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Recent developments of biofuels/bioenergy sustainability certification: A global overview

Nicolae Scarlat *, Jean-François Dallemand

European Commission, Joint Research Centre, Institute for Energy, Via E. Fermi 2749, TP 450, 21027 Ispra (VA), Italy

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ABSTRACT

The objective of this paper is to provide a review on the latest developments on the main initiatives and approaches for the sustainability certification for biofuels and/or bioenergy. A large number of national and international initiatives lately experienced rapid development in the view of the biofuels and bioenergy targets announced in the European Union, United States and other countries worldwide. The main certification initiatives are analysed in detail, including certification schemes for crops used as feedstock for biofuels, the various initiatives in the European Union, United States and globally, to cover biofuels and/or biofuels production and use. Finally, the possible way forward for biofuel certification is discussed. Certification has the potential to influence positively direct environmental and social impact of bioenergy production. Key recommendations to ensure sustainability of biofuels/bioenergy through certification include the need of an international approach and further harmonisation, combined with additional measures for global monitoring and control. The effects of biofuels/bioenergy production on indirect land use change (ILUC) is still very uncertain; addressing the unwanted ILUC requires sustainable land use planning and adequate monitoring tools such as remote sensing, regardless of the end-use of the product.

1. Introduction

Supported in some cases by incentives and policy measures, biofuel production has increased continuously worldwide over the last years. In 2009, global ethanol production reached nearly 20 billion gallons,[1] in more than 40 countries (RFA, 2010). In 2009, the ethanol production reached 10.6 billion gallons in the US, 6.6 billion gallons in Brazil, 1.04 billion gallons in the EU, 0.54 billion gallons in China, 0.44 billion gallons in Thailand, 0.29 billion gallons in Canada, 0.09 billion gallons in India, 0.08 billion gallons in Colombia and 0.25 billion gallons in other countries (RFA, 2010). Global biodiesel production totalled 5.1 billion gallons worldwide in 2009, 80% of biodiesel being produced in the European Union. In the US, biodiesel production reached 650 million gallons in 2008 (Emerging Markets, 2008). The land used for biofuels was estimated in 2008 at around 20 million ha worldwide, or around 1% of the global agricultural land, of which about 8 million ha was used for sugarcane plantation in Brazil (Gallagher, 2008; Searchinger et al., 2008).

Biofuel production started in Brazil in 1975 with the National Alcohol Program, Proálcool, as a response to the oil shock of 1973 and the decline in world sugar prices, through a system of tax rebates and subsidies for ethanol production. Public support has now stopped for bioethanol production. Pure gasoline is no longer sold in Brazil as it is nationally blended with 20–25% of ethanol. Since 2003 and until June 2010, more than 11 million flex fuel vehicles were commercialised in Brazil, which corresponds to a share of 37% in total light vehicle fleet. Bioethanol represented in 2008 about 26% of total road transportation fuel in Brazil (Farinelli et al., 2009, Matsuoka et al., 2009, Leal, 2010). New biofuel mandates, like the Renewable Fuels Standard (RFS) in the United States, or the Renewable Energy Directive in the European Union and other in Latin America and Asia provide perspectives

Abbreviations: ACCS, Assured Combinable Crops Scheme; BSI, Better Sugarcane Initiative; CAP, Common Agricultural Policy; CSBP, Council on Sustainable Biomass Production; EU-RED, Renewable Energy Directive 2009/28/EC of the European Union; Fair Trade, Fairtrade Labelling Organisations International (FLO); FSC, Forest Stewardship Council; Genesis QA, Genesis Quality Assurance; Global GAP, Global Partnership for Good Agricultural Practice; GBEP, Global Bioenergy Partnership; IFOAM, International Federation of Organic Agriculture Movements; ISCC, International Sustainability and Carbon Certification; LCFS, Low Carbon Fuel Standard; LEAF, Linking Environment and Farming; NTA 8080, Sustainable Production of Biomass—The Netherlands; PEFC, Programme for the Endorsement of Forest Certification schemes; RSB, Roundtable on Sustainable Biofuels; RSPO, Roundtable on Sustainable Palm Oil; RTFO, Renewable Transport Fuels Obligation; RTRS, Roundtable for Responsible Soy Production; SAI, Social Accountability International; SAN/RA, Sustainable Agriculture Network/Rainforest Alliance; US-RFS, US Renewable Fuels Standard

* Corresponding author. Tel.: +39 0332 78 6551; fax: +39 0332 78 9992.
E-mail address: nicolae.scarlat@ec.europa.eu (N. Scarlat).

[1] 1 US gallon = 3.785 l.

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for an expanded demand for biofuels across the world. In the European Union, the Directive 2009/28/EC on the promotion of the use of energy from renewable source set mandatory targets of 10% share of renewable energy in transport for 2020 each EU Member State, and 6% reduction in greenhouse gas (GHG) emissions from road transport fuels (EC, 2009a). The estimations show that about 34.6 Mtoe of biofuel would be necessary in the EU to comply with the 10% binding target (EC, 2007). In the US, the Energy Independence and Security Act (EISA) of 2007 set overall renewable fuels targets of 36 billion gallons by 2022, with 15 billion gallons of ethanol and 21 billion gallons of advanced biofuels by 2022 (Environmental Protection Agency, 2010a). In addition to its strong bioethanol programme, the Brazil Biodiesel National Program was established to ensure blending 2% of biodiesel in 2008 and up to 5% until 2013. After 2013, B5 (5% biodiesel diesel blend) will be mandatory (Pousa et al., 2007). Australia, China, India, Indonesia, Malaysia, Philippines, South Korea, Taiwan and Thailand have set national or partial mandates to blend biofuels. Latin American countries are putting into place ethanol programs to stimulate bioethanol production. China proposed biodiesel targets for 2010 to increase biofuels production to nearly 4 million tonnes by 2010. The targets of China proposed for 2020 are to produce 12 million tonnes of biofuels, to replace 15% transportation energy needs. The India's National Biodiesel Program started in 2006 and includes a target of 20% of diesel fuel by 2012, based on a Jatropha plantation programme (Emerging Markets, 2008).

Biofuels are considered as an option to reduce greenhouse gases emissions, increase energy supply diversity and security of supply, as well as an opportunity for job creation and rural development. Reducing greenhouse gases due to biofuels production through carbon sequestration during plant growth is one of the main reasons for replacing fossil fuels by biofuels. However, various concerns were lately expressed on various presumed negative environmental impacts.

The global biofuel targets are likely to have a strong impact on land use and agricultural markets. Although biofuels production provides new options for using agricultural crops, there are environmental, social and economic concerns associated with biofuels production. The diversity of feedstock, large number of biofuel pathways and their complexity lead to a high uncertainty over the GHG performances of biofuels, in terms of GHG emission reductions compared to the fossil fuels, especially if land use change is involved. Additional uncertainties occur if indirect effects are considered, such as the indirect land use changes or the impact on food and feed, local energy supply, bio-materials, etc. The specific biofuel characteristics, linked to other markets, produced in large volumes and involved in a variety of complex trading patterns, will pose an enormous challenge for developing a certification system.

Biofuels certification is a response to the concerns related to the biofuels sustainability. There are several existing certification schemes related to sustainability in other fields, varying considerably in scope, as were developed for a wide range of products as a result of various concerns (Van Dam et al., 2010; BTG, 2008). Some systems cover one of the areas in biomass production, such as agriculture, forest and fair trade. They provide insight into the structures of certification systems (design, implementation constraints, cost–benefits, etc.) as well as operational experience and effectiveness. Some schemes include sustainability criteria that could be adapted for bioenergy and biofuels certification, and provide a useful experience for the development of a biofuels certification scheme, or for benchmarking.

This paper provides a review on the latest developments up to 2010 on the main initiatives and approaches for the sustainability certification for biofuels and/or bioenergy. The main biofuels certification initiatives in the European Union, United States and worldwide, are analysed in detail, including how different environmental, economic and social aspects are considered, as well as indirect effects issues. The possible way forward for biofuel certification is discussed, covering main limitations and drawbacks, main aspects to be addressed and implementation and control. This paper provides key recommendations to ensure sustainability of biofuels/bioenergy through certification including the need of an international approach and further harmonisation, additional measures to deal with specific requirements and global monitoring and control. Sustainable land use planning and adequate monitoring tools such as remote sensing, regardless of the end-use of the product are considered essential for preventing certain negative effects of biofuels production and use.

After the introduction in Section 1, this paper describes in Section 2 the mandatory requirements as part of an EU sustainability scheme requested by the EU Renewable Energy Directive 2009/28/EC. Sections 3–5 provide an overview of current status of ongoing certification initiatives in Europe and worldwide for biofuels sustainability. General perspectives of biofuel certification are provided in Section 6, including the different requirements and how different sustainability aspects are addressed by the various existing schemes while a possible way forward for biofuel certification is discussed in Section 7. The main conclusions of the current status for biofuel certification and key recommendations to better ensure the main sustainability concerns are given in Section 8.

2. European Union sustainability requirements

2.1. EU biofuel sustainability criteria

The Renewable Energy Directive 2009/28/EC of the European Union (EU-RED) includes a set of mandatory sustainability criteria as part of an EU sustainability scheme and also monitoring and reporting requirements for biofuels and bioliquids (EC, 2009a). Similar sustainability requirements were set in the Fuel Quality Directive 2009/30/EC (EC, 2009b) on the specification of petrol, diesel and gas–oil and introducing a mechanism to monitor and reduce GHG emissions. Biofuels are required to fulfil all sustainability criteria to count towards EU targets and to be eligible for financial support. The EU Member States are responsible for checking compliance with the sustainability criteria, but the European Commission can recognise voluntary sustainability certification schemes. The EU-RED requires a Single Harmonised Scheme in the European Union and therefore Member States may not lay down requirements that go further.

The EU-RED excludes several land categories, with recognised high biodiversity value, from being used for biofuel production: (a) primary forests and other wooded land; (b) areas designated for nature protection or for the protection of rare, threatened or endangered ecosystems or species; (c) highly biodiverse grassland, either natural or non-natural. Biofuels should not be made from material from peatland and land with high carbon stock, such as: (a) wetlands; (b) continuously forested areas; (c) land covered by trees higher than 5 m and a canopy cover between 10% and 30%.

For the biomass feedstock produced in the EU, the cross-compliance rules of the Common Agricultural Policy (CAP) apply, in accordance with the requirements for good agricultural and environmental conditions. The EU cross compliance regulations refer to preservation of soil and water quality, of biological diversity, careful use of fertilisers and pesticides and air pollution.

In the European Union, biofuels should meet a minimum requirement for GHG savings of 35% relative to fossil fuels, to