons of biofuels were produced worldwide, a roughly 0.9 percent growth of 74.20 million metric tons in 2014 (Figure 2) (BP Global, 2016). World fuel ethanol production rose to all-time high in 2015 after a decline in 2011 and 2012, with total volume peaking at 25.68 billion gallons (Figure 3) (RFA, 2017). Biodiesel production declined slightly by 4.9% in 2015 after it hit a record in 2014, with output declining in all of the major producing regions (BP Global, 2016). Recent estimates in OECD-FAO Agricultural Report 2016 – 2025 (2016), which are prepared by Organization for Economic Co-operation and Development (OECD) and the Food and Agriculture Organization (FAO) of the United Nations jointly, indicate that total amount of biofuel production (including biodiesel and ethanol) would grow steadily in the next 10 years, reaching 128.4 billion liters and 41.4 billion liters by 2025 respectively. Half of the growth in global ethanol production is expected to originate from Brazil, while the United States, Argentina, Brazil and Indonesia will lead the expansion of the biodiesel market.

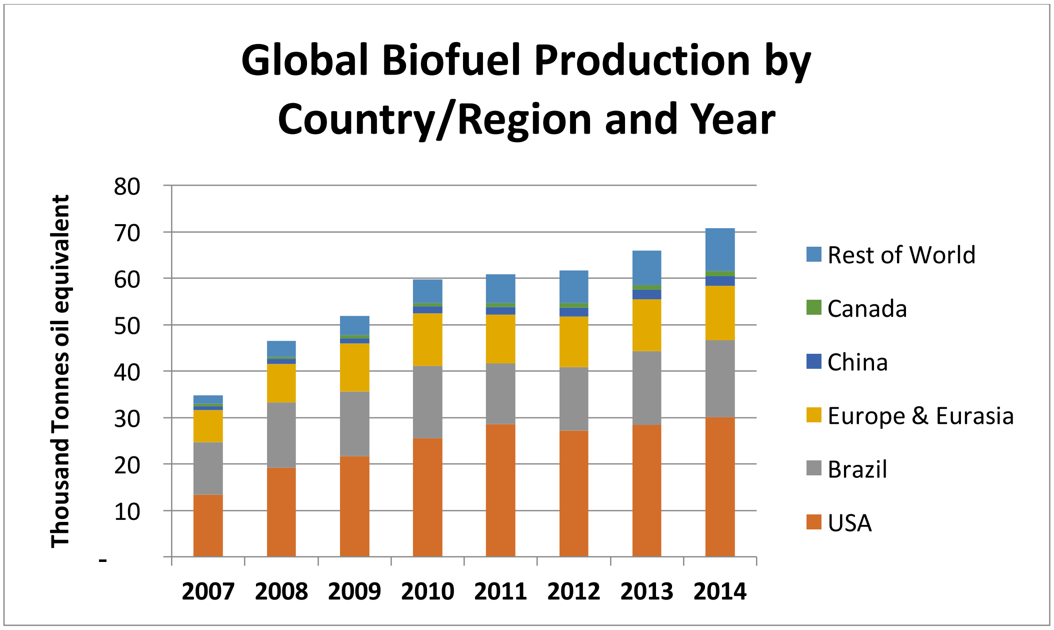

Figure 2. Global Biofuel Production by Country/Region and Year (BP Global, 2016)

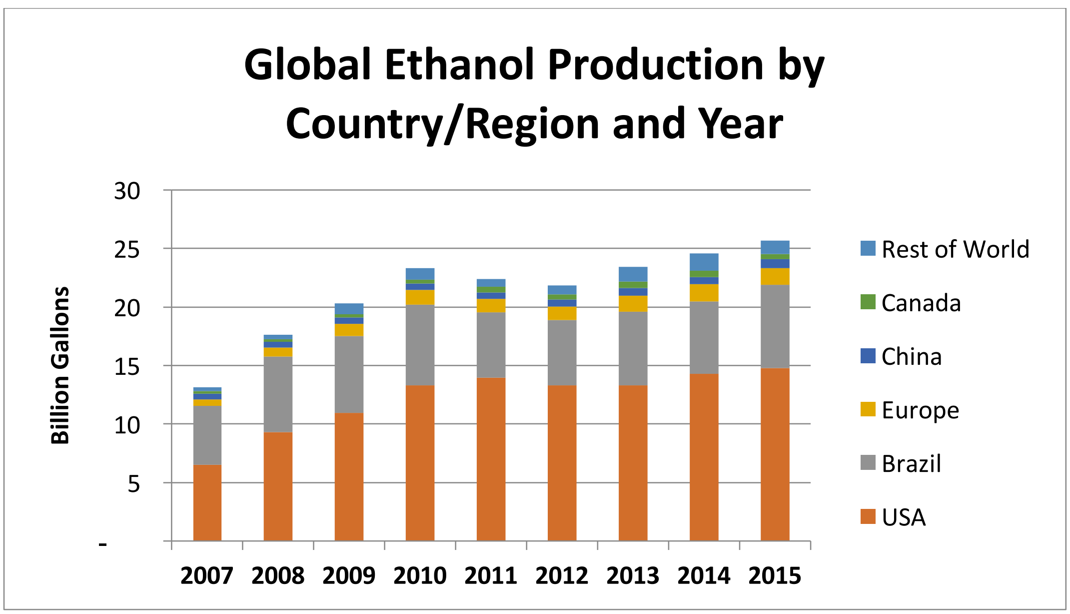

Figure 3. Global Biofuel Production by Country/Region and Year (RFA, 2017)

Introduction of Sustainable Certification into Biofuel Sector

In the wake of the boom in biofuel industry, the need to guarantee that bioenergy is produced in an environmentally, socially and economically sustainable manner was amplified by the discussions concerning the potential drawbacks of biofuels. Doubts started to be cast on the optimism towards biofuel as an ideal solution to climate change, as studies consistently suggest that indirect land use change from increased biofuel demand can cause significant GHG emission that more than offset the direct GHG savings by replacing conventional fossil fuels with biofuels (Delucchi, 2010; Berndes et al., 2011). In addtion, as biofuels are mainly derived from agricultural commodities, including conventional food plants or special energy crops, feedstock production for biofuel can pose serious environmental problems arising from unsustainable farming activities, such as water pollution, soil erosion and loss in biodiversity (Ottinger, 2009).

To address these problems, biofuel certification schemes have been introduced as a governance mechanism to ensure compliance with certain sustainability criteria along the entire supply chain. Exemplifying a combination of private initiative and public requirement, certification systems can enhance the credential of biofuels by providing independent verification that stringent performance standards on environmental, social and economic sustainability are being adhered to throughout the production process. These kind of systems have several benefits. First, certification can make up the area where governmental regulations in managing the environmental impacts of biofuel production are none-existent or not sufficiently stringent (LMI, 2014). For example, palm-oil producing countries in Southeast Asia, including Indonesia, Thailand and Cambodia, often have low capacity to enforce legislation to regulate the environmental and social impact associated with feedstock stock expansion, such as water pollution, land degradation, and marginalization of indigenous groups (Schouten & Glasbergen, 2011). In such case, organizations such as Roundtable on Sustainable Palm Oil (RSPO) can incorporate more rigorous standards in its certification scheme and minimize the negative impact of palm oil production on the environment and communities in palm oil-producing regions, by requiring all companies subscribed to the scheme to strictly comply with these standards.

Second, certification systems can effectively keep biofuel purchasers away from unsustainable fuels in the market. Major fuel consumers, including federal, state, or commercial (e.g., airlines) bulk fuel procurement officers, contractors supporting federal or state biofuel grant programs or government biofuel bid proposals, and corporate sustainability and risk management officers (LMI, 2014), are increasingly considering using biofuels as a replacement for conventional fossil fuel, as a way to enhance environmental performance, boost sustainability credentials, and reduce oil dependence. Nevertheless, due to the intricacy and complexity of biofuel sustainability analysis, average biofuel purchasers may not have the time, resources and expertise to measure the environmental performance of biofuels throughout all stages of the product life cycle (LMI, 2014). The information asymmetry between manufacturers and purchasers opens the opportunity for greenwashing, where the companies can simply portray themselves environmental stewards without actually taking sustainable measures (Horiuchi et al., 2009). Therefore, fuel purchasers may end up being tricked in buying unsustainable biofuels instead of sustainable one and being unknowingly associated with negative externalities of biofuel production , despite that their intent are completely legitimate. Credible certification schemes offer a simple solution to the predicament. To be certified as sustainable, biofuel feedstock or plants must undergo third-party audits to ensure that the feedstock are cultivated and converted into biofuels in a sustainable manner (LMI, 2014). Biofuel purchasers can simply look for certified biofuel instead of inspecting the projects and sorting through the details themselves.

Finally, certification systems allow customers and the market to identify and reward biofuel producers that complies with rigorous performance standards about environmental, human rights and community development, etc., with price premium and better market access (LMI, 2014). For biofuel purchasers, knowing that a biofuel product has been certified provides consumers the confidence that the values of sustainability are being met. Therefore, certification programs can become a powerful marketing tool to win the trust of those consumers who target sustainable products (Zezza, 2013). Apart from being an increasingly more common consumer demand, certification are sometimes incorporated to national legislation and compliance becomes a pre-condition for market access (especially in the case of EU market). In this way, certifications can encourage behaviors that are critical to developing a biofuel industry that is environmentally, socially and economically viable at scale.

2.3 Biofuel Certification under the EU Regulatory Framework

The use of voluntary certification schemes in the bioenergy sector began with the regulatory innovation adopted by EU to implement the sustainability criteria for liquid biofuels contained in Directive 2009/28/EC of the European Parliament and of the Council of 23 April 2009 on the promotion of the use of energy from renewable sources (RED) (Gaebler, 2014). To ensure the use of biofuels (used in transportation) and bioliquids (used in electricity generation and heating) contributes to real carbon savings – one of the key underlying objectives of the EU RED, the EU set out a set of sustainable criteria and use certification schemes as a co-regulation element to supplement the implementation of mandatory requirement in EU RED (European Council, 2009).

Article 3(1) of EU RED sets mandatory targets for the 27 Member States that at least 20 percent of EU's total energy consumption must derive from renewable energy sources by 2020 RED (European Council, 2009). Further, Article 3(4) specifies that each member state must ensure that at least 10 percent of energy in all forms of transportation use must come from renewable energy sources by 2020 (European Council, 2009). Article 17(2)-(6) lays downs the mandatory requirement that biofuels have to meet in order to be counted toward national renewable energy targets and be eligible for financial support. These include that GHG emissions associated with production and use of biofuels must be reduced by minimum 35 percent compared to their fossil fuel equivalents (Article 17 (2)); biofuels cannot be cultivated in areas with high biodiversity value (Article 17(3)) or high carbon stocks (e.g. forests, wetland) (Article 17(4)); biofuels cannot be made from raw material obtained from peat land unless it can be demonstrated that it does not involve the drainage of previously undrained soil (Article 17(5)); and the agricultural raw materials cultivated in the EU and used for the production of biofuels shall conform to the minimum requirements for good agricultural and environmental conditions in Council Regulation (EC) No 73/2009 of 19 January 2009 (Article 17(6)) (European Council, 2009). In addition to the mandatory requirements, social sustainability issues are addressed through the mechanism where the European Commission shall, every two years, report to the European Parliament and the Council on the impacts of biofuel production on the availability of foods at affordable prices, community development and land-use rights, and relevant conditions in the countries that are a significant source of raw material for biofuel production and have ratified and implemented conventions of the International Labor Organization with regard to Forced or Compulsory Labor, Discrimination in Respect of Employment and Occupation and Minimum Age for Admission to Employment and so on (European Council, 2009). Although the Directive itself does not expressly hold operators accountable to social sustainability, the reporting mechanism could provide incentives for operators and the sustainability initiatives to which they subscribe to take internationally recognized labor standards and the impacts of operations on food prices into account. To make the measurement of emission reductions more accurate and consistent, Article 19 set out the methodology to calculate the greenhouse gas emission saving from the use of biofuel and bioliquids under RED (European Council, 2009).

Article 18 allows any individual or organization responsible for one or more steps in the supply chain to choose to comply with the EU sustainability criteria in one of the three ways: by providing data to relevant national authorities and get proof of compliance through a national system; by fulfilling the provisions on sustainability criteria specified in relevant bilateral or multilateral agreements between the EU and third countries; or by obtaining certification from a voluntary national scheme or international scheme setting standard for the production of biomass approved by the EU (European Council, 2009). Recognizing that most biofuel production would be certified under voluntary schemes (as most national systems require or accept the compliance with certificates issued under the Commission-recognized voluntary schemes as proof of sustainability), in July 2011, the EU has officially identified a first set of seven sustainability schemes, which were deemed as adequately covering the sustainability requirements of the RED. By March 2016, 19 voluntary schemes were approved by EU as demonstrating compliance with the sustainability criteria for biofuels (Figure 2). Generally, the recognition decision made by the Commission is valid for 5 years, but the Commission has the right of repealing the decision if it becomes clear that a scheme does not implement all the elements on which the decision was based.

2.4 Certification Programs Approved by the EU

Despite the variance in geographic focus, stringency and organizational structure (Figure 4), certification schemes accredited by EU can be broadly divided into three categories. The first category are the roundtable initiatives (Johnson et al., 2012), which include Roundtable on Responsible Soy (RTRS), Roundtable on Sustainable Palm Oil (RSPO), Roundtable on Sustainable Biomaterials (RSB) and Bonsucro. The schemes are developed through a process where representatives from biofuel supply chain and members from the civil society ("multi-stakeholder"), such as NGOs, research institutions, and government agencies are involved on an equal basis ("Roundtable"), thus raising higher expectations on accountability, transparency and inclusiveness. In general, these roundtable initiatives approved by the EU are customized versions for compliance with RED that have been adapted from existing certification systems with broader geographic application than the EU market. For example, RSB EU-RED are developed from original version of RSB Global Sustainability Standard to comply with the RED definition of land use and with its GHG criteria. All of the roundtable initiatives offer commercial certification services to interested parties in the market (Johnson et al., 2012).

The second category includes industry schemes that target specific trading groups (Johnson et al., 2012), such as 2BSvs[1], Red Tractor[2] and Greenergy[3]. To a large extent,

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[1] 2BSvs (Biomass Biofuel Sustainability voluntary scheme) was developed through a consortium of major economic operators in the French biofuel industry (agricultural and industrial). The 2BS Consortium commissions the technical advisor, Bureau Veritas, with the technical management of the scheme.

[2] Red Tractor EU Red (Red Tractor Farm Assurance Combinable Crops & Sugar Beet System) was run by Red Tractor Assurance, an organization launched by the food industry in the UK. The scheme is only applicable for farms in the UK.

[3] The scheme was developed as a management system for the Greenergy International, ltd., a British distributor of petrol and diesel for motor vehicles. The standard focuses on sugarcane produced in Brazil and is limited to the company's business partners.

certification schemes under this category are limited to members within the internal supply chain but may be open to public (Johnson et al., 2012). For instance, Abengoa RED Bioenergy Sustainability Assurance (RBSA), a certification developed by Spanish multi-nationals Abengoa, was used specifically to ensure the ethanol from Abengoa and its subsidiaries complies with EU RED requirements (German & Schoneveld, 2011).

The third category includes biofuel certifications that are financed by the government (Johnson et al., 2012), including International Sustainability and Carbon Certification (ISCC), Biograce GHG calculation tool, and KZR INIG System. These government-financed schemes vary greatly in geographic scope, operating mechanism, and feedstock coverage. Among these schemes, ISCC, as one of the first seven certification system to demonstrate compliance with the EU RED requirements, is currently dominating the market for EU-RED certification on sustainable biofuels (Ponte, 2014). Similar to its roundtable counterparts, ISCC is developed through an open multi-stakeholder process involving companies, research and industry organizations and NGOs. However, in essence, ISCC was supported by the German Federal Ministry of Food, Agriculture and Consumer Protection through the Agency for Renewable Resources, the central coordinating agency in the area of renewable resources in Germany. Also, despite its nature as a multi-stakeholder initiative, studies indicates that ISCC may be more "industry friendly", or "business-driven" than roundtable initiatives such as RSB, because ISCC clearly distinguishes its standards as a mechanism to help companies involved in biofuels minimize possible credibility threats and reputation risks rather than simply achieving sustainability (Ponte, 2014). Moreover, ISCC has adopted a "pick-and-choose" approach in engaging its stakeholders (which means societal stakeholder groups are not granted a place in governance), so it may not be able to ensure equitable access and fair representation of different interest as it claims (Ponte, 2014).

Scheme	Location	Type of Scheme	Feedstock Covered	RED criteria recognition	Geographic Focus
International Sustainability and Carbon Certification (ISCC)	Germany	Government Financed	All	All	Global
Bonsucro EU	United Kingdom	Roundtable Initiative	Sugarcane	All	Global
Round Table on Responsible Soy EU RED (RTRS EU RED)	Argentina	Roundtable Initiative	Soybean	All	Global
Roundtable of Sustainable Biomaterials EU RED (RSB EU RED)	Switzerland	Roundtable Initiative	All	All	Global
Biomass Biofuels voluntary scheme (2BSVs)	France	Industry Scheme	All	All	Global
Abengoa RED Bioenergy Sustainability Assurance (RBSA)	Spain	Industry Scheme	All ethanol feedstock	All	Global
Greenergy Brazilian Bioethanol verification programme (Greenergy)	United Kingdom	Industry Scheme	Sugarcane	High biodiversity Grass land not included	Brazil
Ensus voluntary Scheme	United Kingdom	Industry Scheme	Wheat	All	primarily UK feedstock

Table 1. Overview of approved voluntary schemes for biofuels/bioliquids

Table 1 cont.

Red Tractor Farm Assurance Combinable Crops & Sugar Beet Scheme (Red Tractor)	United Kingdom	Industry Scheme	cereals, oilseeds, sugar beet	Minimum greenhouse gas reduction not included	UK
Scottish Quality Farm Assured Combinable Crops (SQC) scheme (SQC)	United Kingdom	Industry Scheme	All cereals and all oilseeds	Minimum greenhouse gas reduction not included	North of Great Britain
Red Cert	Germany	Industry Scheme	All	All	EU, Ukraine and Belaru
NTA 8080	Netherland	Government financed	All	All	Global
Roundtable on Sustainable Palm Oil RED (RSPO RED)	Malaysia	Roundtable Initiative	Palm oil	All	Global
Biograce GHG calculation tool	Germany	Government financed	All	Only include Minimum greenhouse gas reduction not included	Global
HVO Renewable Diesel Scheme	Finland	Industry Scheme	Hydrotreated Vegetable Oil	All	Global
Gafta Trade Assurance Scheme	United Kingdom	Industry Scheme	All	All	Primarily UK
KZR INIG System	Poland	Government Financed	All	All	EU only
Trade Assurance Scheme for Combinable Crops	United Kingdom	Industry Scheme	cereals, oilseeds and sugar beet	All	UK
Universal Feed Assurance Scheme	United Kingdom	Industry Scheme	All	All	UK

Table 1. Overview of approved voluntary schemes for biofuels/bioliquids

Being hailed as "the most comprehensive and advanced binding sustainability scheme of its kind anywhere in the world", today, voluntary certification schemes under EU's biofuel regime have already become the main instrument used to verify compliance with the sustainability criteria in EU RED. In the eyes of proponents, certification programs offer a way by which the concerns of diverse stakeholder groups can be addressed, as well as a guide to help the biofuel industry realize its promise for sustainable development. The following section will begin by examining the key benefits of certification programs, and then analyzing how the operating mechanism of certification schemes can help promote sustainable development in biofuel industry. As multi-stakeholder initiatives (MSI) are most widely used forms of certifications by economic operators in biofuel supply chain, two MSI certification programs, developed by the Roundtable on Sustainable Biomaterials (RSB) and the Better Sugar Cane Initiative (Bonsucro) will be the focus of next section.

CHAPTER 3: BIOFUEL CERTIFICATION: HOW IT WORKS

The benefits of certification schemes are realized through two process: standard-setting process and conformity assessment and monitoring process, which are administered by the standard setter and certification bodies respectively (Zarrilli, 2008). Although different parties are involved in and responsible for the activities in standard formulation and implementation, the overall certification system is underpinned by certain general concepts such as efficiency, transparency, and inclusivity, so as to increase the likelihood that a standard system will bring the intended positive changes (ISEAL Alliance, 2013). Due to availability of information, this section will mainly focus on the standard-setting process and conformity assessment and monitoring process for multi-stakeholder initiative.

3.1 Standard-setting Process

The development of the standards in certification programs follows a general work path (Figure 5). Usually, principles that describe the objective and mission of certification schemes are first established as starting points for formulating more detailed standards. Then these objectives are translated into measurable criteria and indictors[4] by categories (Kutas et al., 2009). The principles and criteria can be either established together by one party, as by the Roundtable on Sustainable Biofuels, or in different ways by different parties. Take the NTA 8080 standard as an example (NSI, 2012). Initially, a testing framework for biomass ("Cramer Criteria") were

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[4] Indicators are quantitative or qualitative minimum parameters by which a criterion becomes testable.

established by a committee headed by the government minister, in consultation with experts from both industry and civil society, including oil major Shell and multinational Unilever. These principles were then converted into criteria, however, by the Netherlands Standardization Institute as the NTA 8080. The process of transforming multiple dynamic sustainable goals into a defined set of criteria and indicators, which are used to assess and communicate the consequence of a business operation, can provide evidence concerning certain agricultural practice or act as benchmarks to compare the advantages and disadvantages of different practices (Efroymson, 2013). Due to the complexity of biofuel supply chain and the scale of environmental problem it may bring, the use of criteria and indicators provides a practical and economical way for the standard-setter and economic operators to track the environmental performance and inform good management practice (Efroymson, 2013). For example, under Bonsucro, the assessment of impacts of sugarcane enterprises on biodiversity and ecosystems services (Figure 6) are divided into seven concrete indicators, including aquatic oxygen demanded per unit mass product, percent of land classified as high conservation value areas under national or international standard, existence and implementation of environmental management plan, degree of compliance of fertilizer application to soil and leaf analysis, percent of agricultural co-products that do not jeopardize local uses or soil quality, nitrogen and phosphorus fertilizer applied per hectare per year and Herbicides and pesticides applied per hectare per year (Figure 6) (Bonsucro, 2011).. The standard of acceptable practice for each indicator are either numeric (e.g. the use of nitrogen and phosphorus fertilizer must be less than 120 kilograms per hectare per year) or categorical (e.g. the measure for implementation of environmental management plan (EMP) is “Yes” or “No”) (Bonsucro, 2011). By evaluating the performances against pre-established standards, certification applicants can self-check whether their business operations are conducted in a sustainable manner and identify and correct where it has done poorly.

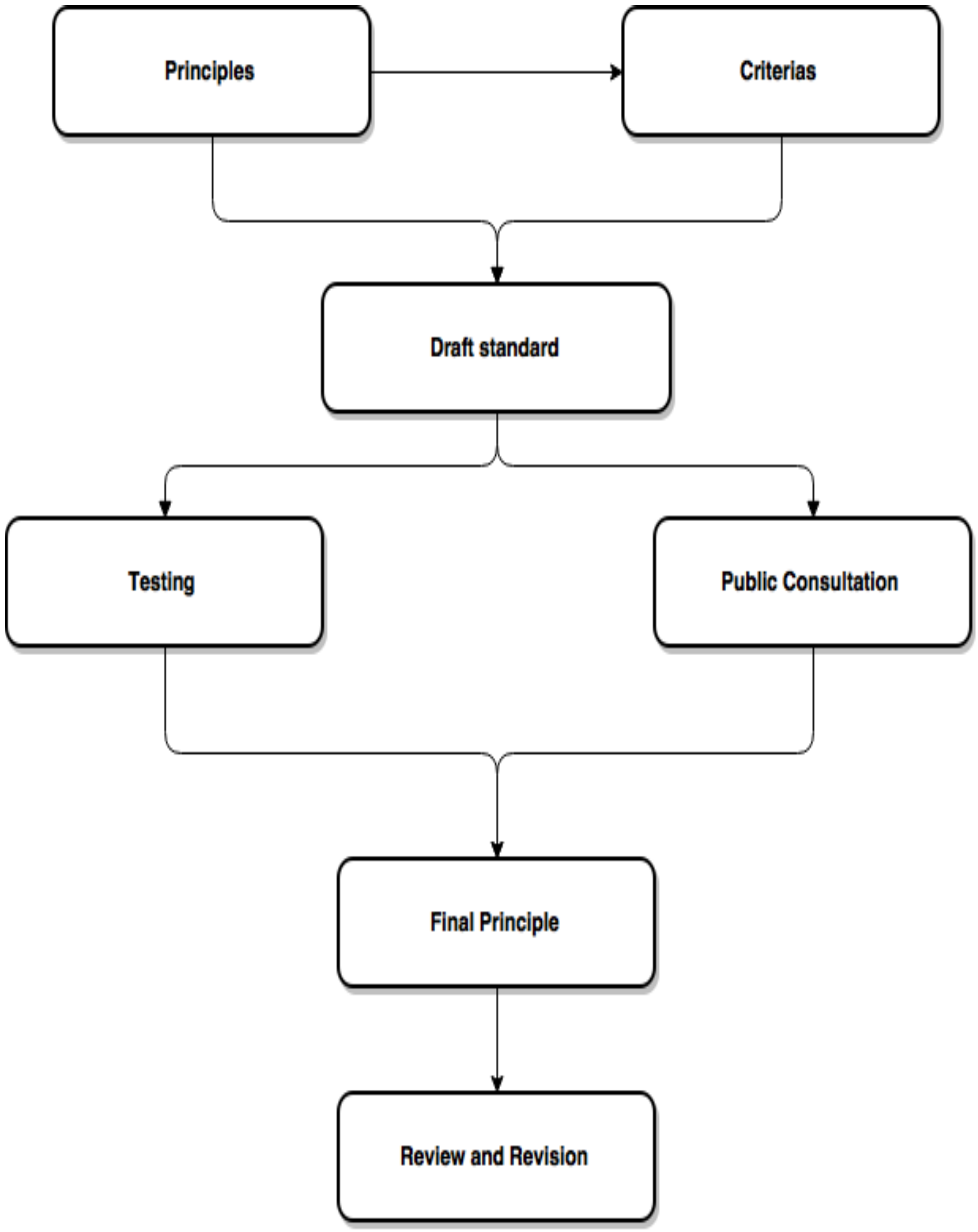

Figure 4. General Working Path of Standard-setting Process

Criterion	Indicator	Verifier	Standard
To assess impacts of sugarcane enterprises on biodiversity and ecosystems services	Aquatic oxygen demand per unit mass product	ppm	<1 kg COD or 0.5 kg BOD5
	Percent of areas defined internationally or nationally as legally protected or classified as High Conservation Value areas (interpreted nationally and officially as described in Appendix 1) planted to sugarcane after the cutoff date of 1 January 2008.	%	0
	Existence and implementation of an environmental management plan (EMP) taking into account endangered species, habitats and ecosystems as well as reference to ecosystem services and alien invader plant and animal control. Coverage of issues required in Appendix 4.	%	>90
	Use of co-products does not affect traditional uses (e.g. fodder, natural fertilizer, local fuel) or affect the soil nutrient balance or soil organic matter	Yes/No	Yes
	Fertilizer applied according to soil or leaf analysis	Yes/No	Yes
	Nitrogen and phosphorus fertilizer (calculated as phosphate equivalent) applied per hectare per year	kg active ingredient /ha/y	<120
	Herbicides and pesticides applied per hectare per year	kg active ingredient /ha/y	<5

Table 2. The assessment of impacts of sugarcane enterprises on biodiversity and ecosystems services under Bonsucro (Bonsucro, 2011)

Once the criteria and indicators have been developed, the draft standard are tested to ensure that they are clear, appropriate and effective (Kutas et al., 2009). The functionality of the criteria and indicators is an important precondition for the success of a certification system (Lewandowski & Faaij, 2006). Usually, a few important characteristics are evaluated in the testing, such as whether the user of the C&I sets can understand them, whether enough information and data are available for using the chosen indicators, whether a clear guideline is provided for the use of the C&I sets (Lewandowski & Faaij, 2006). The results of the field testing are evaluated and used to revise and improve the scheme before the final standard is implemented, which can take from weeks to months (Kutas et al., 2009). In addition, a public consultation would be held in which standard-setter can receive comments from authorities, companies, NGOs and other interested parties and address the issues in following assessment and revision process (ISEAL Alliance, 2006). When the contributions have been adequately taken in to account, the standards are distributed for a consensus vote (ISEAL Alliance, 2006). As multi-stakeholder involvement rarely reaches a true consensus, the standard-setting organization must have a back-up mechanism to ensure that the standard development process may progress based upon a pre-defined decision-making threshold where consensus is impossible to achieve (ISEAL Alliance, 2006). After the final standard is published, it is reviewed and revised periodically for continued relevance and for effectiveness in meeting its stated objectives (ISEAL Alliance, 2006).

Stakeholder involvement is one of the most important element in the standard-setting process. It is only through active participation and good coordination of all parties who are likely to have an interest in the standard or be affected by its implementation that a system can ensure that all knowledge and information are sufficiently incorporated into the standard. In addition, the participatory process can build a sense of ownership among stakeholders, which will lead to a higher willingness to comply and acceptance of the criteria. Overall, stakeholders are consulted and their input integrated into certification schemes at several points of time in the standard-setting process (ISEAL Alliance, 2013). First, formulation of sustainability criteria and indicators necessitates participation of representatives from different stakeholder groups. Affected stakeholders are usually identified through an initial mapping process and are given a range of opportunities to provide their input (ISEAL Alliance, 2013). It is particular important for the stand-setter to pay extra attention to stakeholder groups that are underrepresented and disadvantaged, thereby bringing together a balanced and representative group of interested stakeholders in the drafting and consultation process. Also, as the choice of criteria and indictors in a certification program depends on local conditions, for example, criteria relating to the prevention of erosion will be most meaningful in slope areas that are susceptible to erosion, but not flat areas with no or low danger of erosion, insights from local people, who are directly affected by the biofuel production, are needed (ISEAL Alliance, 2013). Besides that, stakeholders are involved, or at minimum have their positions to be represented in the decision-making process, which guarantees that the diverse interests of stakeholders are taken into account (ISEAL Alliance, 2013)..

Involvement may take different forms at different phases of developing the sustainability standards, such as interviews, outreach meetings and workshops. Take the standard-setting process in the RSB for example. The standsetting in RSB took place in four working groups (WGs) on environmental impacts, social impacts, greenhouse gases and implementation (Schleifer, 2008; RSB, 2007a; RSB, 2007b). Each of the WGs are was open to any interested party, coordinated by a secretariat staff and chaired by one or two experts (RSB, 2014). Overall, 408 organizations and individuals from 45 countries have registered with the WGs (RSB, 2014). After more than 50 working group teleconferences and 4 stakeholder outreach meetings in Brazil, China, South Africa and India, the 12 principles and related criteria of Version Zero of RSB standard were formally adopted by the RSB Founding Steering Board in August 2008

(Schleifer, 2008). Following the guidelines of the International Social and Environmental Accreditation and Labelling (ISEAL) Alliance, the draft standard was then released for a six-month period of public consultation (Schleifer, 2008; RSB, 2009). From August 2008 to March 2009, the RSB Secretariat organized 15 in-person stakeholder outreach meetings around the world in which biofuels stakeholders were invited to review and comment on the draft standard (RSB, 2009). In addition, the Kluyver Centre for Genomics of Industrial Fermentation in Delft, Netherlands was commissioned to conduct an expert workshop to review the RSB standard (Schleifer, 2008). In total, nearly 900 individuals and organizations from over 40 countries participated in the feedback process to improve Version Zero of the RSB standard (RSB, 2011).

3.2 Conformity Assessment and Monitoring Process

In general, enforcement of the sustainability standards is mainly achieved through two mechanisms: conformity assessment and public monitoring. Conformity assessment procedures are "any procedure used, directly or indirectly, to determine that relevant requirements in technical regulations or standards are fulfilled." (WTO, 1995). These procedures may include, among others, procedures for sampling, testing and inspections, evaluation, verification and assurance of conformity, registration, accreditation and approval, and the combination of the three. In the case of sustainable certification scheme, conformity assessment are normally carried out in the form of certification audit - by the standard-setter or third parties accredited by the standard-setter - to reviewed the manufacturing process and independently determined that the biomass and biofuel producers and processors reach the stringent social responsibility and environmental stewardship criteria established by the standard-setter (LMI, 2014). Auditors may carry out the documentary and on-site checks on farmers, first biomass collecting points, warehouses, oil mills, biofuels plants, and biomass or biofuels traders, so as to ensure that all relevant information and material for verification of compliance are obtained (ECA, 2016). This assurance and accreditation mechanisms possess a double-insurance function for companies' self-evaluation. Different from other forms of conformity assessment, where an individual from the organization providing the service or products offers the auditing service (first-party certification), or an association to which the individual or organization belongs provides the assurance (second-party certification), such certification system is not subject to influences of market pressure and internal company manipulation, because the certification bodies or the auditors have no ownership or financial interest in the product or the economic operators involved in the biofuel supply chain (LMI, 2014). Therefore, it can provide a more objective view of the operator's environmental performance. Meanwhile, third-party certification is more cost effective than first-party and second-party certification, because the biofuel producers would not need to buy the testing equipment or hire staff competent to perform the evaluation of the products (ACIL, 2002). As third-party auditors usually have more expertise and experience than the operators in assessing the environmental impacts of business operations, they can also carry out the evaluation more efficiently (Zezza, 2013). By screening out operators that do not conform to the specified requirements to which they are being evaluated, the certification schemes resolve the doubt that environmental sustainability is merely a deceptive gimmick used by market agents without any verification or substantiation behind them (Zezza, 2013).

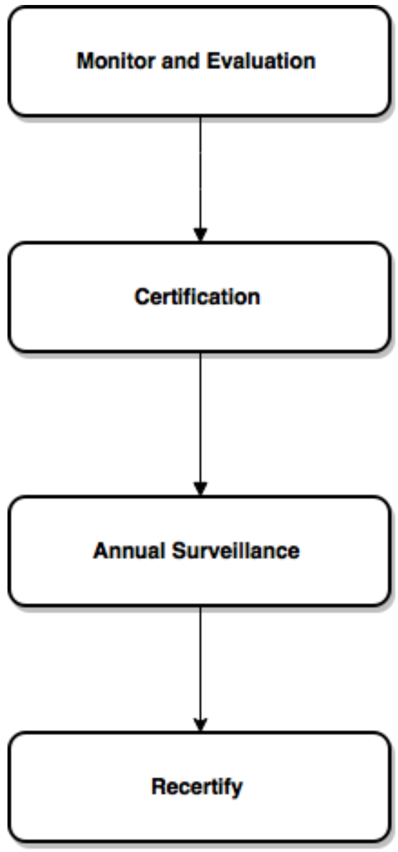

Figure 5. General Work Path for Enforcement Process

Commitment to environmentally sustainable practice is not something that can be done once and for all. In addressing the potential problem that operators may revert to former unsustainable behavior, a certification usually expires after a number of years (e.g., the validity of Bonsucro certification is three years). Upon expiration of the certification, the certification holder should timely submit an application for renewal. In addition, the certification bodies demand annual surveillance to be conducted throughout the period that the certification is valid, with all audits performed by third-party auditors using a standard no less rigorous than the one used in original audits. This adds to the credibility of certification schemes by ensuring that a holistic concern for the environmental and social issues are consistently taken account into corporate policies and practices.

Public monitoring and reporting also plays an important part in the credibility of certification. Unlike auditors, civil society, especially the local community is more sensitive to the loopholes in certification process as it is directly influenced by the effects of non-compliance. Public oversight mechanisms can be used before or after the audits. For example, applicants for Bonsucro certification are posted on the website for a 30-day public comment; at meantime, certifications granted under Bonsucro are published on another page with detailed certification ends date, certification bodies, type of certification, name of the organization, website and public contact. Once a wrongful awarding of a certificate or a member's non-compliance with the standard is detected, the public can initiate a complaint process and Bonscuro would suspend the certification and order a re-audit once if a certified member violate a core criterion.

Just like the Forest Stewardship Council (FSC) or Leadership in Energy and Environmental Design (LEED), biofuel certification is designed as a means to guarantee that fuel crop cultivation and biofuel production adhere to certain sustainability standards. Nevertheless, debates continue to heat up with regard to the social and environmental criteria proposed by EC and the overall effectiveness of certification program. For example, studies have criticized that the minimum criteria set in EU RED only focus on two sustainability criteria, GHG balance and the impact on high biodiversity value areas, while overlooking other crucial issues like food security, land conflicts, labor conditions and water and soil degradation (Ponte & Daugbjerg, 2015). Apart from the fact, the level of stringency for the sustainability criteria in RED is under attack, certification of biofuel and biomass are also considered by skeptics as offering nothing more than a novel form of greenwashing through membership (Lang, 2015, November). This uncertainty surrounding the effectiveness of voluntary certification schemes also reflected in the reluctance of international organizations to give these non-state standards formal recognition

(Fortin & Richardson, 2013). In its “Sustainability Indicators for Bioenergy” published on December 2011, the G8’s Global Bioenergy Partnership refrained from adopting the earlier statements by its Chairman, that “labelling and certification of origin of biofuels should be agreed internationally and introduced into the global energy market”, and instead encouraged the policy-makers to adopt best-practice in areas such as water use, soil quality management and GHG calculation (Fortin & Richardson, 2013).

Should the implementation of voluntary certifications be not fully reliable to achieve the sustainability goals set in EU’s meta-standard, then improvements to current certification system are necessary. In section IV, I am going to discuss the main reasons why certification schemes, as a form of hybrid governance, fail to further sustainable development of biofuels. First, the market provides insufficient incentive for economic operators, along the biofuel supply chain to participate in certification program, as they can gain little if any competitive advantage (e.g., price premium) by getting certified. For small farmers in developing countries, the motivation to adopt biofuel certification is close to none as the processes could impose high transaction costs on them because of the lower administrative and technical capacities and weak institutional capacity. Second, the governments are reluctant to enforce legislation mandating certification due to concerns over WTO compatibility. The introduction of sustainability criteria and certification systems could raise issues concerning market access, market shares and trade liberalization, so it is necessary to ensure that sustainability criteria and certification schemes conform to WTO rules and principles. Third, sustainability certifications in nature is a form of soft law initiative, which means they lack the teeth to really penalize members who does not conform those sustainability standards (other than depriving them of membership/revoking the certification issued), not to mention that the standard themselves may be not stringent enough (e.g., majority of certification schemes in the market fails to take indirect GHG emission from land use change into account when establishing sustainable criteria). In addition, due to the proliferation of certification options in the market, as well as the financial dependence of standard-setting organizations on their members, a “race to the bottom” phenomenon is likely to occur among certification providers; finally, it is difficult to ensure the reliability of third-party certifier. While the independent certifiers are inspecting whether biofuel production meet certain sustainability standards, who is responsible for supervising the auditing firms so that they will not collude with certification applicants? If the auditing process is not reliable enough, how to determine whether a certification program is indeed trustworthy but not made up to deceive environmentally minded purchasers? The following section will elaborate on each of these points in turn.

CHAPTER 4: FAILURE OF CURRENT BIOFUEL SUSTAINABILITY CERTIFICATION SYSTEM

While voluntary certifications are becoming an important instrument in the sustainable development of biofuel community, they also raise significant issues. For example, one of the most significant problems with biofuel certification is the existence of tens or hundreds of certification programs with different format and content in the market. Due to the lack of a uniform definition of what counted as "sustainable biofuel" and negotiated consensus regarding what criteria or indicators should be used in evaluating sustainability, the certification schemes may not necessarily be compatible with each other in terms of the standards used or comparable to the methodologies commonly used in the civil society. This raises difficulties of accountability even in case of full compliance with the certification requirements and transparency in reporting as commitment does not mean sustainability. The remaining part of this section will discuss several external and internal factors that constrain the effective implementation of biofuel certification scheme in detail. These limitations include high certification cost compared to the price premium, potential conflicts between certification and international trade law, insufficient sustainable standards and criteria, lack of consistence and harmonization between different standards, and reliability of standard operators and auditors.

4.1 Certification Is Costly Compared to Potential Price Premium

Producers can incur a number of direct and indirect cost by implementing the voluntary certification schemes accredited by the European Commission. The direct cost makes up for approximately four percent of the total costs associated with certification (Spöttle & Vissers, 2011). It is often split into two components, a certification fee and an auditing fee. The certification fee is the cost levied by the standard-operator, which is usually composed of a membership fee[5] and a quantity/output dependent-fee (for example, USD cents per tonne/gallon/liter of certified product). In addition to the certification fee, the certification seekers also have to pay the auditing fee, which is the cost of hiring external agents, that is, the auditors, to conduct regular conformity assessments or annual surveillance visits on site, so as to ensure that the applicant is indeed in compliance with the underlying standards. The auditing fee can vary a lot between companies and thus is difficult to estimate, since it largely depends on the length of the audit in the number of days, the number of auditors, the daily fee for each auditor (Kalfagianni et al., 2012).

Apart from the direct costs, the applicants can incur huge indirect costs by adapting to the sustainability requirements contained in the certification, including improvement in agricultural practices and purchase of more efficient equipment. Although these measures may be beneficial to the producers in the long run as resource usage becomes more efficient, thereby reducing the production costs, it can be become a burden in the short term, especially for small-scale producers in lower-income developing countries. Several studies have pointed out the difficulty smallholders to get access to the financing and agro-technical skills and services required by the certification process and the potential risk of indebtedness associated with certification, which turns participation in the schemes an unfavorable or unrealistic choice for the them. For example, Van Dam et al (2012) found that the indirect costs are highest at the start of the supply chain, that

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[5] Some certifications, such as Bonsucro, are only open to its members. Therefore, the certification seeker must pay the mandatory membership fee to get access to the certification service it provides.

is, at the farmer or the plantation, which can be can be substantial compared to direct costs for certification. Further, according to Pacini, Assunção, Van Dam & Toneto (2013), in certain cases, small suppliers may also have to bear the cost that was shifted to them by large biofuel procedures (push-the-bill-to-the-weakest" effect). As feedstocks such as sugarcane or palm oil, must be processed quickly to prevent the harvested crops from degradation, local biofuel mills or conversion facilities may become de facto regional monopsonies for feedstock producers and service providers, that is, the only feasible buyer for the feedstock. With unbalanced market power, small-scale farmers might be obliged to foot the bill for adaptations to certification requirement on their own without being able relaying the costs to the buying group.

The situation is made worse considering the short-lived price premium of certified biofuel. Since the implementation of sustainability criteria in 2009, it is hoped that certified biofuels would earn producers price premiums in European markets either by producing sustainable biofuel within the area or export clean fuels to Europe, thereby turning the whole industry towards sustainable development. Nevertheless, the initial idea that certified biofuels would be rewarded with price premium was soon found to be unfounded in light of the market data. Pacini, Assunção, Van Dam & Toneto (2013) found that certified products, in fact, receive little or almost no price premium in the market, with certification becoming the new norm. For example, the average premium for RED-compliant ethanol was only 0.46% over conventional ethanol from 2011 to 2012, with the peak premium amounting to 3.93% in the beginning of the second half of 2011. Since then, the price premium has decreased gradually and has completed disappeared since the beginning of 2012. Just as a trader said in the report, "there is no market for non-certified product. You have to make it better but no one will pay anything extra for it".

With the high cost of certification and the absence of price premium to cover the additional cost, it would certainly disincentivize operators along the biofuel supply chain from getting certified.

4.2 Potential Conflicts between Certification and International Trade Law

The implementation of biofuel certification system must be compatible with WTO agreement. Under the rules of the WTO, certification schemes are considered as conformity assessment procedures**,** which are subject to the rules of the General Agreement on Tariffs and Trade (GATT), and the Technical Barrier to Trade (TBT). Article III:4 of GATT (1986) provides that "the products of the territory of any contracting party imported into the territory of any other contracting party shall be accorded treatment no less favorable than that accorded to like products of national origin in respect of all laws, regulations, and requirements affecting their internal sale, offering for sale, purchase, transportation, distribution or use." For the provision to apply, two preconditions must first be met: first, it must concern products and process and production methods (PPMs); second, the imported and domestic products must be "like". Since the certification scheme is based on sustainability criteria which might differentiate between biofuels on the basis of the environmental sustainability of their production, that is, making a differentiation between like products on the basis of their PPMs rather than their characteristics, certification schemes might be considered as discriminatory if the domestic sustainable biofuels is accorded a treatment that is more favorable, such as partial or full tax exemption, to imported non-sustainable biofuels (Echols, 2009). Similarly, Article I of the GATT, which requires non-discrimination among like products from different WTO exporting sources concerning duties, charges and other measures may apply if it discriminate between biofuels imported from the territory of different trading partners by treating biofuels from some region more favorably than biofuels from other regions (WTO, 1986). Despite that measures contrary to GATT can be justified under one of the general exception to GATT in Article XX, the certification scheme might still be considered as an "unjustifiable discrimination" and a "disguised restriction to international trade" if its necessity and non-protectionist character cannot be proven.[6]

Except the general obligations of the GATT, biofuel certifications are also judged according to the rules of the TBT. Currently, the WTO deals with technical barriers to trade, in the form of mandatory and voluntary technical specifications for products, through the WTO Agreement on Technical Barriers to Trade (TBT). The Agreement recognizes that WTO Member governments have the right to set product specifications for a variety of different legitimate objectives, such as environmental protection. However, the Agreement requires that these measures be developed and applied in a non-discriminatory manner and cannot constitute unnecessary obstacles to trade (WTO, 1995). According to TBT, a document which "lays down product characteristics or their related processes and production methods" can be either a technical regulation (mandatory) or a standard (non-mandatory). Article 2.1 of the TBT Agreement set up some requirements that are similar to those of Articles I and III of GATT, requiring treatment no less favorable than that accorded to like products of national origin and to like products originating in any other country in respect of technical regulations. In addition, as certification is often a "conformity assessment procedure" under TBT, which is defined as "a direct or indirect procedure used to determine the fulfilment of requirements in a technical

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[6] In relation to such environmental sustainability measures as the EU biofuel sustainability criteria especially Article XX(b) and Article XX(g) might be relevant. The preceding concerns measures that are adopted in order to protect human, animal and plant life or health. The latter exception concerns the conservation of exhaustible natural resources.

regulation or standard", Article 5.1.2 and 12.3 of the TBT further demands that conformity assessment procedures should not create, through their preparation, adoption, and application, unnecessary obstacles to trade, especially for developing countries for whom they should take into account particular development characteristics, financial and trade needs. To that extent, the implementation of the certification scheme without consultation or consideration of the characteristics of developing countries may well run counter to the TBT agreement and constitute an obstacle to the trade.

Despite of the extensive discussion over the compatibility between biofuel certification and the law of WTO, Ponte & Daugbjerg (2016) stated that a general agreement has been reached regarding whether the environmental sustainability criteria in RED would fit into the WTO legal framework. However, the socioeconomic criteria, such as respecting land-use rights, improving food security, or protecting labor rights, if made mandatory under RED, may be deemed non-compliant with WTO. To a large extent, the perceived risk of being involved in the WTO dispute contributes to the reluctance of EU legislators to introduce binding socioeconomic criteria into RED. For instance, according to Ackrill & Kay (2011), although the European Parliament supported compulsory labor standards, it was felt within the Commission "that [compulsory labor standards] would overstep some countries "red lines" and thus would almost certainly trigger an action in the WTO", so the reporting requirement rather than a mandatory criteria on labor rights are finally used.

4.3 Limitations in the Scope of Sustainability Criteria

Although RED has established several mandatory criteria for biofuels to be considered as sustainable, the scope of the criteria has been fairly limited. For example, social issues such as human rights, land use rights and food security are only optional but not required to be taken into account when determining sustainability. One topic that has been hotly discussed recent years is if indirect land use effects should be included when calculating GHG emission (Searchinger, 2008). The indirect land use change (ILUC) refers to the unintended consequence, mostly carbon emission, induced by the expansion of feedstock cultivation into previously non-crop land such as grassland or forests. If indirect land use effects are included, it means that the certifiers would need to account for the GHG emissions when farmers clear land to grow feedstocks and feed supplies that have been diverted to biofuels in addition to the emissions from fertilizer and transportation, which in some cases can negate the GHG savings of certain biofuel and result in a net increase in GHG emission. Although EU amended its previous legislation on biofuels in 2015, specifically the Renewable Energy Directive and the Fuel Quality Directive (European Council, 2015), to reduce the risk of indirect land use change, the impact of ILUC emissions on sustainability are not being taken into account in the assessment and recognition procedure carried out by the Commission on voluntary schemes, according to the report by European Court of Auditors. Out of the recognized schemes, only the RSB has developed a set of criteria and compliance indicators for certifying low ILUC fuels. While current measures and methodologies of estimating emissions from land conversion still face lots of technical difficulties (Ahlgren & Di Lucia, 2014; Madhu & Crago, 2012) and further research should be done for assessment of the impact of ILUC on greenhouse gas emissions to reach the certainty to be included in the legislation, it is recommended, as ECA suggested in the report, that the European Commission at least incorporate ILUC in the assessments of voluntary schemes requesting recognition and require the schemes to report once a year any relevant information with respect to the ILUC emission (ECA, 2016).

In addition to ILUC, WWF has noted in a 2013 report that most of the existing certification schemes do not have clear requirements prohibiting or restricting the use of hazardous agrochemicals, including the one included in World Health Organization (WHO) Classes 1A,1B and 2 and the substances banned by the Stockholm and Rotterdam Conventions. In general, the requirements on the use of hazardous agrochemicals are fairly relaxed, in the sense that the majority of the schemes only require the use of such chemicals be reduced and be replaced with alternative substances, but a few had completely prohibited their use (WWF, 2013).

To ensure sustainable production of biomass, voluntary certification schemes should not only aim to prevent ecological damage but also to mitigate negative socioeconomic effects. This may include worker's health, safety and welfare, respect of indigenous rights, food security and son on. Nevertheless, the report prepared by ECA (2016) indicated that while RED require the European Commission to submit a report to the European Parliament and the Council every two years on the impact on social sustainability in the EU and in third countries of increased demand for biofuels, on the impact of EU biofuel policy on the availability of foodstuffs at affordable prices, in particular for people living in developing countries, and on wider development issues in developing countries, both the 2013 and 2015 report submitted by the Commission did not contain sufficient information nor provided clear conclusion concerning abovementioned risks. Similarly, a working paper published by CIFOR (2012) indicated that social sustainability aspects might not be sufficiently addressed in some of the certification schemes. Out of the seven certification schemes that are studied in this paper, two out of which (Abengoa and 2BSvs) are devoid of any commitment to social sustainability. Even for those schemes that set higher standards on social sustainability, the gaps in procedure can still undermine the effectiveness in achieving these goals. As biofuel imported from developing countries with weak governance systems to safeguard the social sustainability of domestically produced biofuels is projected to constitute the bulk of EU consumption in the long run, the absence of social sustainability component in some certification schemes and the wiggle room for standard operators to implement the standards can lead to a situation in which that biofuels complying with the certification requirements are not sustainable at all with respect to child labor, occupational health and safety, community relations, rural development and so on.

4.4 Lack of Consistence and Harmonization among Different Standards

Voluntary certification schemes approved by EU vary a lot in the formulations of sustainability standards and criteria. For example, while schemes like ISCC and RSB go beyond RED requirements to cover land tenure issues, other approved schemes, especially those industrial standards, containing no reference to land and resource rights at all. However, the proliferation of different certification schemes in the market - without a system for mutual recognition – is likely to cause additional problems. The lessons learned from ecotourism, organic foods and forest industry has demonstrated that the existence of diverse certification initiatives with different content and standards can result in confusion among consumers and therefore hinder market efforts to develop meaningful sustainability certification systems in. FASE-ES and Carbon Trade Watch (2003) mentioned that the open market for certification schemes "has transferred the responsibility for combating environmental and social crime from governments to consumers faced with hundreds of eco-labels, the vast majority of which are a result of opportunistic product marketing". This competition has led certifiers to apply the FSC-standards in a vague and lax way. For example, some certifiers, worried about losing their clients, had adopted a "hope for improvement" strategy, by including vague formulations that the certification conditions can be fulfilled within a certain time frame after the certificate had been issued. The strategy has seriously undermined the credibility of FSC certification by allowing timbers to be sold as "sustainable" while the productions involve serious violations of human rights. The same is the case for biofuel industry. Kaup (2015) in the analysis of Brazilian sugarcane complex pointed out that while certification might be beneficial to the sugarcane industry, the Brazilian Sugarcane Industry Association (UNCIA) is worried that overlapping and competing certification schemes in the market can induce protectionism and impede investment. One of the expert from Luiz de Queiroz College of Agriculture (ESALQ) even refers to the multitude of international certification system as "Towel of Babel", indicating that fragmentation and a lack of harmonization between different certification schemes can easily create market confusion (Kaup, 2015).

Another consequence of uncoordinated proliferation of standards with different scopes and varying degree of rigor is the "race to the bottom" phenomenon among standard operators. As previously discussed, most of the certification schemes, if not all, are financially relying the fees paid by certification applicants to maintain operation. Therefore, this dependency creates incentives for standard operators to water down its requirement to cater to the companies they are endeavoring to discipline. From another perspective, this also provides an opportunity for applicants that focus only on the market advantage they can get from being certificated to shop around and opt for the certification schemes that would not incur additional effort for compliance. The dilemma this creates has been openly recognized by the RSB (RSB, 2012):

"How do we make compliance with RSB standards practical and cost-effective for companies while addressing complex issues such as biodiversity, food security or land rights? In other words, how can the RSB cope with fierce competition from a number of emerging schemes offering cheap and simple alternatives, while at the same time remaining true to its aspirations of comprehensively addressing sustainability?"

As companies are favoring standards that best fit their interests, it is likely that stringent and ambitious sustainability certification options can be forced to either lower its standards or be pushed out of the market due to such a broad availability of certifications schemes. Thus, unintentionally, variation between schemes may lead to fragmentation that weakens accountability and compliance, and may consequently undermine the sustainability objectives that the voluntary schemes are designed to achieve.

4.5 Competence of Auditors

Conformity assessment is an important structural element in the implementation of sustainability criteria. In order to reduce the uncertainty concerning the fulfillment of sustainability criteria in the certification schemes, a robust monitoring and verification system is indispensable. Nevertheless, to improve the overall quality of assurance process, not only clear guidance that specifies normative standards on how to carry out conformity assessment of underlying standards should be established, the qualification of the auditors, that is, the body responsible for performing the assessment must also be ensured. In fact, as the implementation of the certification requirements by economic operators is verified by auditors, the competence of the auditors can directly affect the rigor and credibility of the certification scheme. For instance, a report published by Environmental Investigation Agency in 2015 has revealed the problems of auditors and resulting breakdown of oversight mechanism in RSPO's guarantee of sustainable production (EIA, 2015). The RSPO is entirely relying on auditors to monitor the operations of palm oil growers and ensure that the growers are complying with RSPO standards. However, as the report pointed out, the auditing firms which are tasked with checking compliance are in many cases failing to identify and mitigate unsustainable practices by oil palm firms: Not only are they conducting woefully substandard assessments but also they are colluding with plantation companies to deliberate disguise facts of violations. In such cases, the auditors were essentially becoming an accomplice for greenwashing unsustainable practices and even environmental crimes. As EIA Forest Campaigner Tomasz Johnson pointed out, "many major consumer goods firms now delegate responsibility for their sourcing policies to the RSPO and, by extension, to these auditors. If the auditors are engaging in box-ticking and even colluding to cover up unsustainable practices, then products will get to the supermarket shelves that are tainted with human trafficking, rights abuses and the destruction of biodiversity." (EIA, 2015, November 16).

In reality, the objectivity and competence of auditors are affected by several factors. From systematic level, auditing firms, similar to standard operators, may be motivated to conduct doggy assessment in face of the pressure to pander to their clients (House of Commons Environmental Audit Committee, 2008). Even third-party certification bodies are not immune from the problem, as these so-called "independent certifiers" are still somehow, even though not directly or completely, financially dependent on the auditing fee paid by the certification applicants. The situation can become worse for schemes that are not under accreditation bodies, as competing auditing firms can make low offers that only provide a minimum of quality in terms of verifying compliance with criteria (OXFAM Novib, n.d.). Meanwhile, as the assessment are usually conducted at a plantation or farm, it could be difficult for the auditors to verify the environmental or socioeconomic impacts of the operation in the surrounding communities.

Problems in the certification system can also influence the ability of the auditors to carry out the assessment effectively. First, due to the existence of various standards in the market, extensive amount training is required for auditors to be familiar with the process and rules of each certification schemes, making providing enough training to auditors extremely cost-inefficient (OXFAM Novib, n.d.). In order to save time and cost, the auditors may not be sufficiently well trained before it goes to the field, which in turn will affect the quality of the assessment he or she performs. Further, some the criteria and indicators used certification schemes are by nature ambiguous, which allows room for interpretation. For example, terms such “sufficient” or “significant” that are typically used in the standards can either be interpreted rigorously or loosely, so it is up to the auditors’ discretion which way it should go. Finally, the scope of some certification schemes are quite narrow, that is, it is only applicable to a specific step in the whole biofuel production process. In such case, even though the mill that is responsible for processing the harvested crops are certified as sustainable, it does not necessarily mean that the supplier to that mill is producing sustainable

CHAPTER 5: CONCLUSION

With growing production and use of biomass as a renewable energy option in recent years, the need to ensure the sustainable production of feedstock and biofuel has been widely recognized by various stakeholder groups in the market, including NGOs, companies, national governments and international bodies. In response to the trend, the development of principles and criteria and the establishment of certification schemes are considered as a possible strategy that can help guarantee that biofuels indeed contribute to the achievement of stated energy and environmental goals, such as diversification of energy supply and mitigation of climate change.

Biofuel certification is a type of voluntary, usually third party-assessed initiative used by operators along the supply chain to demonstrate that they are in compliance with a set of predetermined standards. It can differentiate biofuels based on certain features (in this case, sustainability), and allow biofuel purchasers to make an informed choice, by providing information about the product or the production process. For the past few years, national and international attempts have been made to facilitate the development and implementation of biofuel certification system or sustainability standards for biomass. For example, In EU's Renewable Energy Directive certification has been associated with tax credits and other incentives and used as a precondition for products to be counted towards national renewables targets.

Unfortunately, although certification may be instrumental to the sustainable production of biomass, the development of the biofuel certification system is, to a large extent, still in the preliminary phase. In section IV, I discussed several limitations of existing biofuel certification system, for example, the proliferation of individual certification schemes may reduce the credibility and effectiveness of certification system. In light of the analysis above, the following recommendations are provided to guide future improvement of sustainability certified market for biofuels and advance biofuel development in general:

5.1 Reducing the Cost of Certification

Compliance with sustainable criteria can be costly, due to direct costs associated with participation in the certification scheme (e.g. membership fee or auditing fee) and extra costs to meet particular sustainability criteria for biomass production, transportation and storage (e.g. construction of new waste treatment facility). The level of costs is strongly related to the scale of production, the strictness and inclusiveness of sustainability criteria, and the expertise required to carry out conformity assessment. To provide incentive for operators along the supply chain to participate in certification programs, the cost of certification must be controlled within a reasonable range, without incurring high additional economic burden (Junginger et al., 2006). Further, several studies that assessed the certification costs have suggested that the expenses for complying with sustainability criteria can be substantial for small-scale producers (typically situated in developing countries). As smallholders often operates with limited financial resources and technical skills, issues of cost can act as powerful deterrent for them to adopt a certification program. It is recommended that the introduction of group certification (groups of smallholder farmers will be certified jointly in order to share the costs.) and simplification of sustainability requirement for smallholders can limit administrative burdens and costs (Zarrilli, 2008).

5.2 Avoiding Violation of International Trade Rules

Although enhancing the sustainability of feedstock and biofuel production is a legitimate goal, there is a concern that voluntary certification system and sustainability criteria can create additional obstacle for international trade. For example, Zarrilli pointed out that measurement to ensure conformity carry the risk of acting as non-tariff barriers (especially for developing countries) if they demand costly, time-consuming and unnecessary tests or duplicative conformity assessment procedures (Zarrilli, 2008), which may then lead to market concentration and a decrease in the number of eligible suppliers (Pacini & Assunção, 2011). Therefore, in order to prevent biofuel certification becoming a barrier to trade, sustainability criteria should be developed through a transparent and fair process, where all countries (that is, both producers and consumers, and both developed and developing countries) are effectively presented. In addition, existing WTO agreements already dabbled in the role WTO can play in the development of a biomass certification scheme as well as potential issues pertaining to voluntary certification and labelling initiatives. Further negotiation between WTO members are needed to provide more insight on how biomass certification should be framed (Van Dam et al., 2008).

5.3 Designing Better Criteria and Indicators

Currently, a consensus has been reached among stakeholder groups that a set of environmental, social and economic criteria should be included in the biofuel certification system. However, standard-setting organizations are split on which criteria should be included and how to translate such concerns or sustainability principles into quantifiable indicators and verifiers. As discussed above, ILUC factors, also referred to as displacement or leakage effect, are rarely accounted for in the most of the sustainability certification system approved by EU, primarily due to the uncertainty in quantifying the complex agricultural production systems, such as fuel yield, co-product market, altered trading patterns and so on (Yeb & Witcover, 2010). Therefore, a better understanding of the underlying mechanism and an update of existing methods (or development of new methodologies to measure impacts) is required on the design of criteria and indicators to capture the dynamic interaction between agriculture and downstream market. Beyond that, pilot studies should be carried out to build up practical experience on how sustainability criteria can be defined and converted into measurable targets, and how they can be met under diverse conditions (Van Dam et al., 2008).

5.4 Harmonization of Diverse Certification Systems

The proliferation of biofuel certification systems in the open market (as shown in Figure 4), as with the case of certification systems in eco-tourism and forestry, can transfer the responsibility for "combating environmental and social crime from governments to consumers faced with hundreds of eco-labels, the vast majority of which are a result of opportunistic product marketing". The competition can lead standard-setters to lax the requirement of obtaining the certification, for example, by allowing certain criteria to be fulfilled "within a certain timeframe" after the certificate is issued, which may impose various risks. It is suggested that the introduction of a global standard that integrates divergent standards and schemes into a single system on the basis of their shared common principles can effectively mitigate the inconsistency and enhance the confidence of stakeholders (Soliman & Roggeveen, 2012). The global standard can either take the form of a meta-standard (minimum standard against which existing certification schemes are benchmarked), or a generic standard (standard that is universally applicable, with its own set of principles and criteria has been suggested) (Soliman & Roggeveen, 2012).

5.5 Improving the Oversight on Scheme Operators and Auditors

Auditors play a key role in the establishment and implementation of an effective, reliable biofuel certification system. The two most important steps in the certification process, which is, establishing sustainability criteria and inspecting whether feedstock and biofuel production meet these pre-determined criteria, are administered by the standard-setter and the certification bodies respectively. Therefore, for certification schemes to really work instead of being used as a tool for greenwashing, it is essential that there are ways to assess the qualification and performance of certification bodies. The International Organization for Standardization, an independent, non-governmental body composed of representatives from 164 national standard organizations, maintains standards that impose a general requirement on third-party operating certification systems such as ISO Guide 65 and ISO 17000, in addition to substantive standards (e.g., ISO 14000 Series). Except for ISO, organizations such as ISEAL Alliance has emerged as the authority on good practice for sustainability standards, and it sets internationally applicable guidance on how to strengthen the effectiveness of sustainability standards system (ISEAL Alliance, 2013). It may be necessary for the international communities on biofuel to push for a showing of compliance with these standards as proof of the legitimacy of the auditors and the auditing process and thereby the overall credibility of the certification issued.

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