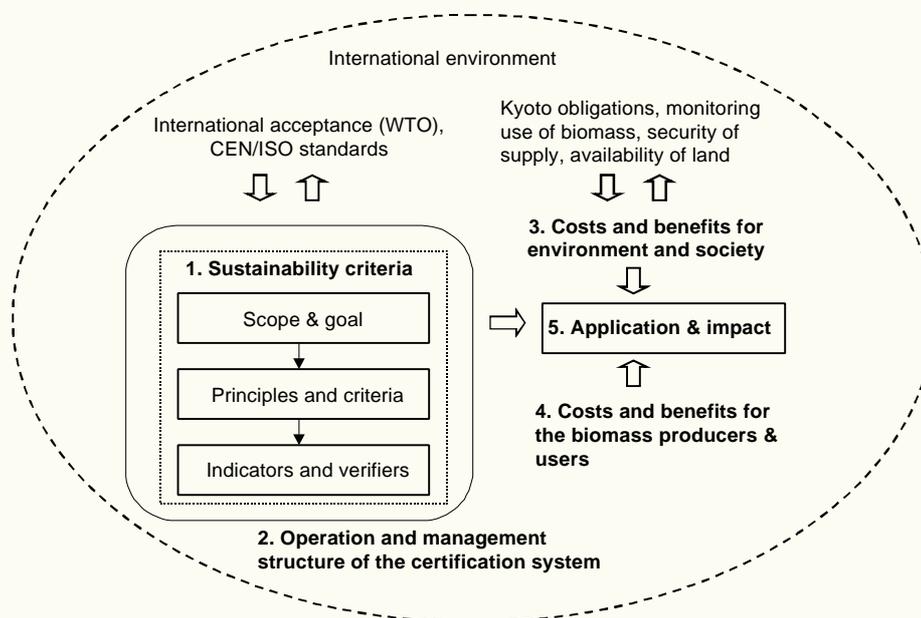


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DISCLAIMER

This report presents the opinion of the authors and BTG Biomass Technology Group BV and not necessarily the opinion and position of the European Commission on the issue of sustainability criteria and certification systems for biomass production.

Colophon

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SUMMARY

Introduction

Bioenergy has the highest contribution to the generation of renewable energy addressing all three energy vectors: the supply of electricity, heating/cooling and biofuels for transport. The global demand for biomass sources for energy purposes is expected to increase significantly. In March 2007, the European Council reaffirmed the Community's long-term commitment to the EU-wide development of renewable energies beyond 2010 and endorsed a binding target of a 20 % share of renewable energies in overall EU energy consumption by 2020; and a 10 % binding minimum target to be achieved by all Member States for the share of biofuels in overall EU transport petrol and diesel consumption by 2020.

Unsustainable biomass production would erode the climate-related environmental advantages of bio-energy. In its resolution of 25 September 2007 on the Road Map for Renewable Energy in Europe, the European Parliament stressed the importance of sustainability criteria for biofuels and requested the Commission to undertake action towards a mandatory certification system for biofuels. On 23 January 2008, the European Commission published a Proposal for a Directive on the promotion of the use of energy from renewable sources, which includes environmental sustainability criteria and verification requirements for biofuels and other bioliquids. In addition, the Commission announced it will report on requirements for a sustainability scheme for energy uses of biomass, other than biofuels and bioliquids, by 31 December 2010 at the latest.

This study's objective is to provide a basis upon which the Commission's Services could decide which actions to undertake in view of proposing minimum sustainability criteria and certification systems for the production of biomass in the EU and for imported biomass. The approach is based on analysis of existing certification systems and initiatives toward biomass certification using the model as presented in Figure 1.

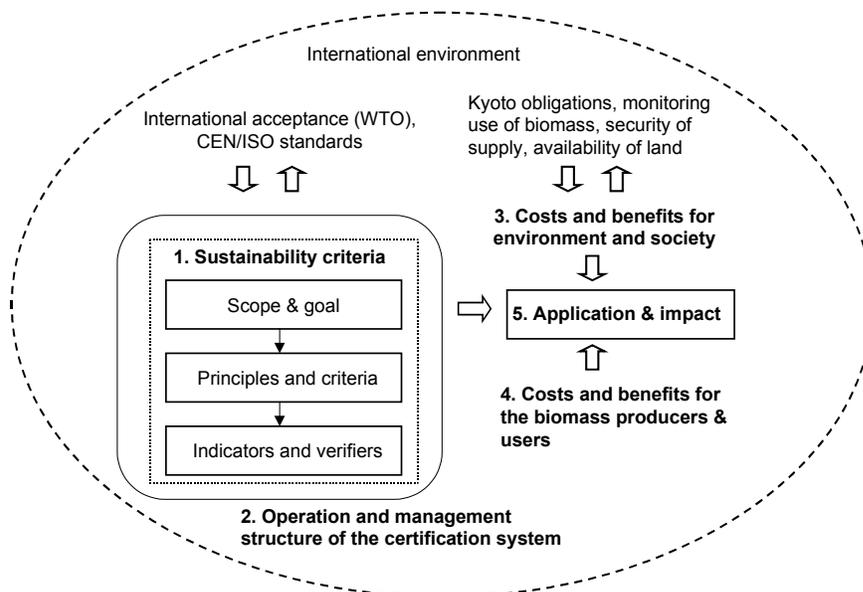


Figure 1 Context of sustainability criteria and certification systems in the international environment and its application and impact

The study is focussed on biomass wide application of sustainability criteria, not necessary limited to biomass for transport fuels.

Current initiatives toward biomass certification

The sustainability of biomass for energy and transport fuels has the warm attention in all strata of stakeholders and policy makers. The European Parliament, national initiatives, international working groups and a number of NGOs advocate certification of biomass to ensure greenhouse emission reductions and production of biomass in a social and environmentally sustainable way, expressed in various concept sets of principles, criteria and indicators.

On the European level the following activities are relevant:

- In March 2007, the European Council called for criteria and provisions to ensure sustainable production and use of bioenergy and to avoid conflicts between different uses of biomass.
- The EU biofuel consultation in Spring 2007 sought feedback from stakeholders and the general public among others on the question '*how should a biofuel sustainability system be designed?*'. A large number of NGOs, companies and institutes provided such feedback.
- Directive 1998/70/EC relating to the quality of petrol and diesel fuels, better known as the Fuel Quality Directive (FQD), is currently under revision. The European Commission proposes a yearly CO₂ emission reduction of 1% between 2011 and 2020 in the automotive fuel production, where 2011 is the base year.
- On 23 January 2008, the European Commission published a Proposal for a Directive on the promotion of the use of energy from renewable sources, which includes environmental sustainability criteria and verification requirements for biofuels and other bioliquids.

On the national level, the Netherlands, United Kingdom and Germany have been active in formulation and promotion of sustainability criteria for biofuels and/or biomass, resulting in reporting obligations, which can be seen as a first step toward implementation of biomass certification systems.

Part of the NGO community supports biomass certification as a tool to guarantee the sustainability of biomass. Other NGOs are more sceptical on the effectiveness of certification and plead to drop the EU target of 10% biofuels in 2020, before entering detailed discussions on certification systems for sustainability biomass production.

Several discussion forums for introduction of sustainability criteria have been established, like EPFL's Roundtable on Sustainable Biofuels, OECD's Roundtable on sustainable development, UN-Energy, the FAO-led International Bioenergy Platform, and relevant tasks of the IEA Bioenergy Agreement.

Analysis existing certification systems

Four different types of certification systems have been investigated:

- Forest certification systems.
- Biomass energy crops certification systems.
- Certification systems used in the power sector.

-
- Certification systems related to emission trading.

Forest certification systems

Sustainability criteria

FSC and PEFC are the main umbrella forest certification organisations. Both schemes are striving to achieve sustainable forest management using independent third party assessment of on-ground forestry practices against a set of pre-determined forestry standards and acknowledge that sustainable forestry requires conservation of the full range of forest functions: economic, social, and environmental.

In the FSC system, all forest certification standards should be in accordance with a set of International Forestry Principles and Criteria developed by FSC International. In contrast, PEFC plays no role in the development of international forestry principles, and instead relies on inter-governmental principles developed and adapted for different forest regions of the world. Field research (UPM 2005) suggests that the more environmentalist FSC based systems have generally the most strict (environmental) criteria. Although a number of PEFC and FSC systems are very comparable, PEFC has been criticised for having endorsed a number of weaker certification systems like SFI and CSA.

Operation and management structure

The structure of the umbrella forest certification systems like FSC and PEFC show how criteria development can take place, either centralised using a three chamber approach (FSC) with equal votes for economic, social and environmental stakeholders, or using a more national approach (PEFC) in which national organisations develop certification systems, to be presented later for endorsement by the international organisation. These systems can act as examples when developing an eventual EU biomass certification system.

Forest certification systems use ISO guidelines to monitor and prove independence of the standard setting process, accreditation and certification activities:

- Development of certification standards: ISO Guide 59: Code of Good Practice for Standardisation.
- The certification process by third parties: ISO Guides 62, 65 and 66.
 - ISO Guide 62: 1996 (EN 45012: 1998) General requirements for bodies operating assessment and certification/registration of quality systems.
 - ISO Guide 65: 1996 (EN 45011: 1998) General requirements for bodies operating product certification systems.
 - ISO Guide 66: 1999 General requirements for bodies operating assessment and certification/registration of environmental management systems.
- Accreditation of forest certification bodies: ISO Guide 61: General requirements for assessment and accreditation of certification/registration bodies.

Two main alternatives for chain-of-custody verification can be distinguished: 100% physical separation, and labelling systems for the use of mixtures of certified and uncertified wood.

Benefits and costs

Table 1 summarizes schematically the main benefits and costs of forest certification to society and directly involved users.

- The main benefits of forest certification for society are environmental benefits. Social benefits like increased attention to workers’ safety and better taking care of local stakeholders are deemed an issue especially in developing countries.
- The main benefits for the users are increased market access to environmentally conscious markets. If these markets are absent, or if less eco-sensitive markets are available, the willingness for certification will decrease accordingly. Secondly, in a number of cases (but not always) a price premium can be received. If a large share of the forest sector is certified, the price premium will more often be absent. The premium will also depend on the sector of end use.
- The costs of certification for society are limited, and their determination is rather theoretical.
- It is the user of the certification system -usually the harvesting contractor- who pays the cost of the certification system. Direct costs of certification are generally relatively low as long as areas of more than say 1000 ha are certified. However, if measures lead to reduced harvests, for instance because of introduction of conservation areas, this can directly lead to a considerable loss of income.

Table 1 Main benefits and costs of forest certification for society and users of the system

	Main benefits	Main costs
Society		
Environmental	<ul style="list-style-type: none"> • Mapping and protection of key areas of ecological significance • Increase in deadwood levels • Species diversity • Restoration of threatened forest types 	
Social	<ul style="list-style-type: none"> • Increased attention to worker safety • Better awareness and handling interest other stakeholders 	
Economic		<ul style="list-style-type: none"> • Loss of income from forestry sector • Potential loss of jobs
Users		
	<ul style="list-style-type: none"> • Increased access to eco sensitive markets • Price premium • Efficiency improvement by better management 	<ul style="list-style-type: none"> • Costs of measures, that lead to reduced harvest volumes • Direct costs of auditing (internal and external)

Tangible benefits in the form of increased market access, price premiums or competitive advantages are an important factor determining the success of forest certification.

Impact and application

By the end of 2006 193.7 mln. ha (65%) of forest was certified by PEFC, 84.2 mln. ha (29%) by FSC and 17 mln. ha (6%) by other systems (the American Tree Farm System, Malaysian Timber Certification Council and the Dutch Keurhout system).

Table 2 Certified forest area by scheme and region in Dec 2006 (million hectares)¹

	North America	South & Central America	Europe	Asia	Oceania	Africa	Russia	Total
FSC	27.3	9.6	29.6	1.6	1.3	2.5	12.3	84.2
PEFC	128.3	2.3	57.4		5.7			193.7
Other ^a	11.0			4.8		1.2		17.0
Total	166.6	11.9	87.0	6.4	7.0	3.7	12.3	294.9

^a Other in North America refers to American Tree Farm System, in Asia to the Malaysian Timber Certification Council, in Africa to areas in Gabon recognised under the Dutch Keurhout system

In the last ten years forest certification has taken off in North America and Europe, which form the main environmentally conscious markets. Forest certification has had limited uptake in those developing countries that mainly supply timber to less eco-sensitive markets. Depending on the local situation, various factors were identified to be responsible for this limited uptake, like non-resolution of indigenous right matters, indifference of foreign owned companies, focus on less eco-sensitive markets, illegal logging providing a cheap alternative, poverty, political stability etc.

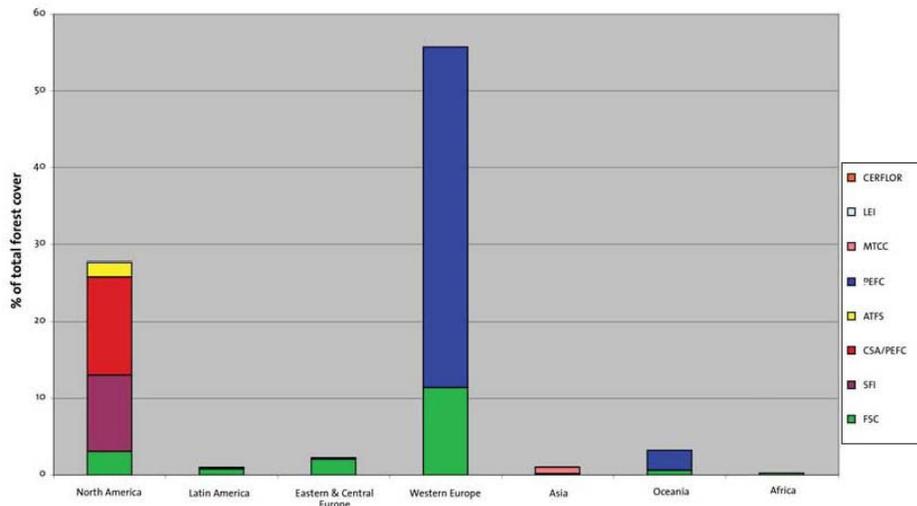


Figure 2 Area certified under each system as a percentage of the total regional forest cover in 2005. Source (Cashore, Gale et al. 2006)

Biomass energy crop certification systems

Of the certification systems related to biomass energy crops only the Roundtable for Sustainable Palm Oil (RSPO) has developed a complete set of criteria and indicators and a certification system². The first plantations could possibly become certified in 2008. The criteria and indicators used have many similarities with those in use in the forestry sector and are fine-tuned on a national level. A carbon balance is currently

¹ Source: <http://www.forestrycertification.info/>

² As per the Terms of Reference, general systems for sustainable agriculture were not included in the study.

missing, but RSPO has indicated to consider its development if there is a need for it. It has to be taken into account that RSPO has not only been developed to serve the biomass energy market, but all potential users of palm oil. The experience gained with RSPO learns that it takes considerable effort to develop sustainability criteria and a certification system for a single type of biomass.

Certification systems in the power sector

Electricity companies have developed biomass certification standards initially for their own use (Essent Green Gold label or GGL), or primarily to present carbon or energy balances that have to be established to obtain green certificates (Laborelec). The GGL is mainly a chain-of-custody system, which for its product certification allows the use of other certification systems. According to (Control Union 2007) Essent is presently the main end user of the GGL and uses the label for part of its biomass import. Although the verification takes place by a third party, the standard setting process and management of the system is less transparent than in case of forest certification systems and less information is publicly available on experiences with the system.

Electricity distribution companies have introduced brand names (labels) for green electricity to promote and distinguish their products. In addition, independent quality labels have been developed, to assist environmentally conscious consumers to verify the ecological performance of green products. In the first place these labels are used to exclude certain types of biomass that are perceived to be less green, like especially the biodegradable part of urban solid waste, demolition wood and sewage sludge. Secondly, a number of the labels have set criteria on the use of biomass and make for instance reference to parts of FSC, organic farming or contain some other definitions. Green electricity labels are generally used on a national level and mainly in European countries. The international Eugene standard strives to harmonise the national voluntary labelling systems, but so far Eugene endorsed only two systems. From the experience with these systems, it can be learned that the absence of an international set of criteria and indicators, can lead to a proliferation of national systems, all of them with their own criteria, some of them clearly developed to meet perceived consumer preferences. None of these green electricity branding systems include carbon balances.

Certification systems related to emission trading

Although the Clean Development Mechanism (CDM) is primary developed to certify emission reductions and not biomass, its structure and development is interesting, especially related to the determination of carbon balance.

- CDM allows companies to use either an existing approved methodology or to propose a new methodology to determine and monitor emission reductions. Similarly, the eventual EU based system could contain a basic CO₂-tool and an option for companies to propose new methodologies. This would require the installation of a permanent methodology panel.
- Secondly, in CDM a distinction is made between methodologies for small-scale and large-scale projects. This division could be considered when developing an EU wide systems of criteria and indicators, especially related to the CO₂ balance and possible other issues that require extensive reporting.
- In the third place, CDM requires the explicit confirmation of the host country that the project contributes to sustainable development in its territory. This is an interesting concept, as the main issues related to sustainability can differ from

country to country. The host country approval, however, cannot replace the commonly agreed sustainability criteria. Also the risk of increased bureaucracy and risk of exclusion of developing countries with weak governance need to be assessed.

- Finally, CDM can be seen as an example of a transparent system. All relevant documentation is available on Internet. Of course it has to be taken into account that CDM is a voluntary system and that in case of obligatory systems part of the commercially sensitive documentation might need to be classified as confidential.

Analysis of barriers

The anticipated benefits for environment and society of the use of sustainable certified biomass are:

- Greenhouse gas savings including effect of carbon sinks
- Avoiding unacceptable competition with food
- Protection of biodiversity (high conservation forests, wildlife habitats)
- Protection of local environment (soil & water protection, agrochemicals, GMOs)
- Promoting positive local economic effects
- Avoid unacceptable labour and indigenous people rights violations.

The following main barriers toward successful achievement of these benefits were identified:

- Certification systems are not regarded effective to monitor and manage indirect effects of biomass production, like competition with food or undesirable effects of indirect land use changes.
- Only a limited number of obligatory sustainability criteria would hold ground in case of a potential WTO conflict.
- Biomass certification could make biomass producers switch their sales to less eco-sensitive markets.

WTO

The legality of mandatory certification of biofuels under WTO rules can be decided on (1) by ruling under dispute settlement understanding (DSU), or (2) by a WTO agreement. The first option has been investigated in some detail. The General Agreement on Tariffs and Trade (GATT 1994) mandates equal treatment of 'like' products. Sustainable and non-sustainable biomass and biofuels are probably regarded as 'like', and introduction of mandatory sustainability criteria could be regarded as non-conformant. However, GATT article XX lists a number of exceptions that could give room for implementation of environmental measures. In recent analyses of the compliance of sustainability criteria under consideration in the Netherlands with WTO rules (Bossche, Schrijver et al. 2007) (Bronckers, Verberne et al. 2007) it was suggested that:

1. Requirements related to the greenhouse gas balance including carbon sinks can probably be formulated compliant with WTO rules, provided that foreign products are not treated less favourable than domestic products and that the measure does not fall under GATT 1994, article XI.
2. Some of the local environmental criteria (biodiversity, soil and surface water protection, air quality etc.) may be compliant with WTO rules.

3. Criteria to avoid competition with food products and social criteria like contribution to local prosperity and social well being of local population are most probably not compliant with WTO rules.

However, the question what is accepted or not under WTO can ultimately only be solved by dispute settlement.

Table 3 shows an overview of the anticipated effectiveness of sustainability principles and the estimated risk that application of the principle would be outlawed in an eventual WTO conflict.

Table 3 Estimated effectiveness of voluntary and obligatory certification in the implementation of sustainability principles, taking into account WTO-risks

Principle	Effectiveness voluntary certification systems ^{a)}	Effectiveness obligatory certification systems (incl. WTO risk ^{b)})
1. Greenhouse balance & carbon sinks	+	+
2. Competition with food / other indirect effects land use change	-	-
2. Biodiversity	+	+/-
3. Local environmental effects	+	+/-
4. Local economic effects	+/-	-
5. Social well being employees	+	- ^{c)}
6. Indigenous peoples rights	+/-	-

^{a)} Evaluation by BTG based on literature survey. + = effective; +/- = limited effective; - = not effective

^{b)} Derived from (Bronckers, Verberne et al. 2007). White (+) = low WTO risk; grey (+/-) = medium WTO risk; Black (-) = high WTO risk ^{c)} Only preventing human rights violations could be acceptable under WTO (Bronckers, Verberne et al. 2007).

Obligatory biomass certification can at best effectively guarantee:

- Greenhouse gas savings including carbon sinks
- Protection of biodiversity (high conservation forests, wildlife habits, etc.)
- Protection of local environment (soil & water protection, agrochemicals, etc.).

Voluntary biomass certification systems do not suffer all the WTO-limitations of obligatory certification. Therefore stricter criteria related to biodiversity and local environmental effects can be formulated. Moreover, these systems can cover issues related to social well being of employees, and the rights of indigenous people.

Other measures need to be considered to tackle possible problems of biomass production related to competition with food and other indirect effects of land use change.

- These could include compensation of owners of areas of high conservation value for protecting and not using the area for other purposes, thereby maintaining biodiversity, wildlife and also carbon stocks. Related ideas were suggested during the UNFCCC Climate Conference in Bali in December 2007.
- Secondly, in general lowering the demand for bioenergy crops on agricultural land reduces competition for land. In some cases, when the competition for land apparently leads to local environmental problems, in association with the involved countries, the EU could consider exclusion of these crops for energy production.

Costs of certification

The costs of certification can form a serious barrier to small biomass producers. A possible solution is to allow group certification, in which the costs of certification can be shared by a number of smallholders or by introduction of a light version of the certification tool for smallholders, analogue to the small-scale and large-scale methodologies in use in CDM.

Towards EU based minimum criteria and certification systems

It is recommended to proceed with the development of EU minimum biomass criteria and to create the necessary conditions such that the market will develop certification systems using the minimum criteria and eventual additional voluntary sustainability criteria.

Development sustainability criteria

The introduction of EU based minimum sustainability criteria can be realised by its incorporation in a new or revised European directive. The relevant directive text should describe the minimum criteria that need to be met. Compared to existing certification systems, additional principles need to be implemented, for instance related to carbon balance and carbon stocks; therefore development of a ‘meta standard’, that refers only to sustainability criteria in existing certification systems is not sufficient. Comprehensive sets of sustainability criteria for a broad number of biomass types need to be developed. Voluntary certification and other measures have to play an important role to cover the issues that obligatory sustainability criteria cannot address effectively.

The minimum greenhouse gas performance expected of sustainable biomass could best be expressed as the maximum allowed greenhouse gas emissions per MWh of electricity or GJ of useful heat. The biomass *supplier* will need to provide information on specific greenhouse emissions associated with biomass production and use, while the biomass *plant owner* could be hold responsible to stay below the maximum greenhouse gas emission limit that may be formulated for particular applications, i.e. heat, electricity, or combined heat and power generation.

CEN standard for minimum criteria

The introduction of minimum criteria in a European CEN³ standard could help to promote the use of standardised minimum criteria throughout the EU. Based on the minimum criteria to be published in the European directive, technical and organisational details could be further elaborated in a CEN standard. CEN standards can be used as a base for certification systems, but also for reporting obligations or for bilateral agreements between parties. It typically takes three years to develop and introduce a CEN standard. Development of a global ISO standard would take much more time and is therefore not recommended at this stage.

Outline certification systems

Starting point of obligatory EU biomass certification should be that third party certification by a EU endorsed certification system is required. Only in case it is legally possible and environmental risks are sufficiently low, certain categories of

³ CEN: European Committee for Standardization

biomass could be excluded from third party certification. However, no distinction can be made between biomass produced within or outside the EU. This outline should be described in the European directive.

The set up and operation of certification systems could be left to the market. The introduction of EU minimum criteria for sustainable biomass will probably motivate several parties to develop certification systems to verify biomass production according to the European minimum criteria and eventually additional voluntary criteria.

It is expected that a number of certification systems will become available, some quite strict, others only certifying according to the minimum criteria. Different certification systems might be developed for different types of biomass. Since the EU will impose obligatory minimum criteria on the biomass consumers, the EU could consider contributing to the development of certification systems.

Accreditation of certification systems

The accreditation of certification systems needs to be covered in the EU directive. It is suggested that reference be made to ISO guides covering accreditation, such that quality requirements related to the independence and transparency of the certification systems are met. In addition, an independent EU body could check whether the biomass certification systems meet the EU minimum criteria.

Accreditation of certification bodies

When certification systems are being developed, certification bodies will be interested in getting accredited if they see sufficient market potential for carrying out certification activities. In case of obligatory certification this market will definitely develop. The costs for accreditation have to be recovered from certification activities.

Biomass certification

In an introductory phase, when the volume of certified biomass on the market is limited, it is very well possible that biomass production and chain-of-custody certification costs need to be (partly) covered by the biomass users, or that price premiums will need to be paid for certified biomass. It is the biomass user who has to prove that the biomass used is sustainable and as such the biomass user is the primary 'problem owner'. Considering the developments in the forestry sector, in a more developed market the certification costs will probably shift in the direction of the biomass producer. Certification could become a prerequisite for biomass producers to obtain or secure position in the EU market. In the end the costs of certification will be recovered from final energy users with the society paying premiums (subsidies) for the use of sustainable biomass.

Biomass certification in broader perspective

EU energy security

Biomass production improves the EU energy security situation. Part of the biomass will be produced within the EU making the EU member states less energy dependent. Another part will be produced outside the EU, which -compared to the situation in which only fossil fuels are used- at least diversifies the number of countries that provide energy carriers into the EU. Biomass certification is a way to implement

biomass production systems in an acceptable and responsible way, which lowers opposition and thereby promotes the sound implementation and growth of bioenergy in the EU energy sector.

Kyoto obligations

Biomass sustainability criteria and certification systems promote low carbon emissions in the biomass production phase, resulting in lower carbon emissions in the biomass producing country. If biomass production takes place in a country with an emission reduction target under the Kyoto Protocol, biomass certification contributes to the achievement of this target.

Monitoring biomass production and use

Biomass production and use could be monitored using data from the involved certification organisations. If legal constraints would obstruct this type of data collection, data on biomass production and use could be included in the yearly company surveys of the national statistical organisations. Alternatively, and maybe more cost effective, research institutes or consultancy companies could carry out surveys on biomass production and use.

Conclusion

The analysis of barriers learns that the implementation of obligatory sustainability criteria and certification systems is possible, although practical issues limit the impact of biomass certification. The EU sustainability criteria should be regarded and presented as *minimum* criteria to ensure that rational carbon savings are achieved and that major environmental impacts are avoided. The EU wide obligatory sustainability criteria can be seen as a good starting point toward sustainable use of biomass, with potential to influence the agricultural sector as well. It creates a substantial demand for sustainably produced biomass in all the EU member countries and thereby sets the international standard. It is recommended to proceed with the development of EU minimum biomass criteria and to create the necessary conditions such that the market will develop certification systems using the minimum criteria and eventual additional voluntary sustainability criteria.

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ABBREVIATIONS

AAU	Assigned Amount Unit
ACCS	Assured Combinable Crops Scheme
AF&PA	American Forest & Paper Association
AFS	Australian Forestry Standard
AoA	Agreement of Agriculture (WTO agreement)
ATO	African Timber Organisation
BSI	Better Sugarcane Initiative
CAR	Corrective Action Request
CDM	Clean Development Mechanism
CEN	European Committee for Standardization
CEO	Corporate Europe Observatory (NGO)
CEPI	International Council of Forest and Paper Associations
CERFLOR	Certificação Florestal (Brazilian forest certification system)
Certifor	Sistema Chileno de Certificación de Manejo Forestal Sustentable (Chilean forest certification system)
CoC	Chain-of-custody
CPPA	Canadian Pulp and Paper Association
CSA	Canadian Standards Association (Canadian forest certification system)
CSA SFM	Canada's Sustainable Forest Management scheme
DNA	Designated National Authority
DNV	Det Norske Veritas (certification body)
DSU	Dispute Settlement Understanding (under WTO)
EA	European co-operation for Accreditation
EC	European Commission
EP	European Parliament
EPFL	Ecole Polytechnique Fédérale de Lausanne
EU	European Union
EurepGAP	Private sector body that sets voluntary standards for the certification of agricultural products around the globe, now GlobalGAP
FAO	Food and Agriculture Organization of the United Nations
FERN	Forests and the European Union Resource Network
FFCS	Finnish Forest Certification System
FMU	Forest Management Unit
FSC	Forest Stewardship Council
FQD	Fuel Quality Directive
GATT	General Agreement on Tariffs and Trade
GGL	Green Gold Label (biomass certification system)
GHG	Greenhouse gas
GMO	Genetically Modified Organism
IAF	International Accreditation Forum
IBEP	International Bioenergy Platform (FAO-led)
ICFPA	International Council of Forest and Paper Associations
IEA	International Energy Agency
IEE	Intelligent Energy for Europe
IFOAM	International Federation of Organic Agricultural Movements

INMETRO	Instituto Nacional de Metrologia, Normalização e Qualidade Industrial
ISO	International Standards Organization
ITTO	International Tropical Timber Organisation
JI	Joint Implementation
LCA	Lifecycle Analysis
LEAF	Linking Environment And Farming
LEI	Lembaga Ekolabel Indonesia
MFN	Most Favoured Nation
MTCC	Malaysian Timber Certification Council
NGOs	Non Governmental Organisation
NT	National Treatment
OECD	Organisation for Economic Co-operation and Development
PAFC	Pan African Forest Certification scheme
PEFC	Programme for the Endorsement of Forest Certification schemes
RFTO	Renewable Transport Fuel Obligation
RSB	Roundtable on Sustainable Biofuels
RSPO	Round Table on Sustainable Palm Oil
RTSD	Round Table on Sustainable Development (OECD)
RTRS	Round Table on Responsible Soy
SCM	Subsidies and Countervailing Measures (as in SCM Agreement)
SFB	Sustainable Forestry Board
SFI	Sustainable Forestry Initiative
TBT	Technical Barriers to Trade (as in TBT Agreement)
UKWAS	UK Woodland Assurance Standard
UN	United Nations
UNCTAD	United Nations Conference on Trade and Development
UNEP	United Nations Environment Programme
WTO	World Trade Organisation
WWF	World Wildlife Fund

1 INTRODUCTION

1.1 BACKGROUND

Bioenergy has the highest contribution to the generation of renewable energy addressing all three energy vectors: the supply of electricity, heating/cooling and biofuels for transport. The global demand for biomass sources for energy purposes is expected to increase significantly. If biomass is produced without respecting certain minimum criteria this increased production, irrespectively for which purpose and/or market, could lead to unsustainable biomass production and use, eroding the climate-related environmental advantages of bio-energy.

The European Commission has potentially a pivotal role in the process toward implementation of minimum sustainability criteria and the development of certification systems. The EC can provide an international European Framework relating to sustainability criteria for European produced and imported biomass, which can:

- Promote harmonization between European sustainability systems, which avoids double work, or appearance of multiple certification systems, which could work counterproductive.
- Provide an equal level playing field, i.e. avoid that some member countries implement sustainability systems while others don't.
- Generate the necessary critical mass. Many organisations are currently formulating their viewpoints on the issue of biomass sustainability, and there seems a broad understanding that a uniform European approach would be the most effective.

In the resolution of 25 September 2007 on the Road Map for Renewable Energy in Europe, the European Parliament stressed the importance of sustainability criteria for biofuels and requested the Commission to undertake action towards a mandatory certification system for biofuels.

On 23 January 2008, the European Commission published its proposal for a Directive on the promotion of the use of energy from renewable sources (version 15.4). Among others, the Renewables directive contains environmental sustainability criteria for biofuels and other bioliquids (art. 15), a greenhouse gas calculation method (art. 17) and it states how verification of compliance with the sustainability criteria should take place (art. 16). It also indicates that:

‘The Commission shall report on requirements for a sustainability scheme for energy uses of biomass, other than biofuels and other bioliquids, by 31 December 2010 at the latest. The report shall be accompanied, where appropriate, by proposals for a sustainability scheme for other energy uses of biomass, to the European Parliament and the Council’ (art 15, sub 7).

This report on ‘Sustainability Criteria and Certification systems for Biomass Production’ explores the possibilities for an EU based certification system for energy uses of biomass in general taking into account experiences with existing certification systems and actions

taken by various NGOs, companies and national authorities, thereby recognizing the position of the EU which gives the opportunity of an coordinated approach, as well as limitations due to trade treaties.

The possibilities for both voluntary and obligatory EU based approaches are investigated, needed to ensure that minimum criteria are applied in all cases. Technical possibilities, costs, barriers, existing trade agreements, etc. relevant to the possible implementation of an EU based certification scheme are considered. Much can be learned from detailed analysis of existing systems. Also opportunities for synergy can be identified, for instance with Kyoto obligations, accounting of biomass, ensuring security of supply, and more.

1.2 GOAL

The purpose of this study is to carry out an in-depth analysis of existing biomass production sustainability criteria and certification systems that have been developed and/or proposed by various organisations at European and international level so that the Commission's Services could come to a clear understanding of the issues involved (such as implications on land use and environmental impacts) as well as eventual solutions.

The study's objective is to provide a basis upon which the Commission's Services could decide which actions to undertake in view of proposing minimum sustainability criteria and certification systems for the production of biomass in the EU and for imported biomass.

1.3 SCOPE

The study focuses on analyses related to the possible application of an eventual EU based minimum sustainability criteria and certification system taking into account that:

- EU proposals for minimum sustainability criteria should not conflict with the EU's international commitments, especially the GATT under the WTO. Therefore the study will exclude traditional agricultural activities on crops for food/fodder production.
- The analysis of minimum sustainability criteria will therefore be related to biomass production based on energy crops (such as short rotation coppice, Miscanthus and Sweet Sorghum) and forestry operations for use in the EU.
 - Certification systems should be applied relatively easy and at acceptable costs by the industry.

Application of an EU proposal for minimum sustainability criteria (through certification systems) could have a much higher impact than the existing mainly voluntary systems. This study will analyse existing voluntary systems and will investigate the opportunities and limitations of an eventual EU based system.

1.4 METHODOLOGICAL ISSUES

The sustainability criteria and certification systems are embedded in an international environment that consists of numerous environmental, legal and economic issues. See Figure 3. These issues determine whether the introduction of minimum sustainability criteria and biomass certification systems is feasible, at which costs for society, and what benefits can be expected. On basis of a detailed investigation of these issues, the European Commission can determine whether a EU based sustainability criteria and certification system is desirable.

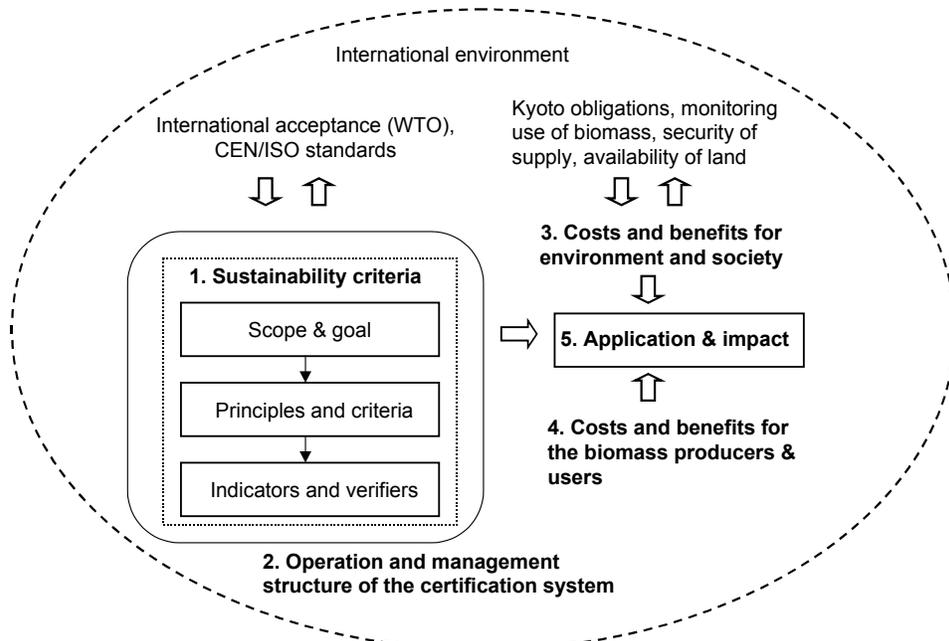


Figure 3 Context of sustainability criteria and certification systems in the international environment.

Please refer to Annex B for a more detailed introduction into the methodological framework.

1.5 READING GUIDE

The relationship between sustainability criteria, certification systems and various aspects (like costs and benefits for the user and society, the economic and legal environment) are laid out in a theoretical framework. This framework was used as a tool for the data collection and analysis phases as described in subsequent chapters and can be found in Annex B.

In Chapter 2 recent activities and policies of the EU, active EU member states, NGOs, universities, institutes and international organisations related to certification of biomass are summarized.

In Chapter 3 existing certification systems are presented. First forest and energy crops certification systems are systematically reviewed in detail. Following the theoretical

framework, attention is paid to the set of criteria, the organisational framework, benefits for the user and for society and the impact of the certification systems. Finally, certification systems that are in use in the electric power sector and those that relate to carbon emission trading are briefly reviewed.

Chapter 4 provides an analysis of barriers, economics, costs and limitations of the existing certification system, with extra attention given to the question whether obligatory biomass sustainability criteria and certification will be WTO conformant (Section 4.2) and to the costs of biomass certification (Section 4.3). This analysis is an important basis for recommendations towards possible pathways to biomass certification.

Sustainability is a container concept, embracing issues like greenhouse gas emissions, biodiversity and social aspects. It also cannot be separated from issues like competition for land for food, materials and energy; it relates to the broader greenhouse emission reduction targets formulated within the EU and as part of the Kyoto obligations as well as to energy security within the EU. In Chapter 5 it is investigated how obligatory biomass certification could be used to support these related issues.

In Chapter 6 conclusions and recommendations are presented. The recommendations form the outline for a pathway to EU wide biomass certification.

In this chapter the main activities and viewpoints of European bodies, EU Member States, NGOs, intentional organisations etc. on the development of biomass sustainability criteria are presented. Section 2.1 summarizes recent EU policy initiatives, such as the Road Map for Renewable Energy, the results of a public consultation, and the opinions of the European Parliament. In Section 2.2 the activities of the European Countries most active in biomass certification, i.e. the Netherlands, United Kingdom and Germany, are presented. Section 2.3 presents the activities and opinions of a small sample of NGOs, namely WWF, CEO, and Wetlands International. Section 2.4 covers the same of international organisations collaborating in such forums and initiatives as the Roundtable on Sustainable Biofuels, the OECD Round Table on Sustainable Development, UN Energy, the FAO-led International Bioenergy Platform and relevant tasks of the IEA Bioenergy Agreement.

2.1 EU POLICIES AND ACTIONS

Road Map for Renewable Energy in Europe

In the ten years, the role of bioenergy in the EU energy supply has grown considerably and further growth is anticipated in the short and long term. Among others, the EU has set targets for renewable electricity⁴ and biofuels for transportation⁵ in 2010.

Building on policies already in place, on 10 January 2007 the European Commission presented proposals for a new Energy Policy for Europe, presented as a Renewable Energy Roadmap (EC 2007). The proposals were confirmed during the Spring European Council of March 2007 (European Council 2007):

'The European Council reaffirms the Community's long-term commitment to the EU-wide development of renewable energies beyond 2010, underlines that all types of renewable energies, when used in a cost-efficient way, contribute simultaneously to security of supply, competitiveness and sustainability, and is convinced of the paramount importance of giving a clear signal to industry, investors, innovators and researchers. For these reasons, taking into consideration different individual circumstances, starting points and potentials, it endorses the following targets:

- *a binding target of a 20 % share of renewable energies in overall EU energy consumption by 2020;*
- *a 10 % binding minimum target to be achieved by all Member States for the share of biofuels in overall EU transport petrol and diesel consumption by 2020, to be introduced in a cost-efficient way. The binding character of this target is appropriate subject to production being sustainable, second-generation biofuels becoming*

⁴ See Directive 2001/77/EC on the promotion of electricity produced from renewable energy sources in the internal electricity market.

⁵ Directive 1999/31/EC on the landfill of waste, limiting landfill of biodegradable waste.

commercially available and the Fuel Quality Directive being amended accordingly to allow for adequate levels of blending.

From the overall renewables target, differentiated national overall targets should be derived with Member States' full involvement with due regard to a fair and adequate allocation taking account of different national starting points and potentials, including the existing level of renewable energies and energy mix [...], and, subject to meeting the minimum biofuels target in each Member State, leaving it to Member States to decide on national targets for each specific sector of renewable energies (electricity, heating and cooling, biofuels).

In order to meet these targets, in the Spring European Council the European Council:

- *Calls for an overall coherent framework for renewable energies, which could be established on the basis of a Commission proposal in 2007 for a new comprehensive directive on the use of all renewable energy resources. This proposal should be in line with other Community legislation and could contain provisions as regards:*
 - *Member States' overall national targets;*
 - *National Action Plans containing sectoral targets and measures to meet them; and*
 - ***criteria and provisions to ensure sustainable production and use of bioenergy and to avoid conflicts between different uses of biomass.***
- *Calls for a thorough and rapid implementation of the measures highlighted in the June 2006 Council conclusions 1 on the Commission Biomass Action Plan, notably as regards demonstration projects for second-generation biofuels;*

According to the Renewable Energy Roadmap, 'to achieve, for example, a 20% renewable energy share, at most 230 million tonnes of oil equivalent (Mtoe) of bioenergy would be needed, split between domestic production and imports. On the conservative assumption that 15% of the biomass used is imported, the contribution that would have to come from the EU would be a maximum of 195 Mtoe'.

Public consultation

In early 2007 the European Commission organised a public consultation⁶ with the aim, among others, to obtain the view of stakeholders and the general public how to ensure sustainable biomass production in the broader sense. One of the questions asked in this EU biofuel consultation was: '*How should a biofuel sustainability system be designed?*'. In the consultation paper three possible environmental sustainability criteria were presented:

- Achieving a minimum level of greenhouse gas savings
- Avoiding major reduction in carbon stocks through land use change
- Avoiding major biodiversity loss from land use change.

⁶ Biofuel issues in the new legislation on the promotion of renewable energy, Public consultation exercise, April – May 2007, Energy and Transport Directorate-General, European Commission.

Possible types of evidence to proof that environmental sustainability criteria are respected were suggested:

1. Some EU Member States and other countries are developing national schemes to measure greenhouse gas impacts. Once accredited for EU use through a comitology process, these would be evidence of greenhouse gas emissions in production (for sustainability criterion #1). The same approach could apply to international schemes that may be developed.
2. There are voluntary, international schemes setting standards for the production of agricultural and forest products. Some include requirements that would prevent land use change of the types described by criteria 2 and/or 3. Once accredited for EU use through a comitology process, these would be evidence that these criteria have been respected.
3. The European Community could negotiate bilateral or multilateral agreements with third countries, confirming that these countries have in place procedures to ensure that the types of land use change described by criteria 2 and/or 3 do not happen. The existence of such an agreement would be evidence that these criteria have been respected.
4. In the absence of these types of evidence, it would be for Member States to determine how to verify the fulfilment of the criteria. The directive could lay down minimum requirements for how this should be done.

Stakeholders and the general public were requested to comment on the sustainability criteria and to present their views on the possible way forward, by answering the following questions:

- Question 1.1: Do you think the “possible way forward” described above is feasible?
- Question 1.2: What do you think the administrative burden of an approach like the “possible way forward” would be? (If possible, please quantify your answer.)
- Question 1.3: Please give your general comments on the “possible way forward”, and on how it could be implemented. Does it give an adequate level of assurance that biofuels will be sustainably produced? If you think the problem should be tackled in a different way, please say how, giving details of the procedures that would be used.
- Question 1.4: Carbon stock differences between land uses would be taken into account under criterion 2. Should they also be taken into account under criterion 1? If so, what method should be used to determine how the land in question would have been used if it had not been used to produce raw material for biofuels?
- Question 1.5: As described in the “possible way forward”, criterion 3 focuses on land uses associated with exceptional biodiversity. Should the criterion be extended to apply to land that is adjacent to land uses associated with exceptional biodiversity? If so, why? How could this land be defined?
- Question 1.6: How could the term “exceptional biodiversity” (in criterion 3) be defined in a way that is scientifically based, transparent and non-discriminatory?
- Question 2: How should overall effects on land use be monitored?

The public consultation exercise attracted a lot of response from around the world and from practically all relevant sectors. Please refer to http://ec.europa.eu/energy/res/consultation/biofuels_en.htm for the results.

European Parliament, Fuel Quality Directive

Directive 1998/70/EC relating to the quality of petrol and diesel fuels, better known as Fuel Quality Directive (FQD), is currently under review. The review aims to set new standards for transportation fuels in order to reduce air pollution (sulphur and poly-aromatic hydrocarbons). In addition, the European Commission proposes the introduction of a CO₂ emission reduction target of 1% per year between 2011 and 2020 where 2011 is the base year. As part of the review process, the European Parliament commissioned a study on the inclusion of sustainability criteria in the Fuel Quality Directive, which was published in June 2007.

In (Stans, Ooms et al. 2007) three issues were raised:

1. Greenhouse gas emission reduction in the Fuel Quality Directive
2. Inclusion of more specific sustainability criteria
3. Traceability.

Issue #2 is the most relevant for the present study and is introduced as follows: *'The question whether to include sustainability criteria should be more specific. The Commission proposal already includes a very important sustainability criterion, which is the CO₂ content of fuel. The missing criteria concern biodiversity and nature conservation. One could also argue that social criteria to prevent competition between food and fuel should be included. Would it be possible to include criteria on nature protection for fuels in the proposal? Is it possible to add social criteria?'*

(Stans, Ooms et al. 2007) concludes the following:

'Biodiversity and nature conservation are very important topics, especially when biofuels are introduced in the product range of automotive fuels. However, it is very difficult to define whether a certain area is bio diverse or otherwise valuable nature. While some areas have been identified as being of particular high natural value, such as the UNESCO World heritage sites, there are as yet no globally accepted maps that indicate which areas could or could not be converted to plantations'. However, the main report suggests that it would be valuable to have a list of 'no-go' areas agreed upon by the most relevant environmental organisations. These should also include areas that may not be very valuable in itself but play an important role in connecting other valuable nature areas.

Furthermore (Stans, Ooms et al. 2007) comments on the cited risk that biomass production for bioenergy competes with world food production and might endanger local food security where. The reports observes that:

- The real competition is not between types of crops but for productive land and scarce resources needed to grow these edible crops.
- (Temporary) feedstock price increases can also offer benefits for exporting countries and rural populations selling the relevant feedstock.

-
- Despite an increased demand for food over the last decennia, real food prices have declined.

The risk for competition between fuel and food is decreased when higher fuel yields per hectare are realised on acreages that are less suitable for traditional agriculture.

Furthermore, (Stans, Ooms et al. 2007) argue that inclusion of sustainability criteria (besides greenhouse gas emissions) within the Fuel Quality Directive is problematic within the WTO framework, for the following reasons:

WTO agreements were made to eliminate protectionism in which products from the own country are favoured over imported products from third countries. Because of WTO agreements, it is in general not possible to distinct between “like products” that have a physical or chemical composition and have the same function or application.

It is, in general, not possible to distinct between products on basis of their non-product related characteristics such as the source of origin or the manner in which they were produced.

There are, however, exceptions to this general rule, mentioned in a finite list in the GATT. This concerns amongst others the possibility to distinct on basis of the global environmental effect of the product or the way it was produced. This means that it should in principle be possible to exclude some products from the European market because of their contribution to the greenhouse gas effect.

Local environmental and social effects are clearly not mentioned in this finite list and therefore they can not be used as a basis for exclusion. These effects are limited by the territorial boundaries and because of the sovereignty of third countries we cannot interfere.

Even where WTO offers the opportunity to exclude products on basis of their contribution to the greenhouse gas effect, it is advisable to discuss with the affected countries or industries to find solutions other than complete exclusion. Acceptance within WTO will be difficult when de facto products from EU Member States are treated differently from products from outside the EU. Acceptance within WTO is more likely when the exclusion is limited to incentive schemes and less likely when the exclusion concerns the complete market. For example it will be more likely accepted when excluded products are only excluded from a subsidy scheme, or do not count towards an obligation, but can nevertheless be sold on the rest of the market. Inclusion of sustainability criteria within the Fuel Quality Directive would mean that some products would be excluded completely from the EU market. Therefore this measure is less likely to be accepted within the WTO framework.

In Section 4.2 the WTO issues related to the introduction of sustainability criteria are investigated in more detail.

EU Parliament, mandatory certification biofuels

In its resolution of 25 September 2007 on the Road Map for Renewable Energy in Europe, the European Parliament stressed the importance of sustainability criteria for biofuels and requested the Commission to undertake action towards a mandatory certification system for biofuels⁷:

[The European Parliament] Calls on the Commission to develop a mandatory, comprehensive certification scheme, applicable to biofuels both produced within and imported into the EU; believes that the certification criteria should be designed to ensure that the production of biofuels provides significant greenhouse gas savings over the whole life cycle when compared to the conventional fuels they replace and do not cause, directly or indirectly, a loss in biodiversity and water resources, any reduction in carbon stocks through land use change or social problems such as rising food prices and the displacement of people;

Moreover, the European Parliament

- *Calls on the Commission to seek cooperation with the WTO and similar international organisations in order to secure international acceptance of specific sustainability criteria and the certification system, and thus promote the most sustainable means of production of biofuels worldwide and create a level playing field for all.*

And

- *Points out that forest biomass used for energy or for raw materials must be managed according to internationally recognised, high standards of sustainability; emphasises that contributions and commitments from the forest-based sector should be recognised and supported by policies which are conducive to better economic, environmental and social performance.*

European Commission, sustainability criteria for biofuels and other bioliquids

On 23 January 2008, the European Commission published its Proposal for a Directive on the promotion of the use of energy from renewable sources. The Renewables directive includes environmental sustainability criteria and verification requirements for biofuels and other bioliquids⁸. In short the environmental sustainability criteria are formulated:

1. Greenhouse gas emission savings from the use of biofuels and other bioliquids shall be at least 35%.
2. Biofuels and other bioliquids shall not be made from raw materials from land with recognised high biodiversity value:
 - a. Forest undisturbed by human activity,

⁷ European Parliament resolution of 25 September 2007 on the Road Map for Renewable Energy in Europe, Tuesday, 25 September 2007.

⁸ Note that the final draft of the current report was completed before the Commission's draft Renewables Directive was issued. Therefore the draft Directive is not discussed in great detail. Moreover, the current report is more focussed on the sustainability of biomass in general.

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- b. Areas designated for nature protection purposes (unless evidence is provided that the production of that raw material did not interfere with those purposes)
 - c. Highly diverse grassland
 3. Biofuels shall not be made from raw material obtained from land with high carbon stock, i.e. wetlands and continuously forested areas.
 4. Agricultural raw materials cultivated in the EU used for production of biofuels and other bioliquids, need to meet with the standards and provisions listed in point A of Annex III, to Council Regulation No. 1782/2003 under the heading “environment“ and in accordance with the minimum requirements for good agricultural and environmental conditions defined pursuant to Article 5(1) of that regulation.

Installations already in operation in January 2008 need to conform to the greenhouse gas savings requirement by 1 April 2013. January 2008 is the reference date for the status of the areas mentioned under point 2 and 3.

In addition, the Commission announced it would report on requirements for a sustainability scheme for energy uses of biomass, other than biofuels and bioliquids by 31 December 2010 at the latest. The current report is a contribution to the discussion on these requirements.

2.2 POLICIES AND ACTIONS OF MEMBER STATES

A number of EU Member States, including The Netherlands, United Kingdom and Germany, are in the process of formulating principles, criteria and indicators on biomass sustainability, and plan the integration of sustainability criteria into specific policy measures.

The Netherlands

In 2007, the Dutch commission ‘Sustainable Production of Biomass’ led by Prof. Cramer⁹ (Cramer Commission for short), formulated sustainability criteria concerning six themes:

1. Greenhouse gas emissions: How much emission reduction does the use of biomass yield for a specific producer, calculated from its source up to its use, and compared with the average use of fossil fuel?
2. Competition with food and other local applications: Does large-scale production of biomass for energy supply supplant other use of the land, for example for the cultivation of food or wood as building material, and what are its consequences?
3. Biodiversity: Does the local natural ecological system of land and water lose any variation in forms of life because of the large-scale cultivation of energy crops?
4. Environment: Are there any effects of the use of pesticides and fertilizers, or are there other local effects on soil, water and air because of the large-scale production of biomass?
5. Prosperity: Does the production of biomass contribute towards the local economy?
6. Social well being: Does the production improve the social living conditions of the local population and employees?

⁹ Now Minister of Housing, Spatial Planning and Environment

The Cramer Commission formulated a set of nine principles with criteria & indicators and presented these in the report 'Testing framework for sustainable biomass' (Cramer 2007). The criteria & indicators could be implemented in a certification system to be used on company level. Issues that cannot be easily overseen on company level, such as competition with food supply, should be monitored by macro economic analyses.

(Cramer 2007) considers three different types of chain of custodies:

- Track and trace system
- Mass balance system
- Negotiable certificates (book-and-claim)

Each of the three systems has its specific advantages and disadvantages. In case of bulk quantities the report shows a slight preference for negotiable certificates, as the introduction can take place rapidly, primary producers will probably directly profit from their participation, and end users will always have the possibility of additionally introducing a mass balance or track-and-trace system. A good fraud proof system has to be established.

No certification system is available yet. As an intermediary step, the Dutch Government plans introducing a reporting obligation and a greenhouse gas balance calculation tool.

United Kingdom

The Renewable Transport Fuel Obligation (RTFO) will require British suppliers of fossil fuels to ensure that a proportion of the road fuels they supply comprise green fuels like biofuels. Certificates can be claimed when renewable fuels are supplied and fuel duty is paid on them. At the end of the obligation period, these certificates may be redeemed to the RTFO Administrator to demonstrate compliance. Certificates can be traded. The scheme will start operating in April 2008. The obligation is a mechanism for the long term. The Government's intention is that the RTFO should continue until at least 2020.

The British government wishes to promote biofuels that have the highest carbon savings and lowest environmental impacts. Therefore, the British Government intends setting stretching indicative targets for the level of carbon and sustainability performance expected from all transport fuel suppliers claiming certificates for biofuels in the early years of the RTFO.

Starting from April 2008, all biofuel suppliers need to report on the level of carbon savings and the degree of sustainability. Carbon savings can be calculated using a standardised calculation tool, as presented in (Bauen, Watson et al. 2007); sustainability reporting could take place taking into account seven principles (Dehue, Hamelinck et al. 2007):

1. Carbon conservation
2. Biodiversity conservation
3. Soil conservation
4. Sustainable water use
5. Air quality

-
6. Biomass production does [not] adversely effect workers rights and working relationships
 7. Biomass production does not adversely affect existing land rights and community relations.

The British Government has adopted the following implementation scheme:

- From April 2008 there will be a requirement to report on the carbon savings and sustainability of biofuels. Suppliers that do not submit a report will not be eligible for RTFO certificates. The Administrator will publish reports comparing the performance of different suppliers and the biofuels they have supplied, to encourage better performance.
- From April 2010 the Government aims to reward biofuels under the RTFO according to the amount of carbon they save. This will be subject to compatibility with EU and WTO requirements and future consultation on the environmental and economic impacts;
- From April 2011 the Government aims to reward biofuels under the RTFO only if they meet appropriate sustainability standards. This will be subject to the same provisos as above and provided the international standards allowing this are in place.

(Dehue, Hamelinck et al. 2007) promote the development of a meta-standard, adopting existing or nearly completed sustainability standards like RSPO (for palm oil), LEAF, EurepGAP and ACCS.

The British approach shows parallels with the Dutch approach. Similarities exist both regarding the content and the development path. Both systems are fairly comprehensive and when first introduced will start with a reporting obligation to avoid possible conflicts with trade agreements. The British and Dutch collaborate closely and aim for a harmonized approach. An important difference between the two national systems is that RTFO is restricted to biofuels used for transportation whereas the Dutch sustainability criteria will also apply to biomass used for electricity and heat production.

Germany

An amendment to the Biofuels Quota Law to include sustainability criteria is proposed and under discussion within the German government. In the meanwhile the Federal Agriculture and Environment Ministries commissioned studies to investigate certification options.

BMELV/FNR (Ministry of Agriculture) commissioned the development of a practical certification system for biofuels, transport fuels and solid biomass. The work focuses not only on criteria development, but especially on the practical implementation of such certification system and distinguishes high-priority 'major musts', and lower-priority 'minor musts'. Field pilot tests in e.g. Indonesia and Malaysia are under way (Schmitz 2007). No reports have been published yet. The input of FNR and MEO on the EU biofuel consultation shows a preference for a meta-standard approach and a book-and-claim certification system. The outcome of the study will be a proposal for a certification system that could serve to guarantee the sustainability of biofuels as intended in the new

biofuels directive, however, it will not have the national status like the sets of criteria and indicators developed in the UK or the Netherlands.

The study commissioned by the Environment Ministry is carried out by IFEU (Institute for Energy and Environmental Research), assisted by the FSC Working Group Germany and German Watch (Gilbertson, Holland et al. 2007). The project aims to create an overview of the existing certification systems for biomass and agro-fuels, to make recommendations at an international level for a certification system and to establish guidelines for international projects. No published results were found at the time of writing.

2.3 NON GOVERNMENTAL ORGANIZATIONS

Many NGOs contribute actively to the discussion on the sustainable production of biomass for energy purposes. The EU biofuel consultation attracted 63 responses from NGOs. For the purpose of illustration the views of a small sample of NGOs active on the issue are presented below, including WWF, CEO and Wetlands International. The World Wildlife Fund has traditionally been involved in FSC forest certification, and has developed criteria they consider relevant to be included in a biomass certification system. Corporate Europe Observatory is a NGO that is highly critical toward certification as an instrument to guarantee sustainability. Wetlands International has performed relevant research to carbon emissions of drained peat lands.

The author is well aware that this selection of NGOs is limited. For more information on the opinions of NGOs, please refer to European Commission website on the biofuel consultation¹⁰.

World Wildlife Fund (WWF)

WWF has traditionally been an active proponent of forest certification through FSC and is also active in the field of sustainability of biomass. In 2006 WWF Germany published a report on ‘Sustainability standards for bioenergy’ (Fritsche, Hünecke et al. 2006). It presents key environmental and social concerns of bioenergy production and core sustainability standards:

- Clarification of land ownership
- Avoiding negative impacts from bioenergy-driven changes in land use
- Priority for food supply and food security
- No additional negative biodiversity impacts
- Minimization of greenhouse gas emissions
- Minimization of soil erosion and degradations
- Minimization of water use and avoidance of water contamination
- Improvement of labour conditions and workers rights
- Ensuring a share of proceeds – income distribution and poverty reduction.
- Avoiding human health impacts.

¹⁰ http://ec.europa.eu/energy/res/consultation/biofuels_en.htm#stakeholders

In 2007 WWF International commissioned the report ‘Towards a harmonised sustainable biomass certification scheme’ (Dehue, Meyer et al. 2007), promoting the development of a meta standard using existing standards on bioenergy.

Corporate Europe Observatory

Corporate Europe Observatory (CEO) is a European-based research and campaign group targeting the threats to democracy, equity, social justice and the environment posed by the economic and political power of corporations and their lobby groups. The issue of biofuels for transport has caught their interest, and a recent report ‘Paving the way for agrofuels’ (Gilbertson, Holland et al. 2007) describes the current state of EU and national policies regarding sustainability reporting and certification of biofuels.

The report criticises the present sustainability initiatives of UK and Netherlands for requiring only a reporting obligation for the coming years without imposing measures to penalize unsustainable biofuels, except giving NGOs and consumers opportunity to shame and blame unsustainable producers. Moreover, the UK, Netherlands and Germany consider the WTO rules an obstacle to the introduction of strong mandatory certification of biomass. CEO criticises these countries (ab)using WTO rules as an excuse for weak regulations, instead of exploring the possibilities or using their influence within WTO.

In general CEO questions the effectiveness of certification systems, as (among others)

- Greenhouse gas calculations come with high error margins.
- Use of ‘marginal’ lands to avoid competition with food is disputable, as such land can still contain diverse ecosystems, and forms the basis of a variety of social activities. Moreover, production of biofuels cannot be steered by EU-countries.
- Most existing and future certification systems lack sufficient local stakeholder involvement. Local stakeholders were not involved in developing the Dutch Cramer Criteria; Some NGOs did not want to participate in RSPO;
- The ‘meta approach’ builds upon existing standards, which in many cases do not yet exist (for instance in case of sugar cane) and effectiveness of existing systems can be discussed. As an example the World Rainforest Movement has found that, on many occasions FSC was certifying the same plantations that local people and local NGOs were fighting against because of their negative social and environmental impacts.

Wetlands International

Wetlands International and Delft Hydraulics have calculated the emissions from peatland areas in Indonesia on the basis of soil and land-use data, including comparison of comprehensive field data on peat depth and carbon contents. The report (Hooijer, Silvius et al. 2006) shows that over the last years there has been an average annual emission from peat lands of an alarming 2000 Million tonnes CO₂ including 600 Mt from decomposition and 1400 Mt from fires. This is more than the CO₂ emissions from India or Russia and almost three times the German emissions on an annual basis. One important crop planted on drained peat lands is palm oil, which is increasingly used as a biofuel in Europe. Wetlands International asked the European Parliament to support the amendment by the Greens/European Free Alliance in the European Parliament, which calls the Commission to drop the planned 10% mandatory biofuel target.

EPFL Roundtable on sustainable biofuels

The Roundtable on Sustainable Biofuels (RSB) is a key multi-stakeholder initiative to develop standards for the sustainability of biofuels. The Roundtable is an initiative of the Swiss EPFL (École Polytechnique Fédérale de Lausanne) Energy Centre. By mid 2008, it aims to have draft standards developed in conjunction with non-governmental organizations, companies, governments and inter-governmental groups from all over the world. At the time of writing ten principles have been developed:

1. Legality
2. Climate change and greenhouse gas
3. Conservation
4. Soil
5. Water
6. Air
7. Biotechnology
8. Human and labour rights
9. Socio-economic development
10. Food security.

The principles are not yet elaborated into a set of criteria and indicators. The roundtable enables interested parties to comment on draft 'Principles for Sustainable Biofuels', through the website www.bioenergywiki.net. The activities are organised in four working groups:

- Working Group on Greenhouse Gases
- Working Group on Environment
- Working Group on Social Impacts
- Working Group on Implementation

NGOs (like WWF, FSC, and the National Wildlife Federation), universities (like EPFL, TERI, and Keio University), businesses (like Shell, Toyota, and Petrobras) and UN system agencies (like UNCTAD, UNEP) are represented in the RSB steering board.

OECD – Round table on sustainable development

The 20th meeting of the OECD Round Table on Sustainable Development on 11-12 September 2007 considered the sustainable potential of biofuels and government policies to support them. The report 'Biofuels: is the cure worse than the disease' (Doornbosch and Steenblik 2007) was provided as an input to this meeting. The response of the OECD members on the report and the issue of sustainable biofuels is not documented on the OECD's website¹¹. (Doornbosch and Steenblik 2007) concludes that certification of biofuels is useful for promoting good practices but cannot be trusted as safeguard.

- Enforcement and chain-of-custody control could prove to be an enormous challenge.
- The effectiveness of certification could be undermined by displacement of biofuels products

¹¹ http://www.oecd.org/pages/0,3417,en_39315735_39313111_1_1_1_1_1,00.html

-
- Without a uniform certification scheme exporters will face increasing costs and bureaucratic complexity
 - Discrimination of biofuels on sustainability issues could lead to disputes at WTO.

UN Energy

UN Energy is a collaborative framework of all UN bodies contributing to energy solutions, and was established after the 2002 World Summit on Sustainable Development. In May 2007 it published the report ‘Sustainable Bioenergy: a Framework for decision makers’ (UN-Energy 2007), which brings nine sustainability issues under the attention of policy makers.

1. Ability of modern bioenergy to provide energy services for the poor
2. Implications for agro-industrial development and job creation
3. Health and gender implications of modern bioenergy
4. Implications for the structure of agriculture
5. Implications for food security
6. Implications for government budget
7. Implications for trade, foreign exchange balances and energy security
8. Impacts on biodiversity and natural resource management
9. Implications for climate change

The document presents the UN Energy’s vision on the topic of sustainability of biomass and suggests as further actions that internationally agreed standards and other certification models should be established for production, conversion, use and trade of bioenergy systems to protect both society and the environment.

FAO – International Bioenergy Platform

The International Bioenergy Platform (IBEP) is a FAO organized initiative that will cover several bioenergy issues (FAO 2006). Among others it aims to assist in the development of sustainability strategies and assurance schemes aimed at ensuring the sustainable development of bioenergy.

IEA Bioenergy

Under the IEA Bioenergy Agreement, three tasks carry out activities that are related to biomass certification issues:

- Task 29 investigates different regional and national achievements in recognition and evaluation of social and economic benefits of biomass utilisation and drivers in implementing bioenergy projects.
- Task 38 integrates analyses and disseminates information on greenhouse gas balances for a wide range of biomass and bioenergy systems and terrestrial carbon sequestration.
- Task 40 contributes to the development of sustainable biomass markets and trade on the short and on the long term and on different scale levels (from regional to global).

On 25-26 October 2007, IEA Bioenergy Agreement Tasks 29, 38 and 40 jointly organised an expert consultation on sustainability of biomass and biofuels in Dubrovnik, Croatia. Some 30-40 experts, mainly members of the three Tasks, participated in the consultation

that aimed at making an inventory of the state of knowledge and at answering the following questions.

- In what terms can sustainability be defined? What tools are there to ensure sustainable biomass: certification, etc.?
- Greenhouse gas sustainability (carbon stock changes, efficient land use, transport emissions with biomass trade, emissions from fertilizers, all LCA aspects)?
- Environmental sustainability (biodiversity, water, nutrients, leaching, desertification)?
- Socio-economic sustainability (local jobs, out competing local uses of biomass in case of exports, child labour, etc.)?

The outcome of the expert consultation will be summarized in 1-3 position papers prepared by the working groups. Prior to this expert consultation, relevant results of IEA Bioenergy Task 40 are the organisation of several workshops and the publication in late 2006 of the 'Overview of recent developments in sustainable biomass certification' (van Dam, Junginger et al. 2006).

2.5 CONCLUSION

High expectations...

The sustainability of biomass for energy and transport fuels is an issue that has the warm attention in all strata of stakeholders and policy makers. The European Parliament, initiatives of EU Member States, international working groups and a number of NGOs advocate certification of biomass to ensure greenhouse emission reductions and production of biomass in a social and environmentally sustainable way, which is expressed in various concept sets of principles, criteria and indicators (P, C & I).

... but implementation seems to be difficult...

In moving forward toward implementation of these sustainability criteria, the national governments of the Netherlands and the UK decided to initially limit certification system requirements to a reporting obligation only, with a view to avoid compatibility conflicts with WTO rules. In this introductory stage no penalties will be imposed on unsustainable production.

... and some critical questions have been raised

Besides concerns relating to WTO issues it can be questioned, whether biomass certification is suitable as an instrument to guarantee sustainable biofuel production:

- The market for certified biofuels is only a small part of the total market for these crops.
- Moreover, as soon as crops for energy markets are grown, increased land use could lead to competition with food crops and higher food prices and increased pressure on areas with high conservation value effecting biodiversity.

These issues are difficult to control by introduction of a biomass certification system.

When developing a sustainable biomass certification system, an analysis of the experienced gained with existing certification systems can be helpful, in particular when considering the difficulties of initial implementation. Much can be learned from the impacts of especially the forest certification systems.

In this chapter, existing certification systems are presented and analysed. First forest and energy crops certification systems are systematically reviewed in detail. Following the theoretical framework (See Annex B), attention is paid to the set of criteria, the organisational framework, benefits for the user and for society and the impact of the certification systems. Finally, certification systems that are in use in the electric power sector and those that relate to carbon emission trading are reviewed briefly.

3.1 FOREST CERTIFICATION SYSTEMS

3.1.1 Introduction

In the last quarter century a growing body of scientific research has revealed that the world's forests are under stress. Data collected on biodiversity, species decline and deforestation reveal widespread deterioration of forest ecosystem structure and function. In the face of this body of knowledge, and consensus that many problems are intensifying, domestic and international governmental responses have been strongly criticized as woefully inadequate, and far too slow, to address the myriad problems facing global forest management. As a result of this frustration, some of the world's leading environmental groups and their allies decided to sidestep governments and created, in 1993, the Forest Stewardship Council (FSC) (Cashore, Gale et al. 2006).

There exist a rather large range of certification standards, but most systems fall among Programme for the Endorsement of Forest Certification (PEFC) or Forest Stewardship Council (FSC). See Annex C for an overview of standards endorsed by PEFC and FSC. Table 4 shows that by the end of 2006 193.7 ha (65%) of forest is certified by PEFC, 84.2 mln ha (29%) by FSC and 17 mln ha (6%) by other systems (the American Tree Farm System, Malaysian Timber Certification Council and the Dutch Keurhout system).

Table 4 Certified forest area by scheme and region in December 2006 (million hectares)¹²

	North America	South & Central America	Europe	Asia	Oceania	Africa	Russia	Total
FSC	27.3	9.6	29.6	1.6	1.3	2.5	12.3	84.2
PEFC	128.3	2.3	57.4		5.7			193.7
Other ^a	11.0			4.8		1.2		17.0
Total	166.6	11.9	87.0	6.4	7.0	3.7	12.3	294.9

^a Other in North America refers to American Tree Farm System, in Asia refers to the Malaysian Timber Certification Council, in Africa refers to areas in Gabon recognised under the Dutch Keurhout system

An intense competition has been waged for almost a decade now between FSC and often more industry-initiated certification programs. The main systems are introduced below.

¹² Source: <http://www.forestrycertification.info/>

PEFC and FSC – international forest certification frameworks

The main umbrella systems are FSC and PEFC, which both cover a large number of national systems. The two systems have many similarities (Forest Industries Intelligence 2006):

- Both schemes are striving to achieve the same ultimate objective of sustainable forest management. The first objective of the PEFC Council is “*To promote Sustainable Forest Management through the implementation of PEFC*”. The first objective stated in the FSC Mission statement is to promote “*environmentally appropriate, socially beneficial, and economically viable management of the world’s forests*”.
- Both schemes are seeking to achieve this core objective using independent third party assessment of on-ground forestry practices against a set of pre-determined forestry standards.
- Both schemes acknowledge that sustainable forestry requires conservation of the full range of forest functions: economic, social, and environmental.
- Both schemes seek to achieve an appropriate balance between environmental, economic and social objectives through a participatory, consensus-building approach. Both schemes seek, at minimum, to ensure conformance with exactly the same set of international standards, evolved by the International Standards Organization (ISO), for standards-setting and independent third party verification.

With regard to scheme objectives and overall structure, the main *difference* is that PEFC identifies as a central function “*to assess the conformity of participating certification schemes*”, whereas FSC identifies as a central function “*to evaluate and accredit certification bodies*”. In other words, PEFC operates by endorsing fully autonomous national forest certification schemes capable of independent existence outside the PEFC framework. In the PEFC, accreditation of certification bodies is entirely the responsibility of national accreditation organisations. FSC’s approach is more centralised, involving development of an international system to accredit certification bodies (Cashore, Gale et al. 2006).

FSC also adopts a more centralised approach to the development of forest certification principles. In the FSC system, all forest certification standards should be in accordance with a set of International Forestry Principles and Criteria developed by FSC International. In contrast, PEFC plays no role in the development of international forestry principles, and instead relies on inter-governmental principles developed and adapted for different forest regions of the world (e.g. Pan European Principles for European forests, Montreal Principles for other temperate and boreal forests, ATO/ITTO principles for tropical forests.)

FSC

Forest Stewardship Council (FSC) is an international non-governmental organisation founded in 1993. Its task is to support environmentally appropriate, socially beneficial, and economically viable management of the world’s forests. Forest certification according to FSC is based on ten general principles for forest management covering environmental, economic and social issues elaborated in a set of more detailed criteria. The ten general principles are:

-
- 1: Compliance with laws and FSC Principles
 - 2: Tenure and use rights and responsibilities
 - 3: Indigenous peoples' rights
 - 4: Community relations and worker's rights
 - 5: Benefits from the forest
 - 6: Environmental impact
 - 7: Management plan
 - 8: Monitoring and assessment
 - 9: Maintenance of high conservation value forests
 - 10: Plantations

The actual certification standards are drawn up in accordance with the FSC principles in a national co-operation process. See also www.fsc.org.

PEFC

PEFC is the Programme for the Endorsement of Forest Certification. PEFC's origins lie in Europe, where efforts to establish FSC national standards in Finland, Sweden, Norway and elsewhere encountered strong resistance from small, farm-forestry operators concerned to protect private property rights and minimize costs. PEFC International was formally established in 1999 as an umbrella organization to evaluate and endorse national standards from around the world. Today, there are PEFC-endorsed standards in some 20 countries, including Australia, Canada, Denmark, Finland, Germany, Norway and Sweden. Developing country schemes endorsed by PEFC include Chile's CertFor and Brazil's CERFLOR schemes.

SFI

In North America, SFI (Sustainable Forestry Initiative) emerged as an important forest certification standard for industrial forests developed by AF&PA (American Forest & Paper Association) in 1994. SFI was initially carefully controlled by AF&PA, enduring heavy criticism for its lack of consultation with external stakeholders absence of third party field certification. In an effort to garner broader support, SFI increasingly distanced itself from AF&PA, establishing itself as a separate organization in 2000 as the Sustainable Forestry Board (SFB), and reduced its own share from 40 to 33 percent, with the remaining two-thirds split between representatives of conservation groups and the broader forestry community. For further information see www.aboutsfi.com.

CSA

A second FSC competitor scheme in North America is the Canadian Standards Association (CSA) scheme, initiated in 1993 with funding from the Canadian Pulp and Paper Association (CPPA). CSA is an independent, non-governmental organization accredited to the Standards Council of Canada. Like SFI, CSA was initiated by industry. It did, however, include environmental and indigenous representatives on the responsible technical sub-committee. CSA later added a more substantive, performance-based requirement by referencing the Canadian Council of Forest Ministers' sustainable forest management guidelines. These guidelines were developed through the Montreal Process, a lengthy series of negotiations between forestry representatives of twelve countries over the meaning of sustainable forest management in the Americas and beyond.

Other regional forest certification systems

As a reaction to the foreign environmentalist competitor FSC, programs have emerged over the past decade in other regions of the world. In Latin America, Brazil's Instituto Nacional de Metrologia, Normalização e Qualidade Industrial (INMETRO), developed the CERFLOR scheme while Chile's CertFor Scheme was endorsed by the PEFC in 2004. In the Asia-Pacific region, the two largest forest product exporters, Malaysia and Indonesia, have developed schemes known as the Malaysian Timber Certification Council (MTCC) and Lembaga Ekolabel Indonesia (LEI) respectively. In Africa, the African Timber Organisation (ATO) developed the Pan African Forest Certification scheme (PAFC) in the mid-1990s. PAFC Gabon was established in October 2004, and has joined the PEFC in anticipation of future endorsement. Meanwhile in Eastern Europe, schemes are being developed in Belarus, Estonia, Latvia, Lithuania, Poland and Russia for PEFC endorsement.

Further reading

- The International Council of Forest and Paper Associations (CEPI) provides a comprehensive overview of forestry certification systems to be found on the website www.forestrycertification.info.
- (Fritsche, Hünecke et al. 2006) provides an overview of the sustainability criteria of several (forest) certification systems
- The Forests and the European Union Resource Network (FERN) has summarized the characteristics of eight forest certification systems (FERN 2004).

3.1.2 Sustainability principles, criteria, and indicators

Forest principles can be divided into general, social, environmental and economic principles, as follows:

General

- Compliance with national laws
- Existence and contents management plan

Social

- Tenure and use rights and responsibilities
- Community relations and worker's rights
- Indigenous peoples' rights

Environmental

- Environmental impact assessment
- Biodiversity protection
- Maintenance of high conservation value forests
- Wildlife habits
- Soil protection
- Water production
- Agrochemical use
- Use of genetically modified organisms (GMOs)

Economic

- Efficient use of the forest's multiple products and services
- Benefits for local economy
- No harvests above sustainable levels

All FSC endorsed schemes have to comply with the FSC 'Principles and Criteria', which are presented in Annex E.

PEFC endorsed schemes are based on various sets of criteria and indicators as developed by international organisations. Examples are:

- Pan-European: Ministerial Conference on the Protection of Forests in Europe adopted the Pan-European sustainable forest management criteria and indicators and operational guidelines.
- Montreal: Montreal Process "Statement on Criteria and Indicators for the Conservation and Sustainable Management of Temperate and Boreal Forests" or "Santiago Declaration" (1995).
- International Tropical Timber Organisation (ITTO): Guidelines for Sustainable Management of Natural Tropical Forests and Guidelines for the Sustainable Management of Planted Tropical Production Forests (1993). ITTO Criteria and Indicators of Sustainable Management of Natural Tropical Forests (1998).
- Amazon Tarapoto: The Tarapoto Proposal (1995) under the auspices of the Amazon Co-operation Treaty, criteria and indicators for the sustainable management of Amazonian forests.
- African Timber Organisation: criteria and indicators for sustainable forest management in African natural tropical forests.
- FAO Near East: National level criteria and indicators adopted by the FAO/UNEP Expert meeting on criteria and indicators for sustainable forest management in the Near East (Cairo, Egypt, 15-17 October 1996).
- Lepaterique: The Central American Process of Lepaterique, criteria and indicators adopted by the "Expert Meeting on Criteria & Indicators (C&I) for Sustainable Forest Management in Central America" on January 20-24, 1997.
- FAO Dry Africa: The criteria and indicators agreed by an UNEP/FAO Expert Meeting on Criteria and Indicators for Sustainable Forest Management in Dry Zone Africa in Nairobi, Kenya, November 21-24, 1995.

Comparisons of forest certification systems presented by NGOs generally are in favour of FSC. See for example (FERN 2004) which compares eight leading systems, or the report of (Fritsche, Hünecke et al. 2006) commissioned by WWF Germany. Overviews by forest owners or related industries tend to be more in favour of PEFC. See for example www.forestrycertification.info, which compares five leading systems (FSC, PEFC, SFI, CSA and MTCC) with emphasis on the organisational structure of the systems. For a detailed overview and comparison of environmental principles of the FSC and PEFC systems prepared by (Fritsche, Hünecke et al. 2006) refer to Annex D. For more pronounced statements visit <http://www.pefcwatch.org/> and <http://www.fsc-watch.org> and <http://credibleforestcertification.org/>.

Key differences between the FSC and PEFC systems include:

- PEFC has been criticised for having endorsed weak systems especially the Sustainable Forestry Initiative (SFI), a certification system that initially didn't even require third party certification. Furthermore, some PEFC endorsed standards (SFI and CSA) allow an individual forestry company to customise the standard against which it will be certified. This means that the standard of these schemes varies on a case-by-case basis, rather than being applied in a consistent and replicable manner.
- PEFC is criticised for having an unequal balance in membership between industry and other stakeholders.
- (FERN 2004) points out that PEFC endorsed systems are often based on *system standards* instead of *performance standards*. A difference should be made between *system standards* that specify the management systems that must be in place within an organisation to ensure it is managing quality and environmental and social performance consistently. System standards can be very powerful tools for helping organisations understand and improve their performance. However, they do not specify any minimum level of performance that must be achieved. *Performance standards* specify the level of performance or results that must be achieved in a forest. For example, a performance standard might require 10% of a forest management unit to be set aside for conservation. (FERN 2004) concludes that a forest certification scheme that is not based on minimum performance standards is unsuitable for a labelled product. Such schemes include MTCC, CERFLOR, SFI, CSA, AFS, Certfor, and most European PEFC schemes. By contrast, the FSC national standards are all performance-based.
- FSC has been criticised for being unnecessarily expensive, by demanding obligatory set aside areas, which effectiveness from an environmental point of view can be questioned (Savcor 2005).
- The top down approach of FSC has been criticised for not taking national and local circumstances sufficiently into account (www.cdfc.org/forest_certification.htm)
- FSC has been criticized for following ISO Guidelines to a lesser degree than PEFC (Forest Industries Intelligence 2006).

UPM, a large forest management company active in especially Finland, USA and Canada has performed parallel field-testing of forest certification standards in cooperation with independent verifier DNV and with WWF as external observer and technical advisor. Targets of the test were among others to provide insights into the practical differences between the standards on selected areas in different countries and to test the functionality of the used criteria and provide feedback to the schemes (UPM 2005). Figure 4 illustrates the variation in performance of selected sites according to different certification systems. For instance, in Canada the more NGO dominated FSC Maritimes shows a larger number of minor and major non-conformities compared to the industry dominated SFI that showed full compliance.

	Canada		Finland			UK
	FSC Maritimes	SFI	FFCS	FSC Draft Finland	FSC Sweden	UKWAS
Environmental	2,3	3,0	3,0	2,0	2,7	2,8
Social	2,8	3,0	3,0	3,1	3,4	3,1
Economic	2,6	3,0	3,5	2,9	3,2	3,5
Total	2,5	3,0	3,2	2,7	3,0	3,1

■ Exceed compliance
■ Comply
■ Minor non-conformity
■ Major non-conformity

Figure 4 Variation of UPM's performance and overall indicative performance by topic in selected areas in Canada, Finland and UK. Source: (UPM 2005)

In Finland the variation in performance of UPM's sustainable forest management according to different systems is less sharp defined. The major non-conformities were related to 'retention/decaying trees' found by FSC, minor non-conformities were in 'Protection of habitats of special importance' according to FSC criteria and in 'retention/decaying trees' in the Finnish Forest Certification System (endorsed under PEFC). Figure 4 also shows that variations exist between national FSC systems, in this case between FSC Sweden and draft FSC Finland criteria.

Figure 5 shows how assessors judged the clarity of the different criteria. The main reasons for difficulties in evaluation were in the structure and scope of criteria, problems in how to measure the issues and performance and how to define the performance threshold (UPM 2005). The main difficulties in mainly the FSC systems were in defining habitat, biodiversity and unique areas, and in management planning. According to (UPM 2005) the UKWAS set, accepted by both FSC and PEFC, has clear sets of criteria and indicators. The actual impact, i.e. the changes that were implemented because of the forest certification system, was not investigated.

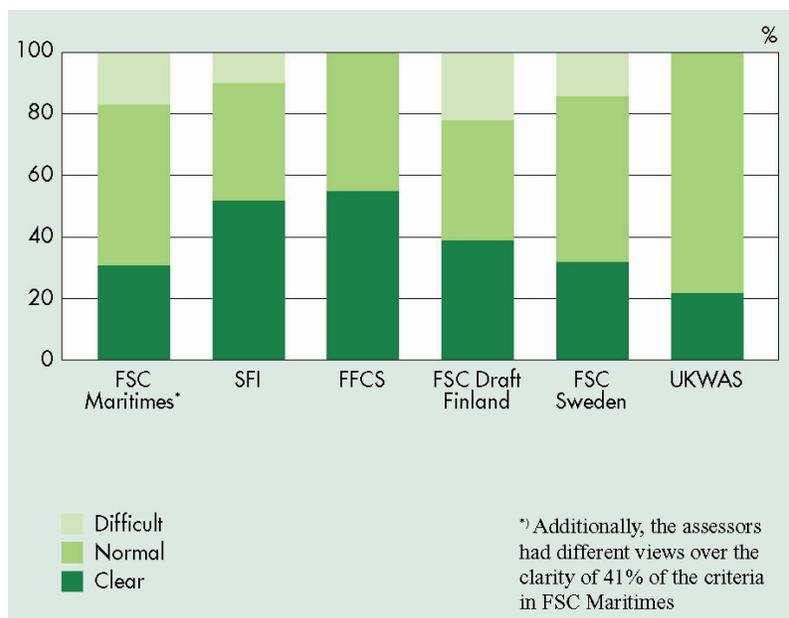


Figure 5 Summary of criteria clarity in interpreting and understanding criteria according to assessors (UPM 2005)

3.1.3 Operation and management structure

A forest certification scheme can be defined as ‘a system of standards, rules and procedures for assessing conformity with specified forestry requirements’ (CEPI 2004). A forest certification scheme comprises at least four elements:

1. *Forest certification standards*: documents, established by consensus and approved by a recognised body, which set out the forestry requirements, which must be met.
2. *Forest certification*: the procedure by which an independent third party gives written assurance of conformance to the forest certification standards.
3. *Accreditation of forest certification bodies*: a procedure by which an authoritative body gives formal recognition that an independent third party is competent to carry out forest certification.
4. *A mechanism to control environmental claims* relating to forest management (like the use of logos) - including procedures to enforce a set of rules for organizations making these claims.

The content of the certification standards, i.e. the principles, criteria and indicators of the system were already described in the previous section. Below, the standard setting process, certification process, accreditation process and labelling system are assessed.

Standards-setting process

ISO has developed a number of guidelines for standards-setting, most notably Guide 59: Code of Good Practice for Standardisation. This provides a widely accepted basis for minimum requirements expected of a standards-setting body. Amongst other things, ISO Guide 59 establishes requirements for standards-setting procedures, transparency, approval of standards, participation, and complaints during standards setting. It

establishes that standards should be agreed using ISO's definition of consensus (CEPI 2004).

In the FSC standard setting process, the guiding principle is that interests be divided into three chambers: economic, social and environmental, each with equal voting rights. Forest certification standards may be developed either:

- a) by FSC national initiatives following the 3 chamber structure; or
- b) in the case of "interim" standards, by FSC accredited certification bodies.

Requirements for development of national standards are more comprehensive than those for "interim" standards. FSC has finalised 22 national or regional certification standards in 11 countries whereas it has issued certificates in 79 countries (Forest Industries Intelligence 2006). Around two thirds of the FSC certificates have been issued against 'generic standards', developed internally by accredited certification bodies for a specific client or country/region in line with the international FSC principles and criteria. This procedure is criticised for falling short in conformance with ISO 59 guidelines (Forest Industries Intelligence 2006). FSC has agreed to progressively phase out use of interim standards.

In the case of PEFC, the main work to develop standards is carried out by national standards-setting bodies that form an essential component of independent forest certification schemes that are endorsed by the PEFC Council. The PEFC is based on governmental sustainable forestry criteria. Forest sector representatives must initiate the process, but all relevant interests must be invited to participate. PEFC requires the use of international sustainable forestry principles developed and agreed through intergovernmental processes conform ISO 59.

Certification process

Both FSC and PEFC require third party certification by an organisation (certification body) that conforms to one or other of ISO Guides 62, 65 and 66:

- ISO Guide 62: 1996 (EN 45012: 1998) General requirements for bodies operating assessment and certification/registration of quality systems.
- ISO Guide 65: 1996 (EN 45011: 1998) General requirements for bodies operating product certification systems.
- ISO Guide 66: 1999 General requirements for bodies operating assessment and certification/registration of environmental management systems.

These documents set out the way in which a certification body should be set up and run.

PEFC Certification bodies must fully conform to one or other of ISO Guides 62, 65 and/or 66. FSC certification bodies must operate in accordance with procedures set out in the FSC Accreditation Manual, which draws heavily on and closely parallels ISO guidelines for certification, adapted for use in the forest sector.

Auditors must conform to general criteria for Quality Management Systems auditors or Environmental Management Systems auditors as defined in ISO 19011, and to additional qualification requirements for auditors carrying out forest management, defined by national (PEFC) forest certification schemes or the FSC system. The period between

certification and the recertification audit must not exceed 5 years and the surveillance audits must be annual.

Accreditation of certification bodies

Accreditation of forest certification bodies is the procedure by which an authoritative body gives formal recognition that an independent third party is competent to carry out forest certification. The quality of certification bodies is critical to the technical success and credibility of a scheme. In order to guarantee the quality of accreditation process, accreditation bodies could seek to conform with ISO Guide 61: 1996 (EN 45010: 1998) *General requirements for assessment and accreditation of certification/registration bodies*. Membership of the International Accreditation Forum (IAF) is a good indicator of credible accreditation and certification procedures. To become a member of IAF, accreditation bodies must demonstrate conformance with ISO Guide 61.

FSC accredits third party certifying bodies. The accreditation program is based on ISO Guide 61 and conforms to the majority of the Guide's requirements. Efforts are on-going to ensure full conformance, for example through establishment of a semi-autonomous independent Accreditation Business Unit within FSC (CEPI 2005).

PEFC requires that certification bodies are accredited by a national accreditation body which is part of the European co-operation for Accreditation (EA) and/or the International Accreditation Forum (IAF) umbrella and which is fully conformant with ISO Guide 61.

Environmental claims – chain-of-custody (CoC)

Both PEFC and FSC handle logo usage according to the same fundamental principles. That is, both schemes enable on-product application of an internationally registered trademark by organisations that conform to chain-of-custody standards and strict requirements for logo usage. In both schemes, a key principle is that chain-of-custody standards and logo usage guidelines be developed in an open and transparent manner. In both schemes, assessment of chain-of-custody must be undertaken by an accredited independent third party operating in accordance with relevant ISO guidelines (Guides 61 for accreditation bodies and Guides 62,65 for certification bodies).



Figure 6 PEFC and FSC pure logo.

Both FSC and PEFC offer two alternatives for chain-of-custody verification: 100% physical separation, and a labelling system for the use of mixtures of certified and uncertified wood.

PEFC offers two alternatives for chain-of-custody verification: physical separation; and inventory control/wood flow accounting. Under the latter, PEFC allows two different procedures: the %input/%output system; and the minimum average percentage system. In PEFC's minimum average percentage system, the minimum percentage is 70% by volume or by dry weight for all wood based products. Regarding the non-certified part of the mixture, PEFC requires that no wood from illegal logging or strictly protected areas enters the certified product chain. Chain-of-custody certified companies must require from all suppliers of wood raw material or purchased products at least a signed *self-declaration* that no wood is derived from these sources.

In case of FSC certification, companies may opt either for a full physical segregation system (FSC pure) or for certification of mixtures of FSC wood with other wood. The present threshold system requires that the FSC content is greater than 70%, after which 100% of the products can be labelled as FSC mixed. However, by 2008 this system is to be replaced by a FSC Credit system. It requires that the FSC content of the product is more than 10%. If X percent of the mixed input material is FSC, than X percent of the final product can be labelled as FSC mixed (FSC 2004)¹³. The other non-certified wood needs to be 'controlled wood' as to avoid the supply of any wood/fibre from controversial sources. These include illegal wood, wood from genetically modified trees, uncertified wood from forests where high conservation values are threatened and wood from areas of social conflict. Companies wishing to supply FSC controlled wood must implement a management system and acquire evidence to demonstrate that the wood does not derive from above mentioned controversial sources.

Table 5 provides a comparison of eight forest certification systems, showing conformity with the relevant ISO Guides, based on (CEPI 2004), in which the PEFC has the best score. Also added are results of an analysis of (FERN 2004), which shows a better score of FSC on having minimum performance thresholds and balanced participation.

¹³ Standard for Chain-of-custody Certification (FSC-STD-40-004), Second version draft 3, has been under stakeholder consultation up till October 5, 2007. Presently version 1 is still valid.

Table 5 Comparison of forest certification systems. Source (CEPI 2004) and (FERN 2004)

	AFS	CER- FLOR	Cert- for	CSA	FSC	MTTC	PEFC	SFI
Standard setting process conforms with ISO Guide 59 ^{a)}	++	+	++	++	+	++	++	++
Certification bodies conform with ISO Guide 62, 65 or 66 ^{a)}	++	++	++	++	+	+	++	+
Accreditation bodies conform with ISO Guide 61 ^{a)}	++	++	++	++	+	x	++	+
CoC – certification bodies conform ISO Guide 62, 65 ^{a)}	++	?	+	++	+	+	++	+
CoC – Accreditation bodies conform ISO Guide 61 ^{a)}	++	?	++	x	+	x	++	+
Is the scheme based on a set of clear minimum performance based thresholds? ^{b)}	No	No	No	No	Yes	No	No	No
Does the scheme require balanced participation in standard-setting process? ^{b)}	No	No	No	Yes	Yes	No	No	No
Is the standard setting dominated by forestry sector? ^{b)}	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes
Does the certification scheme certify at Forest Management Unit or regional level? ^{b)}	FMU	FMU	FMU	FMU	FMU	FMU	Mostly regional	FMU
Are field visits required? ^{b)}	Yes	Yes	Yes	Yes	Yes	Yes	Not always	Un-clear
Is consultation of stakeholders in certification process required? ^{b)}	Un-clear	No	Yes	Yes	Yes	Yes	No	No
Is annual monitoring of certified areas required? ^{b)}	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No
Is the scheme transparent (i.e. are standards and summary reports freely available on websites)? ^{b)}	No	No	Yes	Yes	Yes	Yes	No	No
Is there a label and well-defined chain-of-custody available? ^{b)}	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No
Does the scheme prohibit the conversion of forests to plantations or other land uses? ^{b)}	No	No	No	No	Yes	No	No	No
Does the scheme prohibit use of Genetically Modified Organism trees? ^{b)}	No	No	No	No	Yes	No	No	No

^{a)} Source: (CEPI 2004) ^{b)} Source (FERN 2004)

++ = fully conformant; + = minor observation; x = major observation; ? = insufficient information.

AFS: Australian Forestry Standard; CERFLOR: Certificação Florestal (Brazilian forest certification system); Certfor: Sistema Chileno de Certificación de Manejo Forestal Sustentable (Chilean forest certification system); CSA: Canadian Standards Association; FSC: Forest Stewardship Council (international framework); PEFC: Programme for Endorsement of Forest Certification Council (international framework); SFI: Sustainable Forestry Initiative Programme

3.1.4 Benefits and costs of forest certification to society

The benefits and costs of forest certification to society have been subject to several studies, commissioned by environmental NGOs like WWF (WWF 2005), forest owners organizations (Savcor 2005) and universities (Cashore, Gale et al. 2006).

Benefits to society

One way of measuring the benefits of certification systems is to study the type and number of changes that have to be implemented resulting from initial and annual verification. (WWF 2005) has performed an analysis on the effects of FSC certification in

Estonia, Germany, Latvia, Russia, Sweden and the UK, based on publicly available information from audit reports prepared by independent assessors. The Corrective Action Requests (CARs), listed in the audit reports, provide a summary of the changes that forest managers have had to make to achieve or maintain the forest certification standard. 2817 CARs were reviewed, covering 18 million hectares of forest. It was found that over 50% of CARs were raised to cover ecological issues. The balance is equally distributed between social and economic issues.

The most significant *ecological* improvements were found to be:

- Consistent implementation of Environmental Impact Assessments
- The identification, mapping and management/protection of long term retentions, natural reserves, key habitats and biotopes
- Increase in deadwood levels
- Favours species diversity through natural regeneration care and thinning, etc.
- Restoration of threatened forest types such as deciduous and wet forests.

Significant *economic* improvements found were:

- Recreational benefits have been improved through the conservation of sites of historical and cultural significance. This was complemented by better and safer public access.
- In case of conflicts between deer numbers and forest management objectives, forest certification has led managers to develop game management strategies to minimise economic damage.

Significant *social* improvements found were in the implementation of health and safety legislation, the use of safety procedures and training. Employment of local people has been favoured and certification led to better compliance with social and legal requirements.

It was concluded that '*certification to FSC standards has demonstrated across Europe that it can consistently raise the standard of forest management*'. However, it should be kept in mind that WWF was involved in establishing FSC and is a member of FSC's board of directors.

Interestingly, a WWF report on the effects of PEFC-certification (Hirschberger 2005) concludes that 'certification under PEFC conserves the status quo in forest management with its strengths but also with its weaknesses' and that 'most of the corrective actions by PEFC are only recommendations a forest owner can ignore without any consequences'. Also here it should be kept in mind that WWF is pro-FSC in its position.

On behalf of the Federation of Nordic Forest Owners Organisations, (Savcor 2005) analysed the impact of certification on sustainable forest management in private forestry, taking into account the particular conditions prevailing in Finland, Sweden and Norway using FSC and PEFC based certification systems. (Savcor 2005) reports that both PEFC and FSC-based forest certification have enhanced sustainable forest management and levelled out differences between the Nordic countries, independent of the requirements imposed by national legislation. Both systems put stronger emphasis on ecological

sustainability than on social and economic aspects. Differences in the implementation of environmental, social or economic requirements of the two systems in practical forestry were not significant in any of the pilot regions.

In *biodiversity conservation* the main differences between the PEFC and FSC-based standards are due to the different requirements regarding set-aside areas. FSC requires a blanket 5% set-aside area whereas the approach in the PEFC standards tends to protect valuable habitats if present in the forest. At a regional level, this has led to comparable levels of set-aside areas, whereas the differences are larger in individual forest holdings.

In large-scale industrial forestry, buffer zones can be planned to maintain high conservation values. In small-scale private forestry blanket quota for set-aside areas were not considered an effective tool compared to landscape-level measures according to (Savcor 2005).

(Cashore, Gale et al. 2006) studied the effect of forest certification by performing several case studies in Asia, Eastern Europe, Latin America and Sub Saharan Africa. Summarizing the detailed observations made by (Cashore, Gale et al. 2006) the following general benefits of forest certification can be observed.:

General

- A change in power relations within the forest policy network, away from business industry clientelist networks to more pluralistic arrangement involving environmental community and indigenous peoples' interests.
- Leading parties have greater appreciation of the complexity of the problems and consequences of proposed actions.
- In a number of the case studies, it is evident that the overall image of the forestry sector has improved as a consequence of forest certification.

Social

- Perhaps the most important social effect is increased attention to worker safety
- Improved pay and conditions for workers, development of community infrastructure, and the provision of training are other social effects mentioned.

Economic

- Improved market access was found the most consistent economic effect on firm level.
- Tax collection can be improved via certification since companies undertake to comply with all laws of the country, including those related to tax. In some cases (Gabon) certified companies paid taxes better on time as a result of the requirement to meet national legislative obligations
- Improved working conditions can reduce working days lost to sickness and injury.

Environmental

- Improved forest management planning and inventorying and changed silviculture practices, for instance through the introduction of Reduced Impact Logging (RIL).
- In a number of cases improvements to forest management practices from certification aimed at biodiversity protection were noted.

- Transparency by planning procedures and management structures contribute to combating illegal logging.

(Cashore, Gale et al. 2006) also cites (Newsom and Hewitt 2005), a study that explores the effects of certification on 129 SmartWood-certified operations in 21 countries that were required to make changes to various issues as a result of the certification process. Figure 7 shows that in a large number of verifications requests for changes were made to create environmental, social and economic benefits. Note that this does not imply that all required changes have actually been implemented.

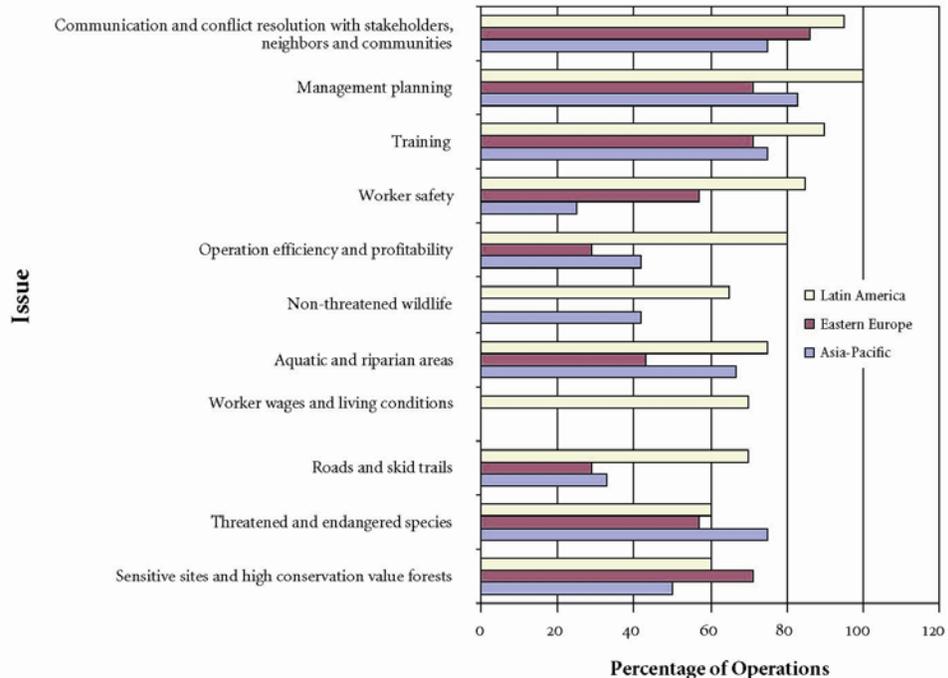


Figure 7 Percentage of SmartWood-certified operations in Asia-Pacific (n=12), Eastern Europe (n=7) and Latin America (n=20) required making changes to various issues during their certification assessment. Source (Newsom and Hewitt 2005) in (Cashore, Gale et al. 2006)

Costs to society

The eco-based approach toward forestry can lead to a decline in hectares available for timber production as well as in the volume produced per hectare. A substantial decline in the volume of timber produced clearly has important system-wide consequences, resulting in fewer jobs, increased demand over supply, potentially higher prices in the absence of imports, and potentially reduced processing efficiencies if mills designed for large volumes must make do with less (Cashore, Gale et al. 2006).

(Savcor 2005) indicates that the main concern in the Nordic countries is to maintain income and employment opportunities generated by the forestry sector, which is crucial for the socio-economic development of rural communities. Only economically viable forest management provides employment opportunities and income to the rural people and can maintain social and economic services in rural communities. The contribution of certification to social or economic sustainability in the Nordic country conditions has been less pronounced than to protection of environment.

3.1.5 Benefits and costs of forest certification to the users

Benefits to the users

Improved market access was found the most consistent economic effect on firm level (Cashore, Gale et al. 2006). Secondly, price premiums appear to be available to most producers in the Asia-Pacific region, but are less evident in the Eastern European markets where the share of certified wood is much higher. In Latin America different reports on the availability of price premiums were received and according to (Cashore, Gale et al. 2006) no definite conclusions could be drawn whether premiums are commonly available. In some cases additional benefits were reported like stability of contracts with buyers, and improved efficiency at the level of the firm as a consequence of the need to engage in more planning, inventorying and managing of the forest operation.

According to (Savcor 2005), a price premium for certified timber is an effective tool to encourage forest owners participation. In Norway and Sweden timber trading organisations and forest industry have paid price premiums with good results. In the Finnish regional certification the forest owners' participation could be ensured without premiums through an effective regional certification arrangement. Forest owners organisations and sawmill industry linked to private forestry have been more positive towards price premiums than large-scale pulp and paper industry, apparently because of different market requirements (Savcor 2005).

Costs to the users

The most obvious negative effect of certification is increased cost to the firm (Cashore, Gale et al. 2006). (Savcor 2005) provides estimates of the costs involved in certification of the three pilot areas subject to study in three Nordic countries. Table 6 and Table 7 present the estimated costs of forest certification in pilot areas in Finland, Sweden and Norway, distinguishing direct costs related to the auditing process and the indirect costs of measures that need to be taken to comply with the sustainability criteria. Some of the presented cases are based on real data while others are estimates based on assumptions and should be considered indicative only.

Table 6 Costs of forest certification at pilot areas in Finland, Sweden and Norway (Euro/ha/year)

System	Region, country	# ha	Direct costs		Indirect costs		Total
			External Auditing	Internal auditing	Organisational costs	Loss of stumpage revenues	
FFCS ^{a)}	Pirkanmaa, Finland	860,000	0.02	0.003	0.02	1.39	1.43
FSC	Pirkanmaa, Finland	860,000	0.25	0.04		18.84	19.12
PEFC	Gävleborg, Sweden	28,542	0.08	0.38	0.50		0.96
FSC and PEFC	Gävleborg, Sweden	2,000,000	0.01	0.04		13.50	13.55
ISO 14001/LFC	AT, Skog, Norway	1,030,000	0.01	0.12	0.81	1.54	2.49
FSC	Norway	3,700	0.38	0.41	0.27	1.61	2.66

^{a)} FFCS (Finnish Forest Certification System) is the national forest certification standard for Finland endorsed by PEFC. It was established in 1997. For further information see www.ffcs-finland.org
Source: (Savcor 2005)

Table 7 Cost of forest certification at pilot areas in Finland, Sweden and Norway (Euro/year)

System	Region, country	# ha	Direct costs		Indirect costs		Total
			External Auditing	Internal auditing	Organisational costs	Loss of stumpage revenues	
FFCS	Pirkanmaa, Finland	860,000	15,300	2,300	20,700	1,191,900	1,230,200
FSC	Pirkanmaa, Finland	860,000	214,200	32,200	..	16,200,000	16,446,400
PEFC	Gävleborg, Sweden	28,542	2,200	11,000	14,200	..	27,400
FSC and PEFC	Gävleborg, Sweden	2,000,000	29,600	76,700	..	27,000,000	27,106,300
ISO 14001/LFC	AT, Skog, Norway	1,030,000	11,000	122,500	835,000	1,588,000	2,556,500
FSC	Norway	3,700	1,400	1,500	1,000	5,940	9,840

^{a)} Source: (Savcor 2005) ^{b)} Source: (FSC 2001)

In most cases indirect costs (loss of stumpage revenues) were the major cost component to comply with the sustainability criteria. Although (Savcor 2005) indicates that the FSC costs requirements in the Pikanmaa case might be overestimated, it clearly indicates that requirements related to numbers of retention trees, buffer zones with restricted harvesting and set aside areas can lead to a substantial decrease in stumpage revenues (in this case 12%). The specific certification costs per hectare are relatively lower if large areas are certified. In a paper of (FSC 2001) the direct costs related to internal and external auditing were estimated for a number of FSC forests in Germany. Results are presented in Table 8.

Table 8 Estimated costs for FSC certification in German cases^{a)}

	# ha	Year 1		Year 2 - 5		Year 1-5	
		External auditing	Internal auditing	External auditing	Total	Euro	Euro/ha/year
		Euro	hours	Euro ^{a)}			
Willebadessen local authority forestry office	7,825	12,104	62	2,170	639	16,830	0.43
Dad Driburg state forest	10,500	8,396	75	2,625	639	13,577	0.26
Paderborn state forest	14,370	9,052	81	2,835	639	14,443	0.20
PreV group	14,530	13,746	178	6,230	639	22,532	0.31
Lippe state federation	15,800	10,013	105	3,675	639	16,244	0.21
OWL group	15,824	17,841	609	21,315	639	41,712	0.53
Total	78,849					125,338	0.32

Source: (FSC 2001)

^{a)} Note: original values have been converted from DM into Euro,. For internal auditing BTG has assumed costs of 35 Euro per man-hour to cover the time spent by forest owners.

For the investigated German forests, varying in size between 7,825 and 15,824 ha, the direct costs for certification are estimated at 0.20-0.53 euro/ha/year, and are on average 0.32 euro/ha/year. Note that no indirect costs, e.g. possible loss of stumpage revenues, have been taken into account.

(Cashore, Gale et al. 2006) cites that forest owners in Latvia incur certification costs ranging from USD 0.30/ha in state forests to USD 6.00/ha in private forests. As discussed above, the specific certification costs per hectare depend highly on the size of the certified area, which would seem the main reason for the wide spread found in reported costs per ha. Using the information provided in Table 8, it can be illustrated that costs for smallholders will be quite high. The minimum costs of an external audit can be estimated at 8,000 Euro, internal auditing adds 40 hours @ 35 euro/hour is 1,400 Euro, and another

639 Euro/year is needed in Year 2-5. The certification costs thus add up to 11,956 Euro in five years, or 2,391 Euro/year. Assuming the size of the certified forest is 1000 ha, the specific certification costs are 2.4 Euro/ha/year. If the size of the certified forest is a mere 100 ha the specific certification costs would amount to 24 Euro/ha/year. This example clearly illustrates the need for group certification to lower certification costs.

According to (Savcor 2005) requirements on the extent of set-aside areas are the main reasons for *additional cost* due to certification. In some cases the harvesting restrictions imposed by certification standards can decrease the stumpage revenues up to 15-20%, having a major impact on the economy of a private forest. In individual certification, audit costs can be a critical cost barrier but in large-scale certifications their role is marginal. Group certification arrangements have kept certification costs to small-scale non-industrial forest owners at a reasonable level (Savcor 2005).

The costs of auditing, although making up a minor portion of the total costs of certification, can represent a critical cost barrier to individual forest owners. Significant losses in stumpage revenues as a result of harvesting restrictions due to certification requirements have decreased the willingness to embrace any certification (Savcor 2005).

3.1.6 Application and impact of forest certification

In the ten years the area of certified forests has strongly increased as illustrated in Figure 8.

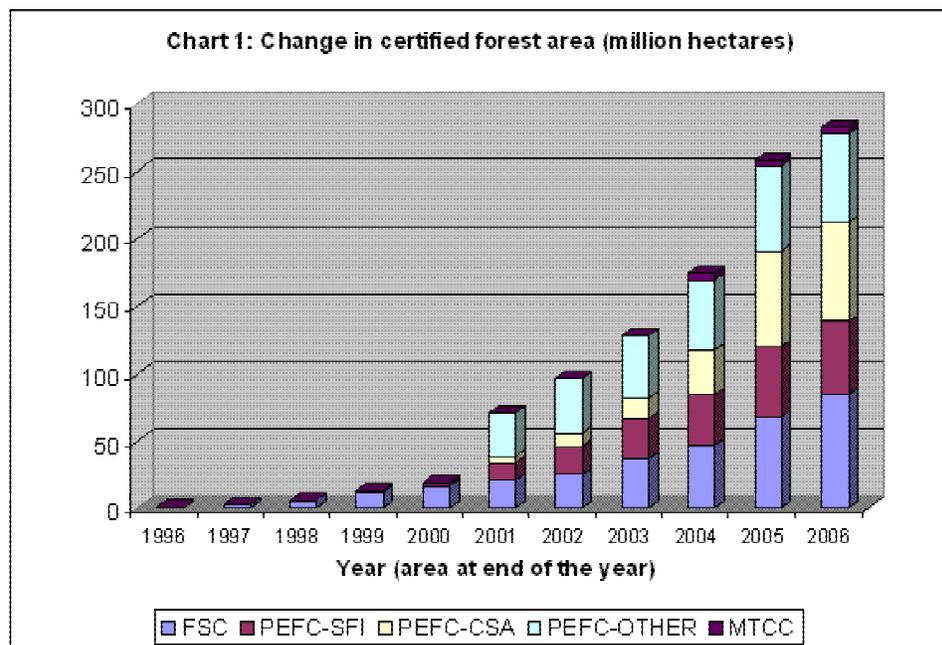


Figure 8 Change in certified forest area (million hectares) Source: www.forestcertification.info

Data in Figure 9 and Figure 10 shows that by 2005, 28% of total forestlands in North America and 56% in Western Europe had been certified according to one of the certification systems.

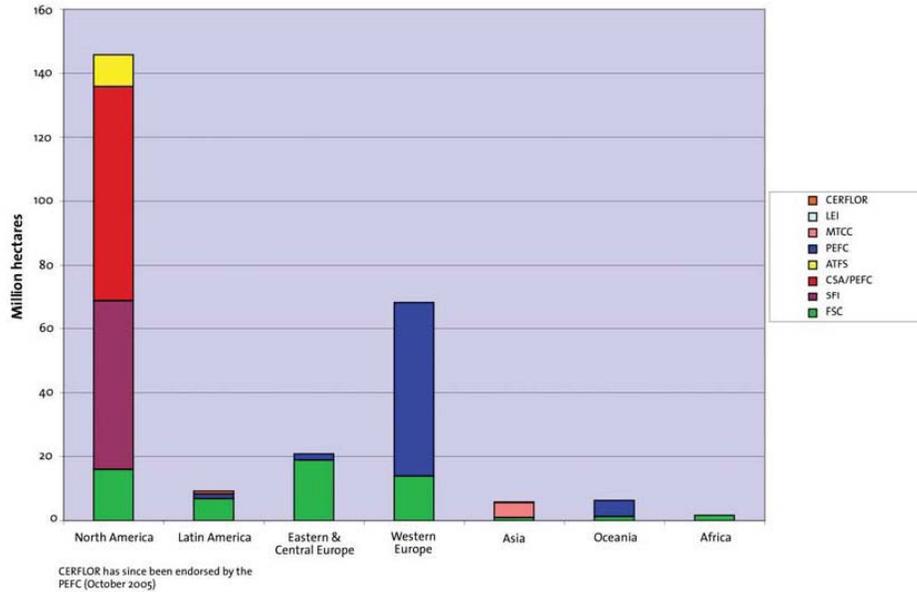


Figure 9 Number of hectares under different certification standards in 2005. Source: (Cashore, Gale et al. 2006)

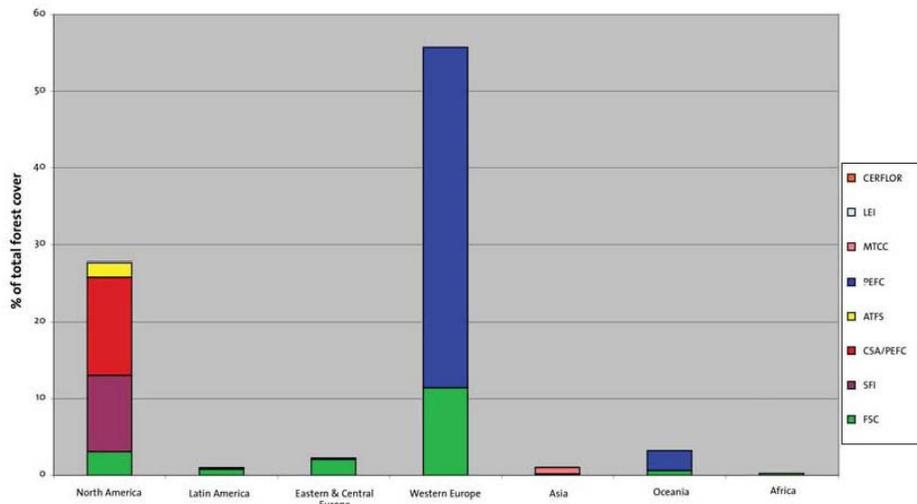


Figure 10 Area certified under each system as a percentage of the total regional forest cover in 2005. Source (Cashore, Gale et al. 2006)

In contrast, forest certification has had limited uptake in most developing countries, both in absolute numbers of hectares certified and as a percentage of the forest estate, despite assertions that it is in these very countries where, if supported, forest certification could have its biggest impact. In (Cashore, Gale et al. 2006) the impacts of FSC certification in developing countries was studied, based on case studies in Asia, Eastern Europe, Latin America and Sub Saharan Africa.

Asia (Indonesia, Malaysia, Papua New Guinea, Solomon Islands)

- In Asia, communities operating on customary tenure lands encounter numerous difficulties implementing forest certification in practice, despite their strong desire to

do so. These difficulties relate to lack of community managerial capacity in general, as well as lack of specific forest management capacity to produce sizeable volumes of good quality timber in a timely fashion for foreign markets.

- Large-scale operations in the region appear to be better positioned to engage with certification. However, in Asia much focus is on production for the non-environmentally sensitive timber markets of Asia, especially China, Japan and Korea. In these cases certification imposes high costs without resulting in tangible benefits in the form of increased market access, price premiums or competitive advantages.
- Non-resolution of indigenous peoples rights matters, lack of interest of foreign dominated industry and government indifference are mentioned as reasons of low FSC certification rates in the investigated Asian countries.

Eastern Europe and Russia (Estonia, Latvia, Poland, Russia)

- The adoption of forest certification in Eastern Europe and Russia has been relatively straightforward. Management capacity, while seriously challenged by the transition process, is also fairly good. For all but central and eastern Russia, the desire to maintain ready exports to Western Europe eased the adoption of certification.
- In the Balkans and Poland, moreover, FSC certification seems to have been seen as a way of validating the quality and capacity of state forest management organizations, although it was also used as an avenue for policy and management. In this way, certification was able to attract the broader social support necessary to the continuation of forest management operations.
- Finally, the transnational environmental NGOs often provided key resources to demonstrate the nature and viability of the international management standards embodied in the FSC system. They were also relatively skilful in drawing upon existing experts to bring these ideas into the larger policy world.

Latin America (Bolivia, Brazil, Guatemala, Mexico)

- In Latin America, structural conditions for successful certification are present in some countries and sectors, but absent in others. In places where governments have seen certification as a means of reaching their own goals - such as technical assistance among community forestry operations or responding to outside pressure for forest sector reform - certification has generally been facilitated by government incentives and actions. In Guatemala, for example, the government used FSC certification to justify creating forestry concessions in the Maya Biosphere Reserve multiple use zone. In Bolivia, the government felt pressure for reform and created a forestry law that would facilitate certification, while in Mexico the government saw certification as a means of reaching its own goals of capacity building in community forestry operations, and created incentives to make certification accessible to this group.
- The Brazilian plantation sector, which dominates the global short-fibre cellulose market, industrial forest companies in Bolivia, as well as producers in northern Mexico that sell to green buyers in the U.S., have all successfully accessed environmentally-sensitive markets in the U.S. and Europe.
- Perhaps the only hindrance to certification that was common to all Latin American case studies was illegal logging. In each of the countries studied, illegally logged forest products were blamed for flooding the markets with cheap alternatives to

certified products and driving down prices, making the financial viability of certification even more tenuous. Current efforts to discourage illegal activity in Latin America must be supported and strengthened. Still, in some regions, such as Brazil, legal deforestation may be as destructive as illegal logging (Cashore, Gale et al. 2006).

Sub-Saharan Africa (Gabon, South Africa, Uganda, Zambia)

The African cases are important for revealing the significant challenges for institutionalising forest certification in Sub-Saharan Africa, but also the unique obstacles and opportunities within each country.

- One facilitating factor is that in the investigated countries, with the exception of South Africa, the land is publicly owned - a feature which poses fewer transaction costs than is the case for smaller private ownerships considering certification. However, government capacity to enforce existing laws and to employ forestry experts is so weak that, until addressed, it is unlikely that public ownership can be used to Africa's competitive advantage.
- FSC-style certification in South Africa was supported by its privately-owned plantation industry, which covers just over one percent of this country's land base, for highly unusual reasons - it wanted to get approval for operations that have been criticized for negatively impinging on natural, treeless ecosystems. In this case, plantation owners, who did come under significant scrutiny from European export markets, saw FSC certification as a way to maintain existing foreign markets.
- In Zambia the limited interest in forest certification was sparked through aid projects promoting forest certification as a way of expanding markets for non-timber forest products such as honey and wild mushrooms.
- While Gabon relies more heavily on export markets than any of the other African cases, its market share of the European market declined after the mid-1990s as FSC-friendly Eastern European countries increased their access. Instead, Gabon shifted its emphasis to Asia, with 45 percent of its export market going to China, which currently places almost no emphasis on certified products.
- Finally, factors such as regime change, poverty, famine, disease and civil war that challenge this continent on every level, have significant negative impacts on the success of forest certification, like on any kind of policy initiative.

3.1.7 Conclusion

Sustainability criteria

FSC and PEFC are the main umbrella forest certification organisations. Both schemes are striving to achieve sustainable forest management using independent third party assessment of on-ground forestry practices against a set of pre-determined forestry standards. Both schemes acknowledge that sustainable forestry requires conservation of the full range of forest functions: economic, social, and environmental.

In the FSC system, all forest certification standards should be in accordance with a set of International Forestry Principles and Criteria developed by FSC International. In contrast, PEFC plays no role in the development of international forestry principles, and instead

relies on inter-governmental principles developed and adapted for different forest regions of the world. Field research (UPM 2005) suggests that the more environmentalist FSC based systems have generally the most strict (environmental) criteria. Although a number of PEFC and FSC systems are very comparable, PEFC has been criticised for having endorsed a number of weak certification systems like SFI and CSA.

Operation and management structure

ISO guidelines are available and used for:

- Development of certification standards: ISO Guide 59: Code of Good Practice for Standardisation.
- The certification process by third parties: ISO Guides 62, 65 and 66.
 - ISO Guide 62: 1996 (EN 45012: 1998) General requirements for bodies operating assessment and certification/registration of quality systems.
 - ISO Guide 65: 1996 (EN 45011: 1998) General requirements for bodies operating product certification systems.
 - ISO Guide 66: 1999 General requirements for bodies operating assessment and certification/registration of environmental management systems.
- Accreditation of forest certification bodies: ISO Guide 61: General requirements for assessment and accreditation of certification/registration bodies.

Two main alternatives for chain-of-custody verification can be distinguished: 100% physical separation, and labelling systems for the use of mixtures of certified and uncertified wood.

Benefits and costs

Table 9 summarizes schematically the main benefits and costs of forest certification for society and directly involved users.

- The main benefits of forest certification are in the environmental field of work. Social benefits like increased attention to workers' safety and better taking care of local stakeholders are deemed an issue especially in developing countries.
- The main benefits for the users are increased market access to environmentally conscious markets. If these markets are absent, or if less environmental conscious markets are available, the willingness for certification will decrease accordingly. Secondly, in a number of cases (but not always) a price premium can be received. If a large share of the forest sector is certified, the price premium will more often be absent. The premium will also depend on the sector of end use.
- The costs of certification for society are limited and their determination is rather theoretical.
- It is the user of the certification system -usually the harvesting contractor- who pays the cost of the certification system. Direct costs of certification are at least 4,000 euro/year, which is relatively low as long as areas of more than about 1,000 ha are certified. If measures lead to reduced harvests, for instance because of introduction of conservation areas, this can directly lead to considerable loss of income.

Table 9 Main benefits and costs of forest certification for society and users of the system

	Main benefits	Main costs
Society		
Environmental	<ul style="list-style-type: none"> • Mapping and protection of key areas of ecological significance • Increase in deadwood levels • Species diversity • Restoration of threatened forest types 	
Social	<ul style="list-style-type: none"> • Increased attention to worker safety • Better awareness and handling interest other stakeholders 	
Economic		<ul style="list-style-type: none"> • Loss of income from forestry sector • Potential loss of jobs
Users		
	<ul style="list-style-type: none"> • Increased access to eco sensitive markets • Price premium • Efficiency improvement by better management 	<ul style="list-style-type: none"> • Costs of measures, that lead to reduced harvest volumes • Direct costs of auditing (internal and external)

Impact

Table 10 shows that by the end of 2006 mln. 193.7 ha (65%) of forest was certified by PEFC, 84.2 mln. ha (29%) by FSC and 17 mln. ha (6%) by other systems (the American Tree Farm System, Malaysian Timber Certification Council and the Dutch Keurhout system).

Table 10 Certified forest area by scheme and region in Dec 2006 (million hectares)¹⁴

	North America	South & Central America	Europe	Asia	Oceania	Africa	Russia	Total
FSC	27.3	9.6	29.6	1.6	1.3	2.5	12.3	84.2
PEFC	128.3	2.3	57.4		5.7			193.7
Other ^a	11.0			4.8		1.2		17.0
Total	166.6	11.9	87.0	6.4	7.0	3.7	12.3	294.9

^a Other in North America refers to American Tree Farm System, in Asia refers to the Malaysian Timber Certification Council, in Africa refers to areas in Gabon recognised under the Dutch Keurhout system

In the last ten years forest certification has taken off in North America and Europe, which form the main environmentally conscious markets. Forest certification has had limited uptake in countries which mainly supply timber to non-eco sensitive countries.

As made clear by the analysis of costs and benefits, it is the owner of the certification system who decides to certify or not. It is concluded that tangible benefits in the form of increased market access, price premiums or competitive advantages are an important denominator determining the success of forest certification. If these benefits are absent,

¹⁴ Source: <http://www.forestrycertification.info/>

for instance if there is access to non-environmental sensitive markets, there is hardly any interest in forest certification. Targeted government policies and assistance of NGO in bearing part of the certification costs can support certification on a national or local scale.

3.2 BIOMASS ENERGY CROPS CERTIFICATION SYSTEMS

For selected crops that can be used for energy purposes like soy, palm oil, and sugar cane, certification systems are currently under development.

- The *Round Table on Sustainable Palm Oil* (RSPO) attracts a lot of attention. Palm oil is regarded a controversial biofuel, which could be used for biodiesel production, but so far its use in Europe was mostly in renewable electricity production. Furthermore, RSPO has set up a complete set of principles and criteria. Indicators on national level are about to be approved, and the first third party certification bodies are about to be accredited. RSPO is more advanced in its development than other initiatives related to dedicated energy crops, and can be seen as a key initiative toward energy crop certification.
- The *Round Table on Responsible Soy* (RTRS) has as its objective to facilitate a global dialogue on responsible soy production by acting as a forum for stakeholders, mobilising participants, organise roundtable conferences. It has published draft sustainability principles.
- The *Better Sugarcane Initiative* (BSI) has the intention to promote sustainable sugar (and ethanol) production, but no system of criteria and indicators has been developed yet.

Specific certification systems or initiatives for growing wheat, sugar beet, rapeseed or sunflower seed were not found. Note that exactly these crops are the most widely used for the production of transportation fuels.

As indicated in the scope of work, conventional agricultural activities for food and feed production are excluded from this study. Therefore systems like EurepGAP, Fairtrade, International Federation of Organic Agricultural Movements (IFOAM), Utz Kapeh Codes of Conduct (Coffee), Standard for Sustainable Agriculture (SSA) are not part of this study.

In the next sections the status and development of the RSPO, RTRS and BSI certification systems are presented.

3.2.1 Palm oil - RSPO

From the 1990s to the present time, the area under palm oil cultivation had increased by about 43%, mostly in Malaysia and Indonesia - the world's largest producers of palm oil. There is serious concern that not all palm oil is being produced sustainably at present. Development of new plantations has resulted in the conversion of large areas of forest with high conservation value and has threatened the rich biodiversity in these ecosystems. Use of fire for preparation of land for oil palm planting has been reported to contribute to the problem of forest fires in the late 1990s. The expansion of oil palm plantations has also given rise to social conflicts between the local communities and project proponents

in many instances. Moreover, part of the palm oil plantations are grown on drained peatlands; according to (Hooijer, Silvius et al. 2006) draining of peat lands leads to CO₂-emissions much higher than can the emission reduction that can be achieved by using palm oil instead of fossil fuels.

To meet the growing demand for sustainable palm oil, the Round Table on Sustainable Palm Oil (RSPO) was established in 2004. It developed a set of 8 Principles and 48 Criteria for sustainable palm oil production, which were published in October 2005. The principles are (RSPO 2005):

1. Commitment to transparency
2. Compliance with applicable laws and regulations
3. Commitment to long-term economic and financial viability
4. Use of appropriate best practices by growers and millers
5. Environmental responsibility and conservation of natural resources and biodiversity
6. Responsible consideration of employees and of individuals and communities affected by growers and mills
7. Responsible development of new plantations
8. Commitment to continuous improvement in key areas of activities

In June 2007 the RSPO certification system was further elaborated (RSPO 2007) indicating procedures for indicator development, certification process, accreditation of third parties and allowed chains of custody. Main points are:

- Indicator development based on the international principles and criteria takes place on national level and by national interpretation. A number of criteria should be measured by major or compulsory indicators, which trigger ‘Major Nonconformities’ if not complied with. Moreover, at least 45 of all indicators must be identified as compulsory.
- In case no national interpretation is available, third party certification bodies may develop a set of indicators, which need to be approved by the RSPO Executive Board.
- The unit of certification shall be the mill and the supply base, which consists of both directly managed land and land of associated smallholders.
- The maximum period of validity of the certificate is 5 years.

Based on the international principles and criteria, Malaysia, Indonesia and Papua New Guinea are developing national sets of indicators. The indicators need to comply with a guidance document on developing national interpretation (RSPO 2006) and have to be approved by the RSPO Executive Board.

Standards setting process

Regarding the standard-setting process, no explicit reference is made to ISO standards, such as ISO 59. However, the organisation of RSPO is presented in a transparent manner in its statutes, by-laws, anti trust guidelines and a code of conduct for members¹⁵. The following seven groups are allowed as members of RSPO. Between brackets, the numbers

¹⁵ See http://www.rspo.org/New_Governance.aspx

of representatives of these groups in the Executive Board - the main decision-making organism - is indicated.

- Oil palm growers (4)
- Palm oil processors and traders (2)
- Consumer goods manufacturers (2)
- Retailers (2)
- Banks and investors (2)
- Environmental/nature conservation organisations (NGOs) (2)
- Social/development organisations (NGOs) (2)

Certification process

As a minimum, (third party) certification bodies must be consistent with the specifications defined in ISO 19011: 2002 Guidelines for quality and/or environmental management systems auditing, with modifications to take into account specific requirements of palm oil and chain-of-custody evaluation as further described in (RSPO 2007).

Accreditation of certification bodies

- Accreditation for approval and monitoring third party certification bodies will be based on ISO/IEC Guide 65: *General requirements for bodies operating product certification systems* and/or ISO/IEC Guide 66: *1999 General requirements for bodies operating assessment and certification/registration of environmental management systems*.
- The accreditation body itself must be operating in accordance with the requirements of ISO 17011:2004 Conformity assessment – general requirements for accreditation bodies accrediting conformity assessment bodies.
- According to a press release dated 19 October 2007, RSPO is in the process of approving the first two certification bodies (SGS Malaysia and Control Union).

Environmental claims – chain-of-custody

Any individual batch of palm oil can be traded through one of three supply chain mechanisms that are approved by RSPO:

- *Fully segregated* - The segregation approach involves keeping material from RSPO plantations separate from material from non-RSPO plantations at every stage of production, processing, refining and manufacturing throughout the supply chain.
- *Mass balance* - The mass balance approach does not try to segregate RSPO and non-RSPO material but instead is based on ensuring that the total quantity of RSPO product produced at any stage in the supply chain is proportional to the quantity of RSPO raw material used. Thus if half the raw material used is RSPO then half the product is RSPO. In this approach, although the amount of RSPO material reaching the end user reflects the amount of RSPO oil produced by RSPO plantations, no direct physical link is maintained between the plantations and the final product. ‘RSPO’ material may, in fact, have come from any source.
- *Book-and-Claim* - In the ‘book-and-claim’ approach, instead of trying to trace RSPO material through the supply chain from plantation to end-user, the ‘RSPO’ element of the oil is traded separately from the oil itself. This is done by issuing some form of credit or tradable certificate to producers implementing the RSPO criteria, which can

then be sold to users wanting to use RSPO for their products. The actual oil enters the normal supply chain and is traded without any claim attached.

For the first two options traceability from the plantation through to the certified end product is required.

Status & discussion

The RSPO has made major progress in setting up the framework for indicator development, accreditation and certification, and the system is almost operational. Seen the developments, the first certified sustainable palm oil could be expected within a year time.

However, it is observed that the RSPO does not cover some of the aspects specifically perceived as important by stakeholders for use of palm oil for energy purposes:

- The present RSPO criteria do not include criteria regarding the greenhouse benefits of palm oil use in energy applications. A position paper on bio-energy (RSPO 2007) states that *'RSPO believes that the use of any first generation feed stocks should provide clear greenhouse gas benefits after considering the entire life cycle of the raw material. RSPO acknowledges that this may lead to the need to develop additional criteria, compatible with the current RSPO principles and criteria'*. RSPO also states that *'the palm oil market is an open market and it is not within the scope of RSPO to decide upon allocation based on end use'*.
- A study commissioned by Wetlands International indicates dramatic CO₂ emissions from drained peat lands (See Section 2.3). The RSPO criteria do not prevent oil palm plantations to be located on these lands.
- Voluntary sustainability certification of palm oil plantations does not prevent that non-certified palm oil will still be produced for less environmental conscious submarkets. However, the increasing demand for energy purposes does increase the demand for palm oil, thereby increasing the pressure on land that might be converted to plantations in a non sustainable manner. This issue cannot be solved by RSPO or any certification system. This initiates a fundamental discussion on the future role of biofuels.

3.2.2 Soy – Round Table on Responsible Soy

The Round Table on Responsible Soy (RTRS) has as its objective to facilitate a global dialogue on responsible soy by acting as a forum for stakeholders, mobilise participants, organise Roundtable conferences. RTRS has published 'final draft' principles on economic, social and environmental responsibility, as follows:

Economic responsibility

1. Impact of Infrastructure

Social responsibility

2. Compliance with labour laws and requirements
3. Respect for land rights
4. Small scale and traditional land use
5. Rural communities and migration

Environmental responsibility

6. Water as a key resource
7. Soil as a key resource
8. Protection of Biological diversity
9. Responsible use of agrochemicals

A working group consisting of producers, industry, finance and trade representatives, and environmental and social NGOs is initialised to work out the principles in a set of criteria and indicators.

The Basel Criteria on Responsible Soy, issued by the NGO community in 2004 (ProForest 2004) are elaborated in more detail than any RTRS document. However, the Basel Criteria are purely a NGO initiative, and the RTRS needs to develop a set of criteria that is accepted by all involved stakeholders. It is not expected that a complete set of criteria and indicators will be available soon. For more information see <http://www.responsiblesoy.org/eng/index.htm>.

Responsible soy is of relative minor importance for the EU energy supply; its main energy markets are in the Americas.

3.2.3 Sugar – Better Sugarcane Initiative

Sugarcane is a water intensive crop that remains in the soil for 12 months of the year using approximately 1000 m³ of water to produce 12.5 tonnes of commercial cane. Some sugarcane is grown on steep hillsides without terracing, resulting in the loss of topsoil from the farm and a high sediment load in rivers and estuaries. There is evidence that a monoculture crop has an adverse effect on soil health and fauna. From a social perspective, jobs in sugarcane production are among the most hazardous in agriculture and in some cases, cane cultivation wages do not provide enough food to cover the calories burned on the job¹⁶.

The Better Sugarcane Initiative (BSI) is a collaboration of progressive sugarcane retailers, investors, traders, producers and NGOs who are committed to developing internationally applicable measures and baselines that define sustainable sugar cane. BSI is an international initiative with the Steering Committee based around the world. The end result of BSI will be a set of performance-based measures and baselines, which can be used by companies and investors across the globe as sourcing and investment screens and by producers to enhance the long-term sustainability of production. At the time of writing the BSI is still in its start up phase. No lists with (draft) principles, criteria and indicators were found. For more information see www.bettersugarcane.org.

3.2.4 Conclusion

Initiatives have been initiated to promote sustainable soy, palm oil and sugarcane. The certification scheme for sustainable palm oil is most advanced in development, and close to the operational stage. It has a clear set of criteria and indicators agreed upon and the

¹⁶ See http://www.bettersugarcane.org/social_environmental_impactsofsugar.htm

operation and management structure is in place. Some relevant issues are not yet covered by RSPO, like greenhouse gas balance including GHG effects of drainage of wetlands. On a more fundamental level, it is observed that palm oil has many end uses, also in less environmentally conscious markets. Increased biofuels use will create additional demand for palm oil, pushing the demand for land, which is not checked on sustainability by RSPO. Specific certification systems or initiatives for growing wheat, sugar beet, rapeseed or sunflower seed were not found. It is noted that precisely these crops are currently the ones used the most for the production of transportation fuels. Possibly, general farming labels like organic farming, EurepGAP etc. could be useful.

3.3 CERTIFICATION SYSTEMS USED IN THE POWER SECTOR

Some certification systems have been developed especially for the use of energy crops and residues in power plants. These include:

- Essent Green Gold Label standard
- Laborelec Sustainability Certification.

Moreover, in various countries standards have been developed for electricity that is produced from genuinely green energy sources. The Eugene Standard (www.eugenestandard.org) created an international standard of quality for green power. By endorsing national standards Eugene strives to provide a Europe-wide label (in fact a meta-standard).

Criteria of these systems regarding the type and origin of biomass could be interesting in the frame of this study.

3.3.1 Green Gold Label

The Green Gold Label (GGL) programme is a certification system for sustainable biomass. It includes the production, the processing, the transport and the final energy transformation. This system was developed by Essent, one of the major Dutch producers and suppliers of sustainable energy, and currently owned by the independent Green Gold Label foundation.

Sustainability criteria

Green gold label offers basically a chain-of-custody certification system (GGLS1), a track-and-trace system for biomass from (by-) products from the power plant (and the green power it produces) back to the sustainable source (GGL 2005). In this system mixing or contamination with non-intrinsic or environmentally harmful materials is prohibited. In every link of the chain written proof must be available that the GGL quality system is supported, sustained and maintained.

Biomass from *forestry* (GGL 2005) in the chain should originate from sustainable managed forests, certified by one of the following forest management certification systems:

- FSC, PEFC, CSA-SFM, SFI or FFCS.

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- An approved pre-scope certificate of one of the endorsed forest management certification systems, with the intention of full certification is also accepted.

In addition, biomass for which a ‘*testimony of approval*’ has been submitted according to the Green Gold Label forest management criteria (GGLS5) is also accepted.

Biomass from *agricultural* origin (GGL 2005) needs to be certified according to:

- Organic certification
- EurepGAP

In addition, biomass for which a ‘*testimony of approval*’ has been submitted according to the Green Gold Label agricultural source criteria (GGLS2) is also accepted.

In fact, relating to the production of biomass the GGL standard functions like a meta-standard, accepting biomass from various certified resources. The Green Gold label forest management and agricultural source criteria are highlighted below.

GGL Forest Management Criteria

GGLS5 is derived from existing and internationally recognised forest management standards (FSC, PEFC, CSA SFM, SFI). GGLS5 has not been developed to replace the existing standards, rather to enable participating parties and stakeholders to perform a *quick-scan assessment* on sound forest management practices. GGLS5 also contains criteria for sound management of woody vegetation other than natural forest and plantations, e.g. parks, lanes and other woody landscape elements with an area of less than 5 ha. An audit based on these principles with a positive result will lead to a “*testimony of approval*” as a GGL approved source. The approval under these criteria is valid for a maximum of 4 years. After this 4 year period a GGL approval can only be given if a pre-scope route towards certification is initiated under one of the independently approved forest management certification systems. To be able to deliver under GGL the forest must be certified by one of the independently approved forest management certification systems within one year after initiating the pre-scope route.

GGLS5 Forest Management Criteria consist of the following principles:

1. Long term tenure and use rights to the land and forest resources.
2. Management plan.
3. Environmental impact.
4. Monitoring and assessment.
5. Plantations.
6. Other sources than natural forests and plantations (woods <5 ha, lanes and parks).

GGL Agricultural Source Criteria

The GGLS2 (GGL 2005) is based on the United Nations sustainable development program Agenda 21. This standard is to be used for approval of the agricultural source when no other certification system is available. An audit based on these principles with a positive result will lead to a “*testimony of approval*” as a GGL approved source. GGLS2 Agricultural Source Criteria consists of the following principles:

1. The agriculture management system is part of an integrated long term planning programme (either individually or organized in a group), aimed at development and sustainability.

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2. The agriculture management system is based on land-resource planning.
 3. The agriculture management is aimed at land conservation and rehabilitation.
 4. The agriculture management is aimed at the assurance of freshwater supply and quality for sustainable food production and sustainable rural development.
 5. The agricultural management system has implemented integrated pest management and control.
 6. The agricultural management system has implemented sustainable plant nutrition to increase food production.

Operation and management structure of the certification system

Standard setting process

The Green Gold Label is currently owned by the independent Green Gold Label foundation. However, no public information or website of this foundation could be found. Therefore, the standard setting process could not be evaluated, which cannot be regarded as a very transparent situation.

Certification process

The GGL mainly leans on certification by the approved forestry and agricultural systems and adds CoC certification. The own GGL agricultural source criteria are to be used if no other certification system is available, and the GGL forest management criteria are meant as quick scan assessment, and not to replace existing forestry standards. In the meanwhile a 'testimony of approval' from the GGL forestry and agricultural criteria is accepted for GGL Chain-of-custody certification.

Accreditation of certification bodies

In the GGL Glossary¹⁷ a certification body is defined as 'a third party certification company that is accredited ISO 65 (or equivalent) for GGL and is approved by the GGL foundation'. The approval procedure of the GGL foundation was not found.

Environmental claims – chain-of-custody

A mass balance system is used. The total annual amount of Green Gold label material is derived from a mass balance calculation $(A/B)*C=D$, where:

A = Annual input of claimed GGL raw material in metric ton or m³.

B = Total annual input raw material in metric ton or m³, including the material that might be used up in the process of the production.

C = Total annual amount of produced end product.

D = Annual amount of end product on which GGL can be claimed.

The chain-of-custody is described by the following principles (and criteria) and seems to be rather complete:

1. Provisions relating to transport and use of certificates and prescribed indications
2. Control of incoming products
3. Administration
4. Quality control

¹⁷ GGL Glossary version 2005.2 See <http://www.controlunion.com/certification/default.htm>

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5. Calculation amount of Green Gold Label material versus Non-Green Gold Label material with the use of the mass balance calculation
 6. Processing facility and equipment.

Status and discussion

According to the website of certification body Control Union Certifications (formerly known as Skal International) more than ten companies are using Chain-of-custody certification. Most or all of these companies sell biomass to Essent. Testimony of approvals of the GGL Agricultural criteria and GGL forest management criteria were not found, indicating that the companies use one of the other existing certification systems for certification of the biomass input to the GLL Chain-of-custody chain.

Although the GGL programme can be seen as a genuine effort of a major Dutch energy company to improve the sustainability of the biomass supply, it cannot be seen as a fully independent firm biomass certification system, as information on the independent GGL foundation is hard to access by the public. The criteria can also be regarded as quite mild, as also an approved pre-scope certificate of one of the endorsed certification systems is allowed, as well as the not so strict GGL agricultural criteria and GGL forest management criteria. A more general observation that will apply to all meta-standard systems is that the weakest forest certification system determines the quality of the meta-standard.

3.3.2 Belgium green certificate system

In the Belgian region of Flanders green certificates are granted according to the energy balance of the supply chain. In the region of Wallonia the green certificates are granted according to proven sustainability and CO₂ balance of the supply chain. The energy and carbon balances of the chains are calculated in a conservative way using standardised values.

The energy company Electrabel and its R&D company Laborelec developed a sustainability certification system for biomass that is co-combusted in conventional power plants. The main reasons to develop the scheme was to meet Belgian GHG and energy balance requirements and the wish to be transparent about activities related to sustainable electricity production. The system is based primarily on the FSC certification system, but also includes a GHG balance. The preferred types of biomass are residues from e.g. wood industry or low value residues from food industry, but wood from short rotation plantations would also be accepted. The Laborelec sustainability certification requires a supplier declaration, international transport declaration, overview of the energy balance, and an independent third party prepares an audit report. Costs associated with the certification system are less than 50 eurocents per tonne of imported biomass (Ryckmans 2007).

Official documents, presenting the sustainability criteria and the operation and management structure of the Laborelec certification system could however not be found on Internet. SGS is mentioned as the sole independent body performing verifications.

3.3.3 Renewable electricity labels

Electricity from renewable energy sources, like wind, solar, geothermal, wave, tidal, hydro, biomass, landfill gas and sewage treatment plant gas is commonly referred to as renewable electricity. Energy companies brand the renewable electricity they sell using their own labels, like green electricity, eco-electricity etc. What sources of renewable energy are included varies from label to label.

Table 11 Overview of inclusion / exclusion biomass criteria of major certification schemes for green electricity (Oehme 2006) in (van Dam, Junginger et al. 2006) and (Oehme 2006)

	Eu-gene	Ecolabel UZ46	Bra Miljövel	Eco-nergia	Milieu-keur	Green Power	Green-e	Env. Choice	Grüner Strom Label	OK power	Nature made basic	Nature made Star
Version		'05	'02	'00	'05	'04						
Country	EU	AT	SE	FI	NL	AU	USA	CA	DE	DE	CH	CH
Including description on eligible sources												
Energy crops	X	X	X		X	X	X	X	X	X		
Forestry	X	X	X	X		X						
Products from biomass		X										
Wood residues	X	X				X	X	X	X			
Biogas or liquid fuel		X	X					X				
Agriculture & agro-residues	X	X	X				X	X				
Eligibility waste types and co-firing												
Biodegradable part un-separated urban solid waste	N	N	N	N	N	Y	N	Y	N	N	N	N
Separated biodegradable waste	Y	Y	Y		Y	Y	Y	Y	Y	Y	Y	Y
Demolition wood	N	N	N	N			Y	N	Y	Y	Y	Y
Landfill gas		N	Y	Y	Y	Y		Y	N	N	N	N
Sewage sludge – thermo-chemical	N				N			N	N	N	N	N
Sewage gas, digestion of sewage sludge	Y			Y	N			Y	Y	N	Y	Y
Co-firing	Y	N	N	Y	Y	Y	Y			Y	N	N
Including criteria / guidelines on												
GMO			X								X	
Origin biomass fuel	X		X	X		X				X		X
Agriculture/soil	X		X	X	X					X	X	X
Wood residues		X								X		
Process: co-generation	X									X		
Process: co-firing	X		X	X	X	X	X	X		X		
Auxiliary energy			X	X								

In addition, independent quality labels have been developed, to assist environmental conscious consumers to verify the ecological performance of green electricity labels. These labelling programmes have emerged in European countries as well as in North America and Australia. The European Green Electricity Network (Eugene Network) was established in 2003 to promote quality green power products and increase their share of the voluntary market, and has introduced a ‘meta-standard’ label that endorses national voluntary labelling systems. Table 11 shows an overview of national labelling schemes, including the European Eugene standard, included biomass types and issues addressed.

Sustainability criteria

With respect to biomass, in the first place the independent labelling systems are used to exclude certain types of biomass that are perceived not to be green, like the un-separated biodegradable part of urban solid waste, demolition wood, and combustion of sewage sludge. The public perception of what types of electricity are considered ‘green’ is not necessarily based on rational sustainability criteria. Green electricity labels seek to promote the best performing types of renewable electricity, but in order to become a successful label the label developer also takes into account public perception. (Oehme 2006) states that *‘consumers must have confidence that labelled green electricity offers genuine environmental benefit and value for money. In this light, some biomass sources – especially different types of waste – need to be supported by and included in national and European biomass strategies, but they should not necessarily be supported by green electricity labels’*. In addition to conforming to consumer preferences, some green electricity labels exclude biomass options like landfill gas, because the exploitation of landfill gas is viable without additional financial support.

Secondly, a number of green electricity labels have set criteria on the origin of the biomass (especially energy crops) and the way the biomass is produced:

- The European *Eugene* requires that dedicated energy crops used in new power plants shall come from FSC (Forest Stewardship Council) certified sources. A power plant is “new” if it has entered operation after January 1, 2001. For existing power plants using wood (from dedicated energy crops and forestry and agricultural material), the plant will have to draw up an action plan to ensure that the wood used will be purchased from FSC certified sources within a period of 4 years.
- The Swedish *Bra Miljöval* requires that wood fuel should come from FSC-certified forestry operations or from forestry operations that do not fell in the following areas:
 - key biotopes, according to the Regional Forestry Board or the equivalent according to the particular country’s definition and methodology cf. FSC 6.1.1b
 - natural forests (FSC 6.1.1a)
 - waste land
 - un-cultivated meadow and pasture land (FSC 6.2.1a)
 - naturally leaf-dominated damp or wetlands (FSC 6.1.2b)
 - the mountainous zone above the nature conservation boundary as defined by the Swedish Society for Nature Conservation or the equivalent in other countries.The *Bra Miljöval* requires that the nutrients in the ash must be returned to the type of soil from which it originates.

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- The Finnish *Ecoenergia* requires a chain-of-custody (verification of origin) and the type of raw material used (chips from a regeneration cut, chips from small-sized stemwood from silvicultural cuttings, etc.) to be known.
 - The German *Grüner Strom Label* requires that biomass fuel needs to comply with criteria of organic farming (AGÖL or EEC Regulation 2092/91).¹⁸
 - The German *ok-power* requires that biomass from dedicated cultivation (rapeseed oil, short rotation wood) shall come from certified organic farming or FSC certified forestry.
 - The Swiss *Nature Star* (not Nature Basic) requires that tropical timber shall come from FSC certified forestry. Untreated wood complies with a standard which is oriented towards the FSC (criteria for plants using wood fuel or waste wood).
 - The Canadian *Environmental choice* requires that biomass, if generated from dedicated energy crops:
 - use only dedicated energy crops that have been sourced from operations that have implemented a sound environmental management system and are adhering to sound environmental management practices, and
 - ensure that the rate of harvest does not exceed levels that can be sustained.
 - The Australian *Green Power* requires that energy crops should come from sustainably managed plantations. Utilisation of any materials (including wastes) from high conservation value forests, such as old growth forests, other native forests, and ecologically sensitive sites (for example, areas of remnant native vegetation) are not acceptable under Green Power.

Some green electricity labels require complete FSC certification of wood energy crops, others require wood biomass to come from sustainably managed forests, as defined by the label in a generic and sometimes more specific way. Some labels just require a chain-of-custody to be in place, and others don't put any specific requirements on energy crops. Regarding non-forest energy crops some labels prescribe organic farming. For a complete comparison of systems, please refer to (Oehme 2006).

In the frame of the IEE project 'Clean Energy Network for Europe' the following draft biomass 'proposals' were made for inclusion in the European Eugene standard (Oehme 2006):

1. Eligibility of sources.
2. Woodfuel (plantation and imports) should be certified according to FSC or comparable standard.
3. GMOs are not permitted.
4. Energy crops not produced on arable land, which has been gained by conversion of pasture or grassland. Short rotation tree plantations also not produced on former forest areas.
5. Biogas plants using manure need to reduce emissions of CH₄, N₂O and NH₃ by covering the storing tank and other accurate methods.
6. Overall efficiency should be at least 60%.

¹⁸ These criteria do not apply to biomass cultivated for co-digestion in rural biogas plants (< 500 kW_e).

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7. Co-firing of solid biomass according to CEN/TS 14961:2005 in coal-fired power stations is permitted. Overall efficiency should be at least 70%.
 8. Wood fuels from non-certified forest (not plantations and imported wood fuels) shall not originate from illegal harvesting or from High Conservation Value Forests.
 9. Maintenance of soil fertility; no removal of needles, foliage and roots, if possible ash has to be returned to the soil.
 10. Integrated farming. Biomass from dedicated cultivation on arable land need to comply with guidelines for integrated crop protection. Conditions of animals producing livestock waste should comply with principles of integrated farming.
 11. Transport and auxiliary energy: fossil energy for extraction, transportation and processing of fuel, processing energy at the plant, transportation of residual products and also balancing is not permitted to be greater than 10% of the electricity supplied with the label.

Operation and management structure of the certification system

It is outside the scope of this study to analyse all European systems for renewable electricity labelling in detail. In this section, the focus will be on the European Eugene meta-standard.

Standard setting process

Regarding the standard setting process, a Eugene standard is available, but without a version number or year of publication, and without information on if and how updates will be published, or which stakeholder groups are involved in this process. An IEE project 'Clean Energy Network for Europe' has been carried out to develop ecological standards for biomass in the framework of green electricity labelling (Oehme 2006), resulting in draft biomass criteria for inclusion in the Eugene standard. It is not clear if and what standard setting process will be followed.

Certification process

According to the Eugene Standard (Eugene 2007), suppliers of labelled green electricity must conduct an annual verification process to substantiate their claims about green electricity purchases and sales and the management and use of green funds. The supplier must employ an independent certified public accountant, formally accredited to the national label, to conduct this verification. The results of the verification must be submitted to the national labelling body not later than three months after the end of each calendar year.

The verification must guarantee the following items:

1. The power supplier purchased enough electricity in quantity and type to meet its customer demand for each product (supply offerings only);
2. The power was purchased from eligible generators; (supply offerings only);
3. The product contains enough new green electricity to meet the environmental additionality requirements;
4. The sound management of the fund, including details on income and expenditure (fund offerings only). The verification process uses company contracts, invoices, billing statements, and certificates of origin generated within the regional power pool and from a system recognised by Eugene.

In any case, the national Eugene-accredited organisation must perform random checks of the auditor's work to ensure a sufficient degree of control. Any fraud must result in loss of the label and public reporting of this incident, including the name of the supplier and the product.

Accreditation of certification bodies

Eugene states that certification bodies must be formally accredited to the national label and does not add additional requirements.

Environmental claims – chain-of-custody

The Eugene label may apply to two categories of green electricity offerings:

- Those ensuring that all consumers' energy supply is matched with electricity from eligible sources and contains a proportion of supply to be from new green electricity plants or green hydro power facilities (so-called "supply offering")
- Those that charge a premium for the supply of electricity from conventional sources, with the premium being invested in a fund for further expansion of renewable capacity (so-called "fund offerings").

Status and discussion

To address different consumer preferences, the various systems include or exclude co-firing, demolition wood, sewage gas. Some of the national labelling systems require the biomass supply to meet FSC and Organic farming requirements, others do not. One lesson to be learned is that the various voluntary systems for green electricity labelling did not result in a harmonized system for eco-friendly electricity. Eugene strives to harmonise the national voluntary labelling systems, but up till now it has endorsed only two systems, the German ok-power and the Swiss Naturemade Star labels. The systems are mainly focussed on environmental sustainability. Criteria regarding social aspects were not found. The systems intrinsically assume that biomass would origin from domestic markets, where social issues do not play such an important role.

3.4 CERTIFICATION SYSTEMS RELATED TO EMISSION TRADING

Although systems related to emission trading are primary developed to certify emission reductions and not biomass, it is interesting to study their structure and development.

In the frame of the Kyoto obligations, many biomass projects are being developed under the Clean Development Mechanism (CDM) and Joint Implementation (JI). Under CDM methodologies are proposed by project participants, reviewed by a CDM Methodology Panel and approved by the CDM Executive Board. CDM methodologies are generally conservative estimations of emission reductions that can be achieved with a project, compared to the existing or baseline situation, i.e. the most likely situation in case the project was not implemented.

CDM methodologies can be divided into *small-scale* and *large-scale* methodologies. Many biomass installations have a capacity of less than 15 MW_e or 45 MW_{th}, for which small-scale methodologies can be applied, like AMS IC 'Thermal energy for the user with

or without electricity' or AMS ID 'Grid connected renewable electricity generation'¹⁹. In these cases it is required that biomass projects only use 'renewable biomass' which could be originating from forests, cropland or grass land where:

- (a) The land area remains cropland and/or grasslands or is reverted to forest; and
- (b) Sustainable management practices are undertaken on these land areas to ensure in particular that the level of carbon stocks on these land areas does not systematically decrease over time (carbon stocks may temporarily decrease due to harvesting); and
- (c) Any national or regional forestry, agriculture and nature conservation regulations are complied with.

If these 'sustainability' criteria are met, the production and transport of the biomass is regarded as CO₂ neutral. In large scale methodologies, for instance ACM0006 'Consolidated methodology electricity generation from biomass residues', also other project emissions need to be calculated like:

- CO₂ emissions from on-site fossil fuel and electricity consumption that is attributable to the project activity. This includes fossil fuels co-fired in the project plant, fossil fuels used for on-site transportation and fossil fuels or electricity used for the preparation of the biomass residues, e.g. the operation of shredders or other equipment, as well as any other sources that are attributable to the project activity; and
- CO₂ emissions from off-site transportation of biomass residues that are combusted in the project plant; and
- If applicable, CH₄ emissions from anaerobic treatment of waste originating from the treatment of the biomass residues prior to their combustion²⁰.

The production and use of pure plant oil for cultivation of oilseeds, the production of plant oil and the use of plant oil for transportation is described in small-scale methodology AMS IIIT. The project emissions consist of N₂O-emissions from cultivation the crop and emissions from energy use for processing (e.g. pressing and filtering) of plant oil. At the time of writing (February 2008), no approved methodology for production and use of bio-ethanol or biodiesel exists.

The structure and content of CDM leads to the following observations possibly relevant for developing sustainability criteria and certification systems:

- The described methodologies seek an optimal balance between practical applicability and completeness. The methodologies do not reach the level of precision of a full LCA analysis. In general the main emphasis is on the emission reductions by replacing fossil fuels, and to a lesser extent to the determination of the emissions in the production phase of the biomass.
- The idea to determine CO₂-balances and other criteria in more detail for large projects and less detail for small-scale projects is worth considering when developing biomass sustainability criteria.

¹⁹ See <http://cdm.unfccc.int/methodologies/SSCmethodologies/approved.html>. In CDM small-scale methodologies have a code starting with AMS.

²⁰ See ACM0006, v6, EB33, p 20/65, <http://cdm.unfccc.int/methodologies/PAMethodologies/approved.html>

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- CDM projects have to comply with sustainability policies of the country where the project is implemented. National approval of the host country by the Designated National Authority (DNA) is required as a prerequisite for registration as CDM project. This type of structure involves the host country in the process.
 - The status of all CDM projects and related documents can easily be accessed through a website (see <http://cdm.unfccc.int/index.html>) creating optimal transparency.

3.5 OVERVIEW EXPERIENCES WITH EXISTING SYSTEMS

In the previous sections four different types of certification systems have been investigated:

- Forest certification systems
- Biomass energy crops certification systems
- Certification systems used in the power sector
- Certification systems related to emission trading.

This section provides an overview of the experiences with the different systems and indicates how a EU certification system could make use of the experiences gained with the existing certification systems.

Forest certification systems

Among the different types of certification systems, most experience has been gained with forest certification systems.

- Forest certification show how a number of certification criteria for biomass could be formulated, related to biodiversity conservation, local environmental impacts and social aspects. No forest certifications were found that take into account the greenhouse gas balances.
- The structure of the main umbrella forest certification systems like FSC and PEFC show how criteria development can take place, either centralised using a three chamber approach (FSC) with equal votes for economic, social and environmental stakeholders, or using a more national approach (PEFC) in which national organisations develop certification systems, to be presented later for endorsement by the international organisation. These systems can act as examples when developing an eventual EU based biomass certification system.
- The experience with forest certification shows how independence of third party certification bodies can be guaranteed using ISO standards. Moreover, the quality of the standard setting procedures can also be proven using ISO standards (See section 3.1.3). It is strongly recommended to follow these ISO standards in biomass certification as well.
- Because forest certification systems have been in use for more than a decade, valuable information is collected regarding the dissemination and market dynamics of these systems. See section 3.1.6 for an impression of these market developments. Although it contains useful information, it has to be taken into account that it concerns voluntary certification, while the eventual EU based sustainability criteria and certification systems would be obligatory.
- The costs for biomass certification can be estimated based on experiences in the forestry sector. See section 3.1.5 for the costs of forest certification. In section 4.3

cost estimates for biomass certification are made based on experiences in the forestry sector.

Energy crop certification systems

Of the certification systems related to biomass energy crops only the Roundtable for Sustainable Palm Oil (RSPO) has developed a complete set of criteria and indicators and a certification system²¹. In 2008 the first plantations can probably become certified. The used set of criteria and indicators have many similarities with those in use in the forestry sector and are fine tuned on a national level. A carbon balance is currently missing, but RSPO has indicated to consider its development if there is a need for it. It has to be taken into account that RSPO has not only been developed to serve the biomass energy market, but all potential users of palm oil. The experience gained with RSPO learns that it takes a considerable effort to develop sustainability criteria and a certification system for a single type of biomass.

Certification systems in the power sector

Electricity companies have developed biomass certification standards initially for their own use (Essent Green Gold Label or GGL), or primarily to present carbon or energy balances that have to be established to obtain green certificates (Laborelec). The GGL is mainly a chain-of-custody system, which for its product certification allows the use of other certification systems. According to (Control Union 2007) Essent is presently the main end user of the GGL and uses the label for part of its biomass import. Although the verification takes place by a third party, the standard setting process and management of the system is less transparent than in case of forest certification systems and less information is publicly available about experiences with the system.

Electricity distribution companies have introduced brand names (labels) for green electricity to promote and distinguish their products. In addition, independent quality labels have been developed, to assist environmentally conscious consumers to verify the ecological performance of green products. In the first place these labels are used to exclude certain types of biomass that are perceived not to be green, in particular the biodegradable part of urban solid waste, demolition wood, combustion of sewage sludge. Secondly, a number of the labels have set criteria on the use of biomass and for instance refer to parts of FSC, organic farming or contain some other definitions. Green electricity labels are generally used on a national level and mainly in European countries. The international Eugene standard strives to harmonise the national voluntary labelling systems, but so far Eugene endorsed only two systems. From these systems, it can be learned that the absence of an international set of criteria and indicators, has lead to a proliferation of national systems, all of them with their own criteria, some of them clearly developed to meet perceived consumer preferences. None of these electricity branding systems include carbon balances.

²¹ As per the Terms of Reference, general systems for sustainable agriculture were not included in the study.

Certification systems related to emission trading

Although the Clean Development Mechanism (CDM) is primarily developed to certify emission reductions and not biomass, its structure and development is interesting, especially related to the determination of carbon balance.

- CDM allows companies to use either an existing approved methodology or to propose a new methodology to determine and monitor emission reductions. Similarly, the eventual EU based system could contain a basic CO₂-tool and an option for companies to propose new methodologies. This would require the installation of a permanent methodology panel.
- Secondly, in CDM a distinction is made between methodologies for small-scale and large-scale projects. This division could be considered when developing an EU wide systems of criteria and indicators, especially related to the CO₂ balance and possibly other issues that require extensive reporting.
- In the third place, CDM requires the explicit confirmation of the host country that the project contributes to sustainable development in its territory. This is an interesting concept, as the main issues related to sustainability can differ from country to country. The host country approval, however, cannot replace the commonly agreed sustainability criteria. Also the risk of increased bureaucracy and risk of exclusion of developing countries with weak governance need to be assessed.
- Finally, CDM can be seen as an example of a transparent system. All related documentation can be found on internet. Of course it has to be taken into account that CDM is a voluntary system and that in case of obligatory systems, part of the commercially sensitive documentation might need to be classified as confidential.

Conclusion

Although the experience with certification systems in use for biomass energy crops, in use for green electricity labelling and in use in the carbon project sector is interesting the experience in the forestry sector is considered the most relevant for the development of a biomass certification system.

The investigation of experiences with existing certification systems leaves two main issues virtually untouched: (1) introduction of the carbon balance as a sustainability criterion and (2) the fact that the EU based system would be obligatory while all of the assessed certification systems are voluntary. Analysing the work carried out by governmental initiatives on development of biomass sustainability criteria in a number of the EU Member States (UK, Netherlands and Germany) will assist to better understand these issues.

4.1 INTRODUCTION

In order to develop a sound pathway toward EU based obligatory biomass sustainability criteria and certification systems, much can be learned from the existing certification systems presented in the previous chapter. Direct application of any of these existing certification systems is, however, not possible. In the first place, the EU based system would be the first *obligatory* system. As voluntary systems are generally systems initiated and developed by companies and NGOs, its participation is seen as voluntary not limiting other trade. The introduction of government imposed, obligatory sustainability criteria that exclude the use of non-sustainable biomass could be seen as a trade barrier. The obligatory certification system will need to be furnished in such a way that it complies with the WTO regulations. In section 4.2, attention is paid to the WTO law, and an assessment is made which types of sustainability criteria can meet the WTO regulations, and which cannot. Secondly, compared to voluntary certified goods like wood and agricultural products, biomass has a relatively low value, while in comparison to conventional energy carriers it is produced in relatively small volumes. Thus, the costs of biomass certification are very relevant and assessed in section 4.3.

A comprehensive analysis of the technical and non-technical barriers of biomass certification is provided in section 4.4 including possibilities to overcome these barriers, which serve as a base for an outline towards EU sustainability criteria and certification systems as described in section 6.2.

4.2 BIOMASS SUSTAINABILITY AND WTO RULES

The legality of mandatory certification of biofuels under WTO rules can be decided on (1) by ruling under dispute settlement understanding (DSU), or (2) by a WTO agreement. The purpose of this section is to examine the first option, i.e. whether the implementation of certain trade measures giving effect to biomass sustainability criteria are compliant with the rules of the World Trade Organization (WTO) and would stand a chance of success to survive a legality challenge by a WTO member.

4.2.1 TBT agreement and GATT

Two relevant WTO agreements are setting out obligations and exceptions on trade in goods i.e.

1. Agreement on Technical Barriers to Trade (TBT Agreement) and
2. General Agreement on Tariffs and Trade (GATT 1994).

The TBT agreement is discussed first because it goes beyond non-discriminatory norms of the GATT 1994 Articles.

TBT agreement

The Agreement on Technical Barriers to Trade (TBT Agreement) aims to ensure that technical regulations and standards and uniformity assessment procedures do not create unnecessary obstacles to international trade. While it is clear that measures based on

product-related criteria are covered in the TBT Agreement, many commentators believe that the language of the TBT Agreement indicates that it is not applicable to measures that are based on *non-product related processes*, as may hold for many of the hypothetical measures giving effect to biomass sustainability criteria. Sustainable produced biomass and biofuels will physically not differ from non-sustainable biomass. Therefore, the sustainability criteria are generally related to non-product related processes. Consequently, it is questionable whether the TBT agreement should be applied to check biomass sustainability criteria, and other WTO agreements, like the General Agreement on Tariffs and Trade need to be consulted.

General Agreement on Tariffs and Trade

The General Agreement on Tariffs and Trade (GATT 1994) regulates the market access of WTO Member States. It is the basic text containing the general rules being laid down in sector agreements established in the Marrakech Final Act.

GATT 1994 articles I, III and XI

Relevant GATT provisions in the context of bio-energy certification schemes (in case the TBT Agreement does not apply) are (WWF International, 2006):

- GATT 1994 Article I: This provision sets out the most favoured nation (MFN) principle, according to which Members must extend any advantage granted to a product from one WTO member to ‘like’ products from all other WTO Members.
- GATT 1994 Article III: This provision sets out the national treatment principle, according to which internal taxes and regulations must treat imported products not less favourable than ‘like’ domestic products.
- GATT 1994 Article XI: This article prohibits the use of quantitative restrictions, including “prohibitions or restrictions other than duties, taxes or other charges” on the importation and exportation of products from or into other WTO Member countries.

Sustainable and non-sustainable biomass and biofuels can be regarded as ‘like’²² products. Certification systems that hinder or prevent the use of non-sustainable biofuels which are ‘like’ sustainable biofuels, are potentially conflicting at least with GATT 1994 Articles I and III. Therefore, in general the main question is whether the enforcement of sustainability criteria fall among the general exceptions presented in Article XX, because, if a measure is found to violate one of the GATT 1994 obligations, including Articles I, III, or XI described above, the defending WTO Member may still be able to justify the challenged measure under Article XX.

GATT 1994 Article XX

GATT 1994 Article XX provides exceptions, which may justify environment-related measures on products and the use of necessary measures to assure these standards are met, even though they violate the general principles of GATT 1994. Among others, these exceptions are justified when (i) necessary to protect human, animal or plant life or health or (ii) relating to conservation of exhaustible natural resources if such measures are made effective in conjunction with restrictions on domestic production or consumption (Bauen *et al.* 2005).

²² See Annex F for a more detailed discussion on the definition of ‘like’ products.

According to (Bronckers, Verberne et al. 2007) six aspects need to be taken into account to avoid WTO disputes related article XX, loosely translated from Dutch as follows:

1. Does the measure - and the related public interest - fall under the exceptions of Article XX?
2. Is a territorial link with the EU member state present? It is disputable if a territorial link is still needed. However, WTO jurisdiction has not cancelled out this requirement yet.
3. Is the measure proportional? It has to be proven that the measure is related with or necessary to protect the public interest that was indicated under step 1.
4. Could international treaties justify the measure?
5. Have other WTO member states been consulted?
6. Is the measure of non-economic nature?

For a more extensive explanation of GATT and WTO rules please refer to Annex F.

4.2.2 **Obligatory biomass sustainability criteria and WTO rules**

Following the introduction of WTO principles and provisions presented above, this section will explore as illustration the WTO legality of posing obligatory minimum biomass sustainability criteria recently developed in the Netherlands by the Cramer Commission (See Section 2.2). Two Dutch studies looked at the WTO legality i.e. (Bronckers, Verberne et al. 2007) and (Bossche, Schrijver et al. 2007). Results of these studies were used for the summary below. For a detailed analysis refer to the above-mentioned reports.

(Bronckers, Verberne et al. 2007) gives a risk mark and some explanation and comments for each of the nine Cramer sustainability criteria. Possible marks in the risk assessment are (i) white, (ii) grey and (iii) black, with the following meanings:

Mark	Level of risk
White	Low risk (implementation of sustainability criteria seems possible, provided it is done carefully and well justified)
Grey	Medium risk (implementation of sustainability criteria is problematic, but does not seem to conflict with WTO-Law per se)
Black	High risk (implementation of sustainability criteria would not seem to be possible in a manner that does not conflict with WTO-Law)

GHG balance & carbon sinks

The requirement demanding that biofuels sold and biomass used in Europe to produce energy should have a positive greenhouse gas balance could be acceptable under GATT 1994 Article XX as being necessary *to protect human, animal or plant life*. Being a global environmental problem, CO₂-emissions related to biofuels produced outside the EU have negative effects also in the EU member states. This means that a link with the territory of the EU member states can be made. Moreover, the Kyoto Protocol requires greenhouse gas reduction from the EU member states. Table 12 shows the conclusion of (Bronckers, Verberne et al. 2007) on this issue.

Table 12 GHG and carbon sink criteria & WTO according to (Bronckers, Verberne et al. 2007)

Principle	1. The greenhouse gas balance of the production chain and application of the biomass must be positive 2. Biomass production must not be at the expenses of important carbon sinks in the vegetation and in the soil
Mark	For 1-2: White
Comments	Criteria 1 and 2 are both marked white, provided <ul style="list-style-type: none">foreign products are not treated less favourably (<i>the jure</i> or <i>de facto</i>) as Dutch productsconcrete measures do not fall under GATT 1994 Article XI In case these conditions are not met concrete measures may be justified on basis of GATT 1994 Article XX if: <ul style="list-style-type: none">a territorial link can be constructed with the Dutch territoryin the elaboration of the measure (e.g. a calculation tool) no arbitrary choices are made which harm certain imported products Furthermore, a marginal proportionality test under the TBT Agreement cannot be ruled out at this stage.

Competition with food

When looking at the competition with food it is difficult to define workable criteria to measure the impacts of biofuel and biomass production. Excluding biofuels to avoid competition with food is regarded as extremely difficult under WTO rules. No direct territorial link with the EU country can be made, and the measure is not found in the exceptions listed in GATT Article XX. (Bronckers, Verberne et al. 2007) have marked this measure black. See Table 13.

Table 13 Competition with food and WTO rules according to (Bronckers, Verberne et al. 2007)

Principle	3. The production of biomass for energy must not endanger the food supply and local biomass applications (energy supply, medicines, building materials).
Mark	Black
Comments	Criterion 3 is marked black. The criteria mark could become white if: <ul style="list-style-type: none">foreign products are not treated less favourably (<i>the jure</i> or <i>de facto</i>) as Dutch productsconcrete measures do not fall under GATT 1994 Article XI In case these conditions are not met concrete measures cannot be justified in our opinion on the basis of GATT 1994 Article XX, due to the “apparent” absence of a territorial link with the Dutch territory. In such case a situation in which a marginal proportionality test under the TBT Agreement need to be carried out will not even occur.

It is concluded that introduction of a principle related to competition with food is difficult to implement and difficult to defend in case of a potential WTO dispute. This does not mean that competition with food is an irrelevant issue. Other measures need to be taken into consideration to avoid extreme competition with food, and at least careful monitoring of development is advised. See also section 5.1.

Biodiversity

Protection of biodiversity could be seen as a measure *to protect animal and plant life* under Article XX. The absence of a direct territorial link with the EU member state is seen as a weak point, in case a WTO dispute would arise. However, international treaties exist that could protect certain types of plant life. (Bronckers, Verberne et al. 2007) concluded that biodiversity should be marked grey. See Table 14.

Table 14 Biodiversity criteria and WTO rules according to (Bronckers, Verberne et al. 2007)

Principle	4. Biomass production must not affect protected or vulnerable biodiversity and will, where possible, have to strengthen biodiversity
Mark	For 4: Grey
Comments	Criteria 4 is marked grey. The mark of any of these criteria could become white if: <ul style="list-style-type: none">foreign products are not treated less favourably (<i>the jure</i> or <i>de facto</i>) as Dutch productsconcrete measures do not fall under GATT 1994 Article XI In case these conditions are not met concrete measures cannot be justified in our opinion on the basis of GATT 1994 Article XX, due to the “apparent” absence of a territorial link with the Dutch territory. In such case a situation in which a marginal proportionality test under the TBT Agreement need to be carried out will not even occur.

Local soil, water and air quality

Local soil, water and air quality are issues that typically affect the local environment. It is therefore difficult to prove a territorial link, which is a risk in potential WTO disputes. The fact that environmental standards are imposed on a third country will probably not be accepted by these third countries. (Bronckers, Verberne et al. 2007) indicate that current WTO law gives hardly any space to WTO members to impose environmental rules to third countries. See Table 15.

Table 15 Local soil, water and air quality criteria and WTO rules according to (Bronckers, Verberne et al. 2007)

Principle	5. In the production and processing of biomass the soil and soil quality must be retained or even improved 6. In the production and processing of biomass ground and surface water must not be depleted and the water quality must be maintained or improved. 7. In the production and processing of biomass the air quality must be maintained or improved.
Mark	For 5-7: Grey
Comments	Criteria 5, 6 and 7 are all marked grey. The mark of any of these criteria could become white if: foreign products are not treated less favourably (<i>the jure</i> or <i>de facto</i>) as Dutch products concrete measures do not fall under GATT 1994 Article XI In case these conditions are not met concrete measures cannot be justified in our opinion on the basis of GATT 1994 Article XX, due to the “apparent” absence of a territorial link with the Dutch territory. In such case a situation in which a marginal proportionality test under the TBT Agreement need to be carried out will not even occur.

Local prosperity

Principle 8 of the Cramer Commission requires that the production of biomass must contribute towards local prosperity. (Cramer 2007) recognises that *'The translation of this theme into criteria and indicators is uncharted territory (...) and so far it has not been included in any of the existing certification systems'* and instead of introducing quantifiable criteria the use of a reporting obligation is suggested by the Cramer commission.

Within FSC principle #5: benefits from the forest, two criteria on local prosperity can be found (FSC 2004):

- 5.2 Forest management should strive to strengthen and diversify the local economy, avoiding dependence on a single forest product.
- 5.4 Forest management and marketing operations should encourage the optimal use and local processing of the forest's diversity of products.

These criteria containing phrases like *'strive to'* and *'encourage'* suggest not a hard quantifiable approach either.

However, formulation of criteria to guarantee local prosperity would be seen as very controversial. This criterion is apparently intended on foreign production, which means a violation of GATT Article III.4. Secondly, it is not mentioned in the exceptions listed under GATT Article XX. Moreover, many WTO members would strongly oppose criteria related to local prosperity, as it could create a very disturbing precedent, with far-reaching consequences outside the field of biomass and biofuels. Many developing countries would regard this as an attempt to use difference in social circumstances as a justification for trade limitations (Bronckers, Verberne et al. 2007). This would be unacceptable for them and they will certainly act against this type of measures. (Bronckers, Verberne et al. 2007) mark this principle as black. See Table 16.

Table 16 Local prosperity criteria and WTO rules according to (Bronckers, Verberne et al. 2007)

Principle	8. The production of biomass must contribute towards local prosperity.
Mark	Black
Comments	Criterion 8 would appear obviously aimed at foreign production and in our opinion falls under the prohibition of GATT 1994 Article Art. III.4. Furthermore this criterion may violate GATT 1994 Article XI. This criterion (local prosperity) does not fall within the justification grounds of GATT Article XX. There is also no territorial link with the Netherlands.

Social well-being employees and local population

(Bronckers, Verberne et al. 2007) distinguishes between negative effects on human rights and the other issues related to social well being of employees and local population (namely no negative effects on working conditions of employees, no violation of official property rights, contribution to the well being of local population, insight into possible violations of the integrity of the company).

Avoiding negative effects on human rights might be justifiable under GATT Article XX (a) *'the protection of public morality'*, but this exception has rarely been applied. (Bronckers, Verberne et al. 2007) remark that when import restrictions could be justified in each occasion when there is political discontent on the developments within a country,

international trade would be seriously disrupted. However, seen the broad recognition of some human rights, it is thinkable that in case of human right violations in a third country, especially when it could be related to the traded product, a justification for trade restrictions could be accepted. It is questionable whether trade restrictions could be justified related to offences of all principles of the Universal Declaration of Human Rights of the United Nations, as it would have far reaching effects outside the biomass discussion. This would need to be analysed separately for each human right. (Bronckers, Verberne et al. 2007) mark this issue grey and black. See Table 17.

Table 17 Criteria on human rights and WTO rules according to (Bronckers, Verberne et al. 2007)

Principle	9. The production of biomass must contribute towards the social well-being of the employees and the local population. <ul style="list-style-type: none"> • 9.2 no negative effects on human rights
Mark	Grey & Black
Comments	In exceptional cases it could be argued that prevention of certain human rights violations falls within the justification ground of GATT 1994 Article XX (a): the protection of public morality. For each individual human right it needs to be examined whether this justification ground can be called upon.

Other issues related with social well being of employees and local population are not listed under GATT 1994 Article XX exceptions and concern local production circumstances with no direct territorial link with the EU member states territory. (Bronckers, Verberne et al. 2007) are therefore rather pessimistic that trade measures related to these issues would held in a potential WTO dispute, and mark this issue black. See Table 18.

Table 18 Criteria on human rights and WTO rules according to (Bronckers, Verberne et al. 2007)

Principle	9. The production of biomass must contribute towards the social well-being of the employees and the local population (other cases) <ul style="list-style-type: none"> • other issues
Mark	Black
Comments	For the remainder Criterion 9 would appear obviously aimed at foreign production and in our opinion falls under the prohibition of GATT 1994 Article Art. III.4. Furthermore this criterion may violate GATT 1994 Article XI. This criterion (local prosperity) does not fall within the justification grounds of GATT 1994 Article XX. There is also no territorial link with the Netherlands.

4.2.3 Analysis of other possible trade measures

Both recent Dutch studies (Bossche, Schrijver et al. 2007) and (Bronckers, Verberne et al. 2007) looked in close detail into the compliancy of hypothetical trade measures that give effect to the Cramer criteria for the sustainable production of biomass to WTO provisions.

(Bronckers *et al*, 2007) assessed the potential to implement the Cramer sustainability criteria in concrete measures that are compliant with WTO and EU trade law. The authors considered eight hypothetical trade measures, as follows:

-
- **Minimum requirements:** to legally prescribe criteria as minimum requirements, to which all locally produced and imported biofuels need to comply. This option was elaborated in the previous section.
 - **Compulsory blending requirements:** incorporating the criteria in a biofuel regulation, in the sense that only biofuels meeting the criteria count towards meeting the blending obligation. *WTO compliancy of compulsory blending is similar to that of minimum requirements.*
 - **Subsidy conditions:** incorporating the criteria as subsidy conditions in subsidy regulations that aim at promoting the use of biomass and biofuels; *In general no conflict with WTO-regulations is expected as long as the subsidies are not bound (de jure or de facto) to the use of domestic products.*
 - **Excise duties deduction:** to implement lower excise duties for imported biofuels meeting the criteria. *Similar to subsidies, no discrimination between imported and local products is allowed. In addition it has to be assessed whether the excise duty deduction is a discriminatory tax measure as intended in GATT 1994 Article III.2. If so, for each criterion it should be determined whether GATT 1994 Article XX provides justification of the measure.*
 - **Reporting requirements:** introducing a reporting obligation (specifically aimed at the criteria) for industrial users of biomass and biofuels. *In general a report obligation is not expected to be seen as a trade limiting measure.*
 - **Import ban:** taking urgent measures against the import of biomass or biofuels that do not meet the criteria. *An import ban is not expected to be allowable, as it is infringes Article XI of GATT. Only for criteria 1 and 2 (greenhouse gas balance and carbon sinks) a justification might be found.*
 - **Covenants:** governments supporting or taking part in covenants between companies and in which appointments are made concerning the use of biomass and biofuels meeting the criteria. *In general covenants between private parties fall outside WTO rules. Only if governments dominate the covenant, WTO rules would apply, in the same manner as with binding minimum criteria.*

It goes beyond the scope of this study to analyse these measures in detail. Please refer to the original reports. Annex G provides a readers guide into the other comprehensive report by (Bossche, Schrijver et al. 2007).

4.2.4 Additional observations on WTO and sustainability criteria

In short, the above presented analysis, which is for a large part based on the work of (Bronckers *et al*, 2007), found that implementation of the Cramer criteria covering (1) greenhouse gas balance and (2) carbon sinks seems possible under WTO rules, that the implementation of the Cramer criteria dealing with (in-)direct social and economic impacts seems impossible, and that implementation of Cramer criteria dealing with other (in-)indirect environmental impacts will be problematic, although they do not seem to conflict with WTO-Law *per se*.

(Gilbertson *et al*, 2007) observes that not only the Dutch but also the British and German initiatives cite the WTO as a major obstacle to biomass certification. Voluntary certification is allowed under WTO rules, but only if there is free competition among

different labels, and if no measures are taken to inhibit trade in non-certified goods. Mandatory certification (i.e. the setting of social and environmental standards) would be likely to face a challenge from producer countries. (Doornbosch et al, 2007) state that “*even if the certification requirements would apply to all countries and to domestic production in a similar way, the measure might still be found against by a WTO dispute panel on the grounds of having a disproportionate impact on trade.*”

The exceptions provided by GATT 1994 Article XX give potential room to justify potential trade measures - in particular environment-related measures - giving effect to biomass sustainability criteria. Especially issues that affect the environment of the importing country, like greenhouse emissions, could be covered under Article XX. Local environmental effects will probably not be regarded as affecting the importing country and might not be allowed under Article XX.

No provisions exist within WTO agreements to link trade with social issues and labour standards, and any attempt to make such linkages has so far been met with opposition. However, the International Organization for Standardization (ISO) has recently launched the ‘Working Group on Social Responsibility’ with the task of publishing ISO26000 standard on guidelines for social responsibility in 2008 (Bauen *et al.* 2005).

4.2.5 **Conclusion**

The legality of mandatory certification of biofuels under WTO rules can be decided on (1) by ruling under dispute settlement understanding (DSU), or (2) by a WTO agreement. The first option has been investigated in some detail.

The Agreement on Technical Barriers to Trade (TBT Agreement) does not give much guidance, as it is not certain whether it is applicable. Many commentators believe that the language of the TBT Agreement indicates that it is not applicable to measures that are based on non-product related processes, like is the case with biofuels.

The General Agreement on Tariffs and Trade (GATT 1994) mandates equal treatment of ‘like’ products. Sustainable and non-sustainable biomass and biofuels are probably regarded as ‘like’, and introduction of mandatory sustainability criteria could be regarded as non-conformant. However, article XX lists a number of exceptions that could give room for implementation of environmental measures.

Recent analyses of the compliancy of Dutch Cramer criteria to WTO rules suggest that:

1. Requirements related to the greenhouse gas balance including carbon sinks can probably be formulated compliant with WTO rules, provided that foreign products are not treated less favourable than domestic products and that the measure does not fall under GATT 1994, Article XI.
2. Local environmental effects (biodiversity, soil & surface water protection, air quality etc.) may be compliant with WTO rules.
3. Criteria that aim to avoid competition with food products and social criteria like contribution to local prosperity and social well being of local population are most probably not compliant with WTO rules.

The question of what is accepted or not under WTO can ultimately only be solved by dispute settlement.

4.3 COSTS OF BIOMASS CERTIFICATION SYSTEMS

Since the 1990s certification has been applied in the forestry sector and substantial forest areas have been certified since. The following main cost components can be distinguished in forest certification and are investigated in the next sections:

- Costs of biomass product certification
- Costs of chain-of-custody certification
- Costs of getting accredited for carrying out certification
- Costs of setting up the certification system.

The biomass product certification cost estimates will be based on information from the forestry sector explored in section 3.1.5 and will be indicative and informative only, for the following reasons.

- In the first place, the forest certification cost estimates were based on European examples only. Auditing costs could be higher in case site visits need to be made to developing countries where few or no local auditors are available. Local labour costs associated with internal auditing costs could however be lower.
- Secondly, a number of factors could lead to variations between costs of ‘sustainability’ certification and costs of ‘forest’ certification. For example:
 - Obligatory biomass certification will entail the verification of partly different sustainability criteria. For instance, biomass certification will most probably contain the establishment of a carbon balance, which is absent in current forest certification systems, but might contain fewer local environmental and social criteria (because of its obligatory character).
 - The ownership structure of plantations varies depending on the crop involved. Some crops are mainly produced by large numbers of smallholders; other crops typically by large centrally owned plantations. Certification of smallholders will be more expensive.
- Finally, it is important to bear in mind that biomass energy crops have generally a lower economic value per tonne or cubic meter than timber and other forest products. In case of biomass energy crops, the costs of certification will have a relatively stronger impact on the price of the final product.

Therefore, the certification cost estimates presented here have an indicative and informative value only.

4.3.1 Cost of biomass product certification

The costs of certification for the users of the certification system can be divided in *direct* certification costs related to the auditing process and *indirect* certification costs related to changes in management planning and biomass production practices that may be needed to conform to the certification standards.

Direct certification costs

Direct certification costs consist of *external auditing costs* related to the third party certification body and consultants, and the *internal auditing costs*, related to the preparations that the company requesting certification has to make. Rough indicative estimations of direct certification costs can be made based on experiences in the forestry sector.

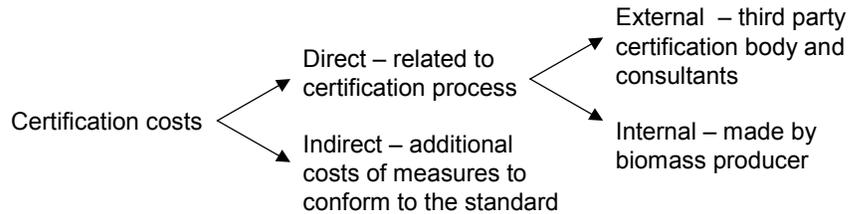


Figure 11 Structure of product certification costs

Direct external costs (auditing costs invoiced by third party certification body)

In forest certification generally a five years cycle is followed. In the first year, detailed initial auditing is needed while in the subsequent years 2-5 audits will be less time consuming and costly. In year six the next full certification cycle would start.

(FSC 2001) provides auditing costs data for an area sized between 8,000 and 16,000 ha. Data derived from (FSC 2001) (section 3.1.5) suggest for a forest of this size external auditing will cost about 10,000 euro. (Smith 2002) indicates that costs for *group* certification have ranged from 5,000-30,000 USD. For a sample forest sized between 15,000 and 28,000 ha (Smith 2002) estimates group certification costs at 15,000 USD. (Smith 2002) further indicates that initial certification of areas smaller than 1,000 ha will cost at least 4,700 USD. The two data sources present very different cost estimates for the subsequent annual audits. According to (Smith 2002) a subsequent annual audit for a forest of 15,000 ha will cost about 5,000 USD, while (FSC 2001) calculates only 639 euro for such audit for an 8,000-16,000 ha area. Author BTG assumes that in case a site visit is required 5,000 Euro (current prices) is more realistic.

Direct internal costs (invoiced by consultant)

Consultants are often hired to advise and support the involved company in the preparation of the external audit. For the five German cases investigated in (FSC 2001) between 88 and 228 hours of consultancy were used. The average was 138 hours. Depending on the hourly rate, the associated costs are 5,000 – 15,000 Euro. Supposedly no consultancy costs were made in the years 2-5.

Internal auditing costs (made by company that initiates certification)

(FSC 2001) indicates that for certification of an area of 8,000 - 16,000 ha the involved company will need 60-178 hours²³ to make its own preparations. Assuming internal costs of 35 Euro/hour, the internal auditing costs will amount about 2,000 – 6,000 Euro. For subsequent years, author BTG assumes that the project owner spends one to two weeks

²³ Excluding an outlier of 609 hours

for audit preparation, accompanying site visits and answering questions (CARs and FARs) for biomass certification. The associated costs amount to 1,500 – 5,000 Euro.

Based on the cost data presented above, an estimate of the direct biomass certification costs has been constructed. See Table 19. In order to relate costs of forestry certification (in ha) with biomass production (in tonnes or GJ), the following assumptions were made:

- The average biomass yield is 5 tonnes biomass/ha.
- The net calorific value of biomass is 15 GJ/tonne.

This assumption need to be adjusted depending on the crop type and local conditions.

Table 19 Estimated direct costs for biomass certification based on experiences with forest certification

Area	ha	100	1,000	10,000	30,000	60,000
Mass yield	ton/year	500	5,000	50,000	150,000	300,000
Energy yield	GJ	7,500	75,000	750,000	2,250,000	4,500,000
Direct external costs						
Certification body - first audit	Euro	5,000	6,000	10,000	15,000	20,000
Consultant - first audit	Euro	5,000	6,000	10,000	12,000	15,000
Certification body - subsequent audits	Euro/year	5,000	5,000	6,000	8,000	10,000
Direct internal costs						
Biomass producer - first audit	Euro/year	2,000	3,000	5,000	6,000	8,000
Biomass producer - subsequent audits	Euro/year	1,500	2,000	3,000	4,000	5,000

Assuming that biomass certificates will have validity for a five years period, like in the forestry sector, the specific biomass certification costs expressed in Euro/GJ can be calculated. See Table 20.

Table 20 Estimation of biomass certification costs per unit, assuming a five years certification cycle

Area	Ha	100	1,000	10,000	30,000	60,000
Biomass yield	ton/year	500	5,000	50,000	150,000	300,000
Energy yield	GJ	7,500	75,000	750,000	2,250,000	4,500,000
Total direct external costs						
Certification body - first audit	Euro	5,000	6,000	10,000	15,000	20,000
Consultant - first audit	Euro	5,000	6,000	10,000	12,000	15,000
Certification body- subsequent audits	Euro/5 years	20,000	20,000	24,000	32,000	40,000
Total direct internal costs						
Biomass producer - first audit	Euro	2,000	3,000	5,000	6,000	8,000
Biomass producer - subsequent audits	Euro	6,000	8,000	12,000	16,000	20,000
Total direct costs						
	Euro/5 years	38,000	43,000	61,000	81,000	103,000
	Euro/yr	7,600	8,600	12,200	16,200	20,600
	Euro/ha/yr	76	8.6	1.22	0.54	0.34
	Euro/GJ	15	1.7	0.24	0.11	0.07

Although the presented cost estimation has to be interpreted as a exemplary first indication of biomass certification costs, it shows that the direct specific certification costs are relatively small in case of biomass yields of 50,000 tonnes/year and upwards, but are substantial to excessive when annual biomass yields are 5,000 tonnes or less.

Group certification is often seen as a solution to keep certification costs of smaller areas within limits. Although this may be true to the individual landowner, the overall costs of third party auditing (direct external costs) would be similar or slightly higher in the case of group certification, depending on the size of the group and the area per group.

Main point of attention is that a group needs to be organized. (Smith 2002) distinguishes different types of groups:

- In forestry, the *resource manager* is a forester or group of foresters that manages forestlands for independent landowners. Resource managers can be hired to just act as a group umbrella to organize certification, rather than requiring full management services which these organization typically also offer. This is the least complex way of organizing forest, or biomass group certification.
- Another option is to use an existing *cooperative* or *association* to organize the group certification. Setting up a new cooperative or association just for the sake of group certification seems to be too time and effort consuming.

Indirect certification costs

Biomass is a diverse product and is grown under different conditions. Depending on the requirements, measures may need to be implemented to conform to the certification standards. Some measures like improved management planning can generate cost reductions by increased efficiency. Measures that lower the yield, like for instance obligatory set aside areas or other areas that need to be untouched for the sake of saving biodiversity, can constitute a considerable loss of income. Given the fact that European biomass criteria have not been elaborated in detail yet and considering that the need for measures depends on the type of biomass, at this point in time it is not possible to make a serious estimate of the indirect certification costs.

4.3.2 Costs of Chain-of-custody certification

Chain-of-custody (CoC) certification allows companies that manufacture and/or market biomass products to label them with the logo of the certification system, indicating the product is sustainably produced.

Chain-of-custody certification is needed when applying the ‘track-and-trace’ system in which the product is traced from its sustainable origin to the end consumer or the ‘mass balance’ system in which the product can be mixed with products from non-sustainable origin, but in which the share of sustainable product is carefully calculated and labelled. In case a ‘book-and-claim system’ is applied no Chain-of-custody certification is required, although the produced volumes of the sustainable product need to be checked and verified at the production site.

Each party involved in the chain-of-custody, like importing companies, traders, and logistic companies need to become certified. Certification in general requires an internal review whether the company can comply with the requirements of the chain-of-custody-standard. In general, companies wishing to become CoC-certified need to:

- Introduce a quality management system, related to division of responsibilities, procedures, training and records keeping
- Keep record of material inputs and outputs as described in the standard

- Apply a certain control system and calculation system in case of sources being mixed.
- Apply labelling according to the standard.

A certification body needs to be contracted that carries out an on-site audit. (Xpedx 2007) estimates that in case of printing companies wishing to be chain-of-custody certified under FSC or SFI, on-site audits take 0.5 – 1 day per location and another day is needed for preparation of the audit report and certification. At a rate of 1,250 USD/day (Xpedx 2007), external auditing costs are 1,875 – 2,500 USD.

The indirect costs of implementation of measures to meet the chain-of-custody standard are borne by the company that is being certified. At this point it is difficult to estimate these costs.

4.3.3 Costs of accreditation of certification body

Certification bodies wishing to carry out third party certification need to be accredited. Beside a document review and office audits at the premises of the certification body, it also involves field audits performed by the certification body under supervision of the accreditation services.

Accreditation Services International (ASI) performs accreditation services for FSC and estimates that accreditation costs roughly 29,700 Euro excluding travel and accommodation costs (ASI 2006). Considering the number of man-days involved author BTG estimates that travel and accommodation costs at roughly 3,000 - 7,000 euro (average 5,000 Euro). Table 21 shows a breakdown of estimated accreditation costs.

Table 21 Overview estimated accreditation costs.

Step	Description of charges	Cost estimate (Euro)
Application pack	Printed materials	400
Application fee	Application	1,800
Document review	ASI Lead auditor: 10 days	7,000
Office audit	ASI Lead auditor: 8 days	5600
Forest audit	ASI Lead auditor: 8 days	3000
	Local expert: 5 days	
CoC audit	ASI Lead auditor: 5 days	3500
Final accreditation report and procedure	ASI Lead auditor: 4 days	2800
Travel and accommodation		5,000 ^{a)}
Total		34,700

Source (ASI 2006) ^{a)} Estimation BTG

Note: lead auditor has a rate of 700 Euro/day, local experts 600 Euro/day.

Note: ASI presents these number as a rough indication, costs of accreditation may vary.

The certification body will need to prepare itself for the accreditation. The associated internal costs of the certification body will be at least 20,000 - 30,000 Euro. The total costs of getting the accreditation will thus be in the order of 55,000 - 65,000 Euro. In case of FSC the accreditation is granted for a period of 60 months (5 years). Note that in addition to the initial accreditation annual surveillance audits are needed.

4.3.4 Costs of setting up certification system

Setting up a certification system generally involves the establishment of a management body that organises meetings and manages the process of development of the sustainability criteria and certification system. Secondly, a large number of stakeholders have to invest time and money in setting up and evaluating sustainability criteria and attending stakeholder meetings. It is difficult to estimate the costs of setting up a certification system. However, a rough and indicative cost estimation follows below.

A management body that consists of four persons will cost at least 200,000 Euro/year. Using the experience gain in RSPO as guidance, at least 4 years is needed before a certification system is fully developed, so 800,000 Euro is easily spent. In addition, say that at least 50 persons will attend 4 general meetings; if their costs for preparation, travel, and accommodation are conservatively estimated at 2,500 Euro/person, their activities represent a value of 500,000 Euro. A dedicated working group of 25 people will be needed to develop the standard and will meet at least 12 times, representing a value of another 750,000 Euro. This very rough first order calculation reveals that setting up a certification system easily costs 2 million Euro or more. To keep the system up and running, the management body will need at least 200,000 Euro/year to continue operation.

4.4 OVERVIEW OF BARRIERS

The analyses in the previous sections of existing certification systems, WTO rules and certification costs provide insight in the technical and non-technical barriers that need to be overcome when introducing eventual obligatory biomass sustainability criteria and certification systems.

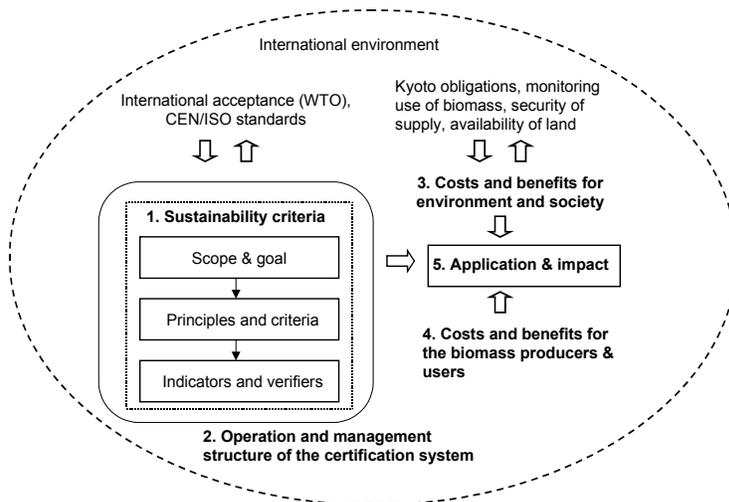


Figure 12 Theoretical framework

In this section, the technical and non-technical barriers are listed and analysed systematically, following the structure presented in the theoretical framework (see Figure 12), thus identifying technical and non-technical barriers related to

- Sustainability criteria (section 4.4.1)

-
- Organisational structure of the certification system (section 4.4.2)
 - Costs and benefits for environment and society (section 4.4.3)
 - Costs and benefits for the user (section 4.4.4) and
 - Application and impact (section 4.4.5).

In developing possible pathways to EU based sustainability criteria and certification systems, these barriers need to be addressed.

4.4.1 Sustainability criteria

Related to sustainability criteria the following barriers can be identified:

- Some sustainability criteria are most likely in conflict with WTO rules and could lead to trade disputes. This barrier specifically applies to obligatory sustainability criteria developed and prescribed by national governments. See Section 4.2.2.
- Some sustainability principles are difficult to translate into effective criteria and indicators. (Cramer 2007) suggest introducing reporting obligations for principles like avoiding competition with uses like nutrition (food), local bioenergy applications, medicine and building materials; and other indirect effects of biomass production.
- Biomass covers a large diversity of crops and residues, which make it challenging to formulate sustainability criteria that are relevant for all biomass types imaginable. Some criteria might not be relevant for certain crops and only increase bureaucracy. On the other hand, the sustainability criteria should be complete and from a legal point of view it may be difficult to make a distinction between biomass types for which compliance with minimum criteria needs to be shown and biomass types for which this is not required.
- It is important that the criteria are formulated unambiguously. (UPM 2005) indicates that definition of clear indicators related to biodiversity, unique habitats, and protected areas can be difficult. See section 3.1.2. Ambiguous criteria could form a barrier to effective implementation of sustainability criteria, indicators and verifiers.
- The use of carbon balances in certification systems is a relatively new development. Existing forest and biomass certification systems do not include carbon calculation tools. The Dutch and British governments have recently commissioned the development of CO₂ calculation tools and in Walloon a carbon balance calculation method for green electricity certificates already exists. However, practical field experience with this tool is limited.
- A choice for a single type of chain-of-custody scheme should be made, or if different chain-of-custody schemes (track-and-trace, mass balance or book-and-claim) would co-exist, a system needs to be developed to avoid double counting, i.e. to prevent e.g. that biomass produced and booked in a book-and-claim system is also included in a track-and-trace system.

The formulation of sustainability criteria is challenging, but in general possible if the associated limitations in relation to indirect effects such as avoiding competition with food and indirect land use changes are taken into account. Compared to existing certification systems, additional principles need to be implemented, for instance principles related to carbon balance and carbon stocks. The development of a 'meta-standard' that only refers to sustainability criteria in existing certification systems is

deemed insufficient. Comprehensive sets of sustainability criteria for a large number of biomass types need to be developed.

4.4.2 **Operational and management structure of the certification system**

Regarding the organisation of the certification system, barriers are identified related to:

- Different application of sustainability criteria among member states and
- Potential development of weak non-transparent certification systems.

Sustainability criteria developed at the EU level will need to be implemented (transposed) in the national legislation of member states. There is some risk that the sustainability criteria will not be interpreted in an equivalent way. If member states would prescribe different tools to check compliance with sustainability criteria (e.g. reporting obligations, in-company checks, or full third party certification) different levels of playing fields could develop within the EU.

In case exclusively third party certification is allowed to monitor compliance with sustainability criteria, several systems to check the European minimum criteria and possibly additional voluntary criteria may be developed in parallel. Some of these systems might be stricter than others but all systems have to comply with at least the European minimum criteria. Besides the strictness of criteria, requirements should be set regarding the structure and operation of the certification systems to avoid weak implementation, weak verification practices and conflicts of interest, and to promote independence of verification activities and transparency. As elaborated in the chapters regarding forest certification (see section 3.1.3) the following ISO standards can be used for these purposes.

- Standard setting process:
 - ISO 59: Code for Good Practice for standardization
- Certification process
 - ISO Guide 62: 1996 (EN 45012: 1998) General requirements for bodies operating assessment and certification/registration of quality systems.
 - ISO Guide 65: 1996 (EN 45011: 1998) General requirements for bodies operating product certification systems.
 - ISO Guide 66: 1999 General requirements for bodies operating assessment and certification/registration of environmental management systems.

Application of these standards can help to avoid development of non-transparent or not independent certification systems.

4.4.3 **Benefits and costs for environment and society**

Benefits from use of biomass sustainability criteria and certification systems

The anticipated benefits for environment and society of using sustainable biomass are:

- Greenhouse gas savings including effect carbon sinks
- Avoiding unacceptable competition with food
- Protection of biodiversity (high conservation forests, wildlife habits)

- Protection of local environment (soil & water protection, agrochemicals, GMOs)
- Promoting positive local economic effects
- Avoid unacceptable labour and indigenous people rights violations.

A fairly exhaustive list of desirable sustainability principles is found in (Cramer 2007). The previous sections 4.2, 4.3 and the literature overview in Chapter 2 indicate some main barriers realising the anticipated benefits:

- Certification systems have limitations in their effectiveness to influence circumstances and developments taking place on a level higher than company level
- Only a limited number of obligatory sustainability criteria would hold ground in case of a WTO conflict.

Table 22 shows an overview of the anticipated effectiveness of sustainability principles and the estimated risk that the application of the principle would be forbidden in case of a WTO conflict. The last column shows that obligatory biomass certification can at best effectively guarantee:

- Greenhouse gas savings including effect carbon sinks
- Protection of biodiversity (high conservation forests, wildlife habits)
- Protection of local environment (soil & water protection, agrochemicals).

Therefore not all desirable benefits for environment and society can be achieved through obligatory certification. The second column of Table 22 shows that voluntary certification could in addition play a positive role in:

- Social well-being employees, and
 - Indigenous peoples rights
- and formulate stricter criteria related to
- Biodiversity, and
 - Local environmental effects.

Table 22 Estimated effectiveness of voluntary and obligatory certification systems in the implementation of sustainability principles, taking into account WTO-risks

Principle	Effectiveness voluntary certification systems ^{a)}	Effectiveness obligatory certification systems (incl. WTO risk ^{b)})
1. Greenhouse balance & carbon sinks	+	+
2. Competition with food / other indirect effects land use change	-	-
2. Biodiversity	+	+/-
3. Local environmental effects	+	+/-
4. Local economic effects	+/-	-
5. Social well-being employees	+	- ^{c)}
6. Indigenous peoples rights	+/-	-

^{a)} Evaluation by BTG based on literature survey. + = effective; +/- = limited effective; - = not effective

^{b)} Derived from (Bronckers, Verberne et al. 2007). White (+) = low WTO risk; grey (+/-) = medium WTO risk; Black (-) = high WTO risk ^{c)} Only preventing human rights violations could be acceptable under WTO. (Bronckers, Verberne et al. 2007)

Voluntary certification can have an important role in addition to obligatory certification. Still, also voluntary certification is expected not to tackle all identified problems, in particular those related to the competition with food and other indirect effects of land use change to biomass production. Taking the example of palm oil, if all palm oil in a country would be certified, no oil palm would be planted anymore on the grounds of a previous rainforest or wetland. However, pressure on land for oil palm could force the growing of other crops on these protected grounds. The biomass certification system is ineffective in such case.

Other measures need to be considered to tackle possible problems of biomass production related to competition with food and other indirect effects of land use change. These could include compensation of owners of areas of high conservation value for protecting and not using the area for other purposes, thereby maintaining biodiversity, wildlife and also carbon stocks. Related ideas were suggested during the UNFCCC Climate Conference in Bali in December 2007. Secondly, in general lowering the demand for bioenergy crops on agricultural land lowers competition for land for agricultural crops. In some cases, when the competition for land apparently leads to local environmental problems, the EU could consider exclusion of these crops for energy production, in liaison with the producer countries.

Cost of the use of biomass sustainability criteria and certification systems

The costs of the biomass certification system for society consists in the first place of the costs that the EU and national governments will need to make to set up and maintain the obligatory certification system, plus the subsidies they grant, if any. Secondly, certification will increase the costs of biomass production. These costs will partly be borne by the biomass producers and traders and lower their profits, for another part the costs will be translated into higher biomass prices and subsequently higher energy prices for the end user.

4.4.4 Costs and benefits for the user

The main users of the biomass certification system will be the biomass producers and the companies producing bioelectricity, bio-heat and biofuels.

Costs and benefits for biomass producers

Biomass certification will provide biomass producers increased or secured access to environmental conscious markets like the EU. Depending on the certified biomass demand, initially premiums could be anticipated. Parallel to the developments in the forestry sector, after a certain period certification could become common and the level of price premiums are expected to decrease or diminish. See section 3.1.5.

The costs of certification can form a serious barrier to small biomass producers. A possible solution is to allow group certification, in which the costs of certification can be shared by a number of small producers. See section 4.3.1 for more details on the costs for biomass product certification related to production volumes.

Costs and benefits for the biomass users

Obligatory biomass certification is unavoidable for energy companies and biofuels producers that wish to benefit from the price premiums generally paid on bioelectricity, bioheat and biofuels. Compared to a similar situation without biomass certification, the energy companies have to incur extra costs using the certification system. Moreover, initially, when not much certified biomass is available, a price premium might need to be paid to procure certified biomass.

Biomass certification could form a barrier if increased costs would make bioenergy production unfeasible. Also there is a risk that certain types and volumes of biomass will become unavailable if they cannot meet the sustainability criteria. For biomass users this uncertainty creates an investment risk and biomass producers could become shivery to invest in this sector if the expected benefits do not compensate for this risk.

Other benefits of biomass certification for the bioenergy sector as a whole are achievement of responsible business targets and creation of a green image, although these benefits could be more modest for individual companies as obligatory character of certification makes it a less useful tool to distinguish oneself from other companies.

4.4.5 External barriers

The obligatory character of the EU-wide application of certification systems would make it a broader used and wider disseminated system than current voluntary biomass certification systems. The degree to which barriers covered in sections 4.4.1 to 4.4.4 can be overcome determines the application and impact that the biomass certification can have. Taking into account the international framework in which the sustainability criteria and certification systems will be implemented the following ‘external’ barriers can be identified.

- The EU member states generally will only have a modest potential impact on biomass production in non-EU countries. The biomass exporting country might respond to the imposition of sustainability criteria by shifting its biomass exports to less demanding markets. Alternatively, only the most sustainable areas might get certified, while other areas would continue serving the less demanding markets. This way, effective change in the sector would be marginal, even if the exporting country meets the sustainability criteria for part of the production.
- If a biomass certification system excludes certain types of biomass as being unsustainable, it could distort the prices and wages paid by these biomass producers, which could worsen the situation of the biomass producers, also regarding maintaining sustainability. Research into the issue of child labour has made it clear that import constraints on goods produced using child labour do not necessarily improve the situation of the children in the exporting economy, at least in the short and medium term (Bossche, Schrijver et al. 2007).
- Developing countries exporting biomass may perceive these criteria as a form of eco- or labour protectionism. The practical effect of implementing the criteria will be an increase in the cost of production (Bossche, Schrijver et al. 2007). If exporting countries are unwilling to work with biomass certification systems it would dramatically lower their impacts.
- Various factors resulted in limited uptake of forest certification in developing countries like non-resolution of indigenous right matters, indifference by foreign owned companies, focus on non-eco sensitive markets, illegal logging providing a

cheap alternative, poverty and political instability of the countries. It can be anticipated that biomass certification in developing countries will face similar challenges.

These barriers emphasise the need for extensive consultation with the biomass producing third countries outside the EU.

The introduction of obligatory biomass sustainability criteria and the development of certification systems are primarily aimed at sustainable production of biomass. Sustainability is a container concept, embracing issues like greenhouse gas emissions, biodiversity and social aspects. It also cannot be separated from issues like competition for land for food, materials and energy; it relates to the broader greenhouse emission reduction targets formulated within the EU and as part of the Kyoto obligations as well as to energy security within the EU.

In this section it is investigated how obligatory biomass certification could be used to support these related issues, with focus on:

- Land availability for food/materials/energy (section 5.1)
- EU energy security (section 5.2)
- Kyoto obligations (section 5.3)
- Greenhouse gas accounting (section 5.4), and
- Monitoring biomass production and use (section 5.5).

5.1

LAND AVAILABILITY FOR FOOD/MATERIALS/ENERGY

This section provides an analysis of how sustainability criteria and certification systems can assist the future problem in land availability for food/materials/energy. Biomass production can lead to competition with food for land. (Cramer 2007) indicates the following potential effects of biomass production on land use:

Economic effects:

- Rise of food prices
- Effects on (market) prices and availability of other products such as cattle feed, construction materials and medicines.

Changes in patterns of land use:

- Relocation or change of food production and cattle breeding
- Changes in the type of vegetation and the share of vegetation and crops. This can result in more one-sided or on the contrary a more many-sided land use. Apart from this, in both cases the land use can also become more intensive by other, more efficient production methods.
- Changes in property structures
- Deforestation
- Loss of protected areas.

A number of NGOs have repeatedly expressed their concern on the effects of increased biomass production. Especially reports on pressure on land to expand new palm oil plantations in Malaysia and Indonesia to the detriment of rainforests and wetlands, and increasing food prices in Mexico as a result of increasing demand for biofuels for transport, have caught the attention of the media and general public.

The negative effects of increased land use can be limited by efficiency improvements in the agricultural sector: with higher yields per hectare in food and feed crops, space can be created on current farmlands for new biomass production. Similarly, efficiency improvements in biomass production will result in higher yields and a lower demand for land per unit of energy. In addition, if biomass could be produced on ‘marginal lands’ presently not used for food or feed production, the pressure on agricultural land could be limited.

The Dutch Cramer Criteria explicitly include a principle stating that biomass production should not lead to competition with (local) food production, local energy supply, medicines and building materials. However, land use changes and efficiency improvements are macro economic developments that exceed the level of an individual company. (Cramer 2007) acknowledges this, and instead of setting quantitative criteria, the testing framework demands companies to provide insight into the change of land use in the region of the biomass production unit and into the change of prices of food and land in the area of the biomass production unit. This reporting obligation needs to be fulfilled only at the request of the Dutch government.

Any attempt to formulate hard criteria, for instance stating that biomass should be produced only on marginal land, will meet difficulties in an eventual WTO-case, as explained in section 4.2.2. It is concluded that obligatory biomass certification can hardly be used to provide a solution to any problem in land availability for food, feed and energy. Instead, other instruments need to be considered to manage competition for land with food and feed production.

If European bioenergy targets undisputedly lead to unacceptable changes in land use and competition with food, than changing the renewable energy targets should be considered. However, all other possible measures should be considered first, as changes in targets would have an adverse effect on the development of the bioenergy sector.

5.2 EU ENERGY SECURITY

Bioenergy is an excellent means to improve the energy self-sufficiency of the EU member states. Production of biomass energy crops within the European Union strengthens the energy independency from third countries. In addition, the import of biomass is expected to increase substantially (Siemons, Vis et al. 2004). Vis-à-vis fossil fuel use, the import of biomass diversifies the number of countries supplying energy carriers to the EU.

Biomass certification is a way to implement biomass production systems in an acceptable and responsible way. Without securing that biomass is produced in a sustainable way, its use could encounter strong opposition from public opinion, pressure groups and potentially from third countries. This could obstruct the development of biomass production to levels that contribute to the EU energy security.

5.3 KYOTO OBLIGATIONS

In this section it is analysed how sustainability criteria and certification systems for biomass production can assist in meeting the Kyoto obligations.

Developed countries including EU Member States are so-called Annex B countries, with emission reduction targets under the Kyoto Protocol. Biomass sustainability criteria and certification systems promote low carbon emissions in the biomass production phase. Reduction of carbon emissions will be accounted in the national greenhouse gas inventory. Thus, lower greenhouse gas emissions from biomass production help Annex B countries to meet their national reduction targets. To ensure that the sustainability criteria related to carbon emissions of biomass production contribute optimally in meeting the Kyoto obligations, the criteria should be made compatible with the accounting rules for Greenhouse Gas Inventories as laid down in (IPCC 2006). See also section 5.4

Most developing countries, including large emerging economies like China and India, are so-called non-Annex B countries. They have to establish national greenhouse gas inventories but are currently not bound to meeting emission reduction targets. However, in the developing countries sustainability criteria related to the GHG balance of biomass production and carbon sinks will also promote the reduction of greenhouse gas emissions, whether or not formally required under the Kyoto protocol.

Sustainability criteria and certification systems for biomass production could possibly contribute to the quality of Kyoto-type projects. In the frame of the Kyoto obligations, many biomass projects are being developed under the Clean Development Mechanism (CDM) and Joint Implementation (JI). The European ‘Linking Directive’²⁴ enables the transfer of emission reductions generated by these projects to European companies.

Sustainability criteria and biomass certification systems could be introduced into CDM and JI methodologies. Within CDM, a distinction is made between renewable and non-renewable biomass. The CDM Methodology Panel and Executive Board could consider inclusion of sustainability criteria as a requirement for biomass being considered renewable, or to introduce a separate category for sustainable biomass. This way a biomass certification system could help to show the public and the CDM or JI Boards that the biomass used is really sustainable.

The EU Member States could also put pressure on the use of sustainability criteria and certification systems in their carbon credit purchase programmes.

- The EU Member States could decide to buy only emission reductions from CDM and JI projects that make use of certified biomass.
- When procuring Assigned Amount Units (AAUs) from countries that emit fewer emissions than permitted under the Kyoto Protocol, it is a common requirement that the selling country uses the income received from AAU to promote or realise emission reductions. The EU Member States could negotiate the introduction of a

²⁴ Directive 2004/101/EC of the European parliament and of the Council of 27 October 2004 amending Directive 2003/87/EC establishing a scheme for greenhouse gas emission allowance trading within the Community, in respect of the Kyoto Protocol’s project mechanisms.

biomass certification system as a prerequisite for countries wishing to trade biomass related AAUs.

5.4 ACCOUNTING GREEN HOUSE EMISSIONS

Each country that signed the Kyoto Protocol and Convention has to provide a National Greenhouse Gas Inventory, stating the greenhouse gas (GHG) emissions on a national level. On project level, emission reductions can be calculated using methodologies developed in the frame of the Clean Development Mechanism (CDM). The possible role of CDM methodologies in the development of sustainability criteria and certification systems was assessed in section 3.4. Below, the possibilities of harmonisation of sustainability criteria with Kyoto type national greenhouse inventories are assessed.

The IPCC approach for greenhouse gas accounting is described in the '2006 IPCC Guidelines for National Greenhouse Gas Inventories' (IPCC 2006), a five volume document describing methodologies to assess greenhouse gas emission on country level, including change in agriculture, forestry and other land use (AFULU). These calculation methods may contain useful elements to describe direct effects of land use change, for instance when an area would be converted from forest into an agricultural area.

Although the calculation method is useful to quantify greenhouse gas emissions, the problem of allocating indirect effects in land use change caused by biomass production remains unsolved.

5.5 MONITORING BIOMASS PRODUCTION AND USE

Product certification systems combined with track-and-trace systems can be used to monitor developments in global certified biomass production. Similar to forest certification systems, the name, size and location of plantations could be made public. Information on the traded volumes is generally not public. The European Union could consider obliging biomass producers, users and traders to report on the biomass production, import and export. The track-and-trace system allows unique identification of biomass produced and a useful database could be created for monitoring biomass use. This type of information can be market sensitive. Procedures and working methods as used by statistical organisations like Eurostat need to be implemented. In case of a mass-balance system, the traceability of the biomass is more limited, and in case of a book-and-claim system no physical link can be made between production and use, but still sustainable biomass production could be made available. Before implementation of such an extensive biomass monitoring system, it should be considered whether it is worth the effort. Obligatory reporting will create the best possible data, on the other hand surveys by specialists from research institutes and consulting companies are suitable and more cost-effective alternatives to identify the main trends.

5.6 CONCLUSION

This chapter investigated how obligatory biomass certification could be used to support related issues.

Land availability for food, materials and energy

It is difficult to develop quantifiable sustainability criteria that control the land availability for food, materials and energy on project level. Moreover, any sustainability criterion related to competition and demanding more than just a reporting obligation could potentially lead to an infringement of WTO rules. It is concluded that a certification system is not the most appropriate tool to avoid indirect adverse effects on land use and other solutions like bilateral agreements, exclusion of certain biomass types, need to be explored.

EU energy security

Biomass production improves the EU energy security situation. Part of the biomass will be produced within the EU rendering the EU Member States less energy dependent. Another part will be produced outside the EU, which - compared to the situation in which only fossil fuels are used - at least diversifies the number of countries supplying energy carriers to the EU. Biomass certification is a manner to implement biomass production systems in an acceptable and responsible way, which lowers opposition and thereby promotes the sound implementation and growth of bioenergy in the EU energy sector.

Kyoto obligations

Biomass sustainability criteria and certification systems promote low carbon emissions in the biomass production phase, resulting in lower carbon emissions in the biomass producing country. If biomass production takes place in a country with an emission reduction target under the Kyoto Protocol, biomass certification contributes to achieving this target.

Monitoring biomass production and use

Biomass production and use could be monitored using data from the involved certification organisations. If legal constraints would obstruct this type of data collection, data on biomass production and use could be included in the annual company surveys of the national statistical organisations. Alternatively, and maybe more cost-effective, specialists form from research institutes or consultancy companies could carry out surveys on biomass production and use.

6.1 CONCLUSIONS**Policy and literature review**

The sustainability of biomass for energy and transport fuels is an issue that has attracted the interest of many stakeholders and policy makers. The European Parliament, national initiatives, international working groups and a number of NGOs advocate certification of biomass to ensure greenhouse emission reductions and production of biomass in a social and environmentally sustainable way, expressed in various concept sets of principles, criteria and indicators.

On the national level, the Netherlands, United Kingdom and Germany have been active in formulation and promotion of sustainability criteria for biofuels and/or biomass, resulting in reporting obligations, which can be seen as a first step toward implementation of biomass certification systems.

Part of the NGO community support biomass certification as a tool to guarantee the sustainability of biomass. Other NGOs are more sceptical on the effectiveness of certification and plead to drop the EU target of 10% biofuels in 2020, before entering detailed discussions on certification systems for sustainability biomass production.

Existing certification systems

Although energy crops certification systems, initiatives related to renewable electricity and developments in the carbon sector are interesting, the experiences in the forestry sector are the most relevant for the development of a biomass certification system.

- Forest certification shows how a number of certification criteria for biomass related to biodiversity conservation, local environmental impacts and social aspects could be formulated. No forest certification systems were found that take into account greenhouse gas balances.
- The structure of the main umbrella forest certification systems like FSC and PEFC show how criteria development can take place, either centralised using a three chamber approach (FSC) with equal votes for economic, social and environmental stakeholders, or using a more national approach (PEFC) in which national organisations develop certification systems, to be presented for later endorsement by the international organisation. These systems can act as examples when developing EU biomass sustainability criteria.
- To date the uptake of forest certification systems in developing countries has been limited due to various reasons such as non-resolution of indigenous right matters, indifference by foreign owned companies, focus on non-eco sensitive markets, illegal logging providing a cheap alternative, poverty and political instability of the countries.
- The forest certification systems show how the independence of third party certification bodies and the quality of standard setting procedures can be secured by use of ISO standards.

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- Because forest certification systems have been in use for more than a decade, valuable information is available regarding the dissemination and market dynamics of these systems. Although it contains useful information, it has to be taken into account that it concerns voluntary certification, while the planned EU based sustainability criteria and certification systems would be obligatory.
 - The costs for biomass certification can be estimated based on experiences in the forestry sector.

Of the certification systems related to biomass energy crops only the Roundtable for Sustainable Palm Oil (RSPO) has developed a complete set of criteria and indicators and a certification system²⁵. Some power companies have experience with voluntary biomass certification and labelling, but the use of these systems is still fairly limited. Although the Clean Development Mechanism is primarily developed to certify emission reductions and not biomass, its structure and development is interesting, especially where related to the determination of carbon balance.

Barriers toward biomass certification

The analysis of barriers learns that the implementation of obligatory sustainability criteria and certification systems is possible, although practical issues limit the impact of biomass certification. Biomass certification can hardly control the effect of biomass production on competition with food and indirect land use changes. Secondly, WTO rules have to be complied with.

Obligatory biomass certification systems can at best effectively guarantee:

- Greenhouse gas savings including carbon sinks
- Protection of biodiversity (high conservation forests, wildlife habits, etc.)
- Protection of local environment (soil & water protection, agrochemicals, etc.).

Voluntary biomass certification systems do not suffer all the WTO-limitations of obligatory certification. Therefore stricter criteria related to biodiversity and local environmental effects can be formulated. Moreover, these systems can cover issues related to social well being of employees, and the rights of indigenous peoples.

Other measures need to be considered to tackle especially problems of biomass production related to competition with food and other indirect effects of land use change.

It is concluded that obligatory biomass certification cannot cover all aspects of sustainable biomass production. It should be presented as *minimum* criteria to ensure that rational carbon savings are achieved and that major environmental impacts are avoided. However, the EU wide obligatory sustainability criteria can be seen as a good starting point toward sustainable use of biomass, with potential to influence the agricultural sector as well. It creates a substantial demand for sustainably produced biomass in the EU Member States and thereby sets the international standard.

²⁵ As per the Terms of Reference, general systems for sustainable agriculture were not included in the study.

6.2 RECOMMENDATIONS

Based on the policy and literature review, experiences with existing certification systems, the analyses of main barriers and the broader perspective of biomass certification systems, recommendations can be formulated of what structure an eventual EU based sustainability criteria and certification system for biomass production should have.

It is recommended to proceed with the development of EU minimum biomass criteria and to create the necessary conditions such that the market will develop certification systems using the minimum criteria and eventual additional voluntary sustainability criteria. In the following sections detailed recommendations are formulated, starting with an outline toward development of minimum criteria (section 6.2.1) followed by conditions that need to be created to promote development of sound certification system (section 6.2.2), including accreditation of the certification systems and certification bodies.

6.2.1 Outline minimum criteria

New or revised European directive

The introduction of EU based minimum sustainability criteria can be realised by its incorporation in a new or revised European directive. The relevant directive text should describe the minimum criteria that need to be met. The following issues should be covered:

- Greenhouse gas savings including effect carbon sinks
- Protection of biodiversity (high conservation forests, wildlife habitats)
- Protection of local environment (soil & water protection, agrochemicals).

Criteria development

The structure of the umbrella forest certification systems like FSC and PEFC show how criteria development can take place, either centralised using a three chamber approach (FSC) with equal votes for economic, social and environmental stakeholders, or using a more national approach (PEFC) in which national organisations develop certification systems, to be presented for endorsement to the international organisation. These systems can act as examples when developing an eventual EU biomass certification system.

Principles related to carbon balance and carbon stocks are not included in existing certification systems; therefore the development of a ‘meta-standard’ that only refers to sustainability criteria in existing certification systems is deemed insufficient. Comprehensive sets of sustainability criteria for a large number of biomass types need to be developed. It is recommended to make use of carbon calculation tools as developed by involved EU member states.

Greenhouse gas emission targets

The overall greenhouse gas emission reduction effect of biomass use depends basically on:

1. The greenhouse gas emissions produced during biomass production and transport
2. The conversion efficiency of the biomass energy plant
3. The type of fuel that is being replaced.

The formulation of an overall carbon reduction target could have adverse effects, because it depends on the type of fuel that is being replaced. For instance, a biomass power plant reduces more carbon emissions if electricity is supplied to a national grid with a high share of fossil fuel fired power plants, than in case renewables are already predominant. Therefore an overall carbon reduction target would discourage projects in countries with already a high share of renewables. In order to avoid discrimination between countries and applications, the minimum greenhouse gas performance expected of sustainable biomass could best be expressed as the maximum allowed greenhouse gas emissions per MWh of electricity or GJ of useful heat, thereby taking into account greenhouse gas emissions of biomass production and transport, and plant efficiency, but not the type of fuel that is being replaced. The biomass supplier will only need to provide information on greenhouse emissions related to biomass production and use, while the biomass plant owner is responsible to stay below the maximum greenhouse gas emission limit that could be formulated for each bioenergy application.

CEN standard for minimum criteria

The introduction of minimum criteria in a European CEN²⁶ standard could help to promote the use of standardised minimum criteria throughout the EU. Based on the minimum criteria to be published in the European directive, technical and organisational details could be further elaborated in a CEN standard. CEN standards can be used as a base for certification systems, but also for reporting obligations or bilateral agreements between parties. It typically takes three years to develop and introduce a CEN standard. Development of an ISO standard would take much more time and is therefore not recommended at this stage.

Voluntary certification

Voluntary certification can play an important role in addition to obligatory certification according to minimum criteria, addressing those issues that cannot be included as obligatory sustainability criteria. The EC is recommended to promote and support the development of voluntary certification systems in addition to obligatory certification.

6.2.2 Outline certification systems

Starting point of obligatory biomass certification should be that all biomass production becomes certified by a EU endorsed certification system. Only in case it is legally possible and if environmental risks are sufficiently low, certain categories of biomass could be excluded from third party certification. However, no distinction can be made between biomass produced within or outside the EU. This outline should be described in the European directive.

Role of market

It is recommended to leave the establishment and operation of certification systems to the market. The introduction of EU minimum criteria for sustainable biomass will probably motivate several parties to develop certification systems to verify biomass production according to the European minimum criteria and eventually additional voluntary criteria.

²⁶ CEN: European Committee for Standardization

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- Biomass users have an interest in the introduction of an effective certification system, e.g. to propagate corporate social and environmental responsibility and, since the sustainability criteria will be obligatory, to comply with the requirements.
 - Clusters of NGOs might have interest to combine the European minimum criteria with additional voluntary criteria into a very solid certification system.
 - Specialised companies might have interest to develop certification systems to meet the market demand created by the European directive.
 - In other cases, different actors might collaborate to develop certification initiatives. An example of this is the Dutch ‘Coalition of the Willing’, in which a range of companies, NGOs and research institutes collaborate.

It is expected that a number of certification systems will become available, some quite strict, others only certifying according to the minimum criteria. Different certification systems might be developed for different types of biomass. Since the EU will impose obligatory minimum criteria on the biomass consumers, the EU could consider contributing to the development of certification systems.

Small biomass producers

In CDM a distinction is made between methodologies for small-scale and large-scale projects. Considering the relatively high cost for certification for small biomass producers, it is recommended to assess the feasibility of such a division, when developing an EU wide systems of criteria and indicators, especially related to the CO₂ balance and possible other issues that require extensive reporting.

Accreditation of certification systems

The accreditation of certification systems needs to be covered in the EU directive. It is suggested that reference be made to ISO guides covering accreditation, such that quality requirements related to the independence and transparency of the certification systems are met. In addition, an independent EU body could check whether the biomass certification systems meet the EU minimum criteria.

The experience with forest certification shows how independence of third party certification bodies can be guaranteed using ISO standards. Moreover, the quality of the standard setting procedures can also be proven using ISO standards (See section 3.1.3). It is strongly recommended to follow these ISO standards in biomass certification as well.

Finally, it is recommended to make the certification system as transparent to the public as possible. CDM is seen as an example of a transparent system in which all related documentation can be found on Internet.

Accreditation of certification bodies

When new certification systems are being developed, certification bodies will be interested in getting accredited if they see sufficient market potential for carrying out certification activities. In case of obligatory certification this market will definitely develop. The costs for accreditation have to be recovered from certification activities. The involvement of the EU in the accreditation process could be limited.

Biomass certification

In an introductory phase, when the volume of certified biomass on the market is limited, it is well possible that biomass production and chain-of-custody certification costs need to be (partly) covered by the biomass users, or that price premiums will need to be paid for certified biomass. It is the biomass user who has to prove that the biomass used is sustainable and as such the biomass user is the primary 'problem owner'. Considering the developments in the forestry sector, in a more developed market the certification costs will probably shift in the direction of the biomass producer. Certification could become a prerequisite for biomass producers to obtain or secure position in the EU market. In the end the costs of certification will be recovered from final energy users with the society paying premiums (subsidies) for the use of sustainable biomass.

Role of biomass exporting countries

Developing countries exporting biomass may perceive sustainability criteria as a form of eco- or labour protectionism. Only a limited number of obligatory sustainability criteria would hold ground in case of a potential WTO conflict. Extensive consultation with the biomass producing third countries outside the EU is recommended.

Possibly, the Clean Development Mechanism (CDM) could serve as a model showing how biomass-exporting countries could become involved. CDM requires the explicit confirmation of the (biomass producing) host country that the projects contribute to sustainable development in its territory. It is recommended to consider this type of host country approval as a way to involve host countries, and to ensure that criteria that cannot be covered by an obligatory system, such as local environmental impacts, get the needed attention. The host country approval, however, cannot replace the commonly agreed minimum sustainability criteria. Also the risk of increased bureaucracy and the risk of exclusion of developing countries with weak governance need to be assessed.

Planning

Of the certification systems related to biomass energy crops only the Roundtable for Sustainable Palm Oil (RSPO) has developed a complete set of criteria and indicators and a certification system²⁷. The experience with RSPO learns that it takes a considerable effort to develop sustainability criteria and a certification system for a single type of biomass and it is recommended to take into account that biomass certification will require considerable resources in both time and energy.

²⁷ As per the Terms of Reference, general systems for sustainable agriculture were not included in the study.

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B. METHODOLOGICAL ISSUES

The concept of '*sustainability criteria and certification systems*' and its relation to the legal, economic and environmental reality has been laid down in a theoretic framework as described below.

Theoretic framework

The sustainability criteria and certification systems are embedded in an international environment that consists of numerous environmental, legal and economic issues. See Figure 13. These issues determine whether the introduction of the biomass certification system is feasible, at which costs for society, and what benefits can be expected. On basis of a detailed investigation of these issues, the European Commission can determine whether a EU based sustainability criteria and certification system is desirable.

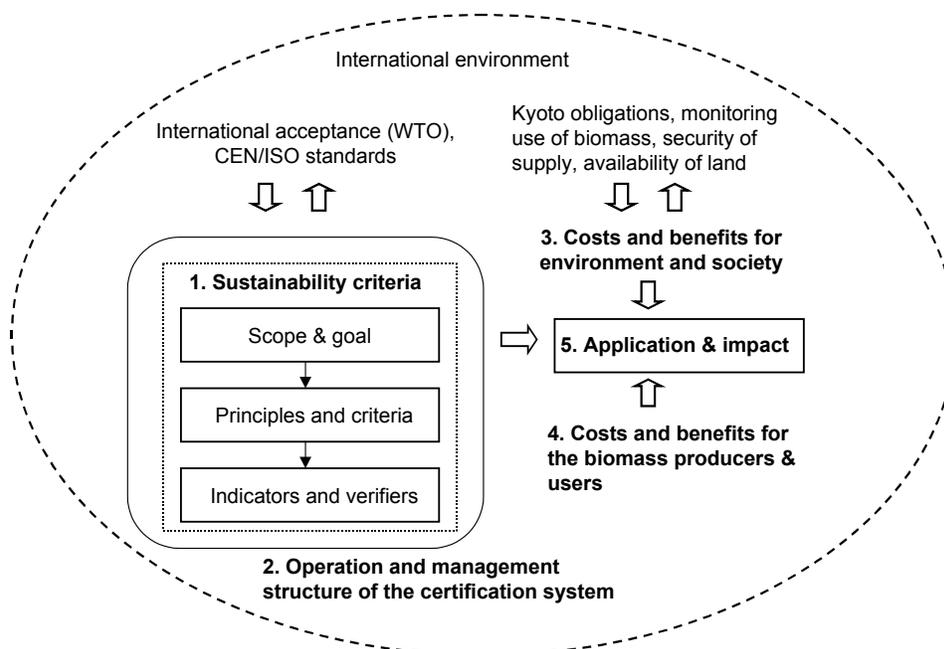


Figure 13 Context of sustainability criteria and certification systems in the international environment.

The numbered items are discussed in the next sections.

Sustainability criteria

Scope and goal

Sustainability criteria and certification systems are being developed to serve a *goal*, for instance as indicated in the invitation to tender ‘*to avoid unsustainable biomass production and use eroding the climate related environmental advantages of bio-energy*’.

Sustainability principles and criteria

Most certification systems have a hierarchical structure in which a goal is translated into a number of principles, like for instance ‘*conservation of biological diversity*’, ‘*positive carbon balance*’ etc. In order to make the principles more workable, sustainability criteria are developed, like ‘*Protected objects must be adequately managed*’.

Sustainability indicators and verifiers

Indicators are used to measure whether the criteria are met. For instance, ‘*there is regular contact between forest owner and experts, local and indigenous population in the management of protected objects, or if not, indicate why this is not being done*’. Sometimes verifiers are defined to double-check the indicators.

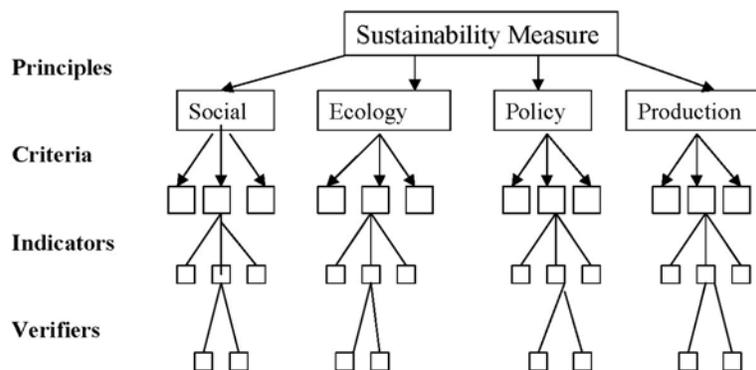


Figure 14 Hierarchical structure of principles, criteria, indicators and verifiers (Source: Mendoza and Prahbu, 2000)²⁸

It is noted that not all certification systems use the word ‘criteria’ in the same way. Sometimes criteria are already measurable units, and ‘indicators’ are missing. However, the core is an effective and complete translation of the broad concept of sustainable biomass production into measurable units.

Besides the content of the principles, criteria and indicators, also the process of development of principles and criteria and the subsequent translation into indicators and verifiers will be subject of the literature survey and analyses.

²⁸ Mendoza, G.A. and R. Prahbu (2000), Multiple criteria decision making approaches to assessing forest sustainability using criteria and indicators: a case study. *Forest Ecology and Management* 131: 107-126

Certification systems

Certification systems allow a systematic check of the minimum sustainability of biomass by using indicators and verifiers, leading to a single verification statement whether or not the biomass is produced respecting minimum criteria. The development of a certification system involves the set up of an organisational structure for management and updating the minimum criteria as well as the accreditation of companies carrying out the verifications. As an example see Figure 15.

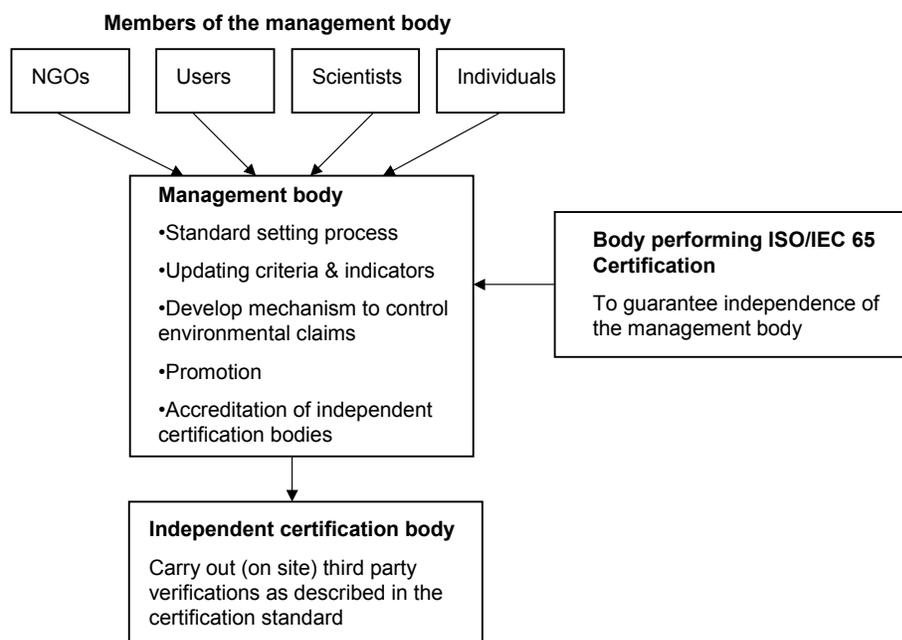


Figure 15 Example of the structure of the organisation around a certification system.

The operation and management structure of the certification systems has to arrange the following issues regarding the sustainable biomass certification process and - if applicable - the chain-of-custody²⁹:

- *Standard setting process*: the process of setting up documents, established by consensus and approved by a recognised (management) body, which set out the requirements which must be met.
- *Certification process*: the process by which an independent third party gives written assurance of conformance to the biomass certification standards
- *Accreditation of certification bodies*: a procedure by which an authoritative body gives formal recognition that an independent third party is competent to carry out biomass certification
- *A mechanism to control claims* related to sustainable biomass production – including procedures to enforce a set of rules for organisations making these claims.

²⁹ Definitions based on CEPI (2004). Explanatory notes on the CEPI comparative matrix of forest certification schemes and standards setting bodies, CEPI - forestcertification.info.

In order to have the trust of all involved parties as well as the general public, it is essential that all procedures are transparent and that independence of the verification body and the management body is guaranteed.

Costs and benefits for society

The primary aim of development of a potential EU based certification system could be *‘to avoid unsustainable biomass production and use eroding the climate related environmental advantages of bio-energy’*. Many existing systems also intend to monitor other aspects like local labour conditions, rights of indigenous people, etc. An evaluation of existing certification systems will provide information if and how these goals are achieved.

As indicated *in the invitation to tender*, other benefits for the EU could be:

- To assist avoiding future problems in land availability for food/materials/energy;
- To assist in the EU energy security situation;
- To assist in achieving the Kyoto obligations;
- Use in accounting rules for greenhouse emissions, and direct and indirect biomass trade;
- Monitoring developments in global biomass production and use.

Part of the study is to investigate how far these goals can be facilitated by the use of sustainability criteria and a certification system.

The implementation of sustainability criteria and a certification system will have its costs and limitations. A number of technical and non-technical barriers might need to be overcome. Most technical barriers will be related to the question how to develop workable criteria and a cheap and smart certification system. The international acceptance of the EU based system and the costs of operating the system are good examples of non-technical barriers.

Costs and benefits for the user

Certification systems can only be successful if the involved parties are motivated to use it. Most of the present certification systems on sustainability are voluntary systems using labels to promote the product to final users or to advertise the green image of the involved companies. Usually, only a part of the market will use voluntary certification systems.

Only national states and the EU have the option to enforce obligatory systems, or to introduce strong incentives to use them. As to avoid disparity between biomass producers and users within the EU, the introduction of an EU based system is preferred³⁰, of course taking into account the existing legislation and treaties like GATT under the WTO for trade with non EU member states.

The costs of biomass production, transport and use are generally substantial and involves the use of innovative technologies and adaptations. Especially if an eventual obligatory certification system is planned, the additional organisational and financial load of for the

³⁰ as indicated by the Project group Sustainable Biomass Production in the report ‘Criteria for Sustainable Biomass Projection’, final report, July 2006.

biomass producer and user need to be carefully evaluated. Equilibrium has to be found between the coverage and sophistication of the sustainability criteria and certification system and the costs that biomass producers and users are able to make to apply the certification system.

Application and impact

Much can be learned from the working methods and promotion strategies of operational certification systems. Especially the impact of forest certification has been studied in detail. It shows what ambition levels can be achieved at what costs and what makes companies interested in the use of sustainability criteria. The study will pay considerable attention to these issues, while taking into account the expected differences between the present voluntary systems and an eventually EU based (obligatory) system.

C. PEFC AND FSC ENDORSED SCHEMES

Table 23 PEFC schemes endorsed by the PEFC Council³¹

Country	Name	Scheme
Australia	Australian Forestry Standard Limited	Australian Forest Certification Scheme
Austria	FEFC Austria	Austrian Forest Certification Scheme
Belgium	WoodNet	Belgian Forest Certification Scheme
Brazil	National Institute of Metrology, Standardization and Industrial quality	Cerflor – Brazilian program of forest certification
Canada	CSA International	SCA Sustainable Forest Management Program
Chile	CertforChile Forest Certification Corporation	CertforChile
Czech Republic	PEFC Czech Republic	Czech Forest Certification Scheme (2006)
Denmark	PEFC Denmark	Danish Forest Certification Scheme
Finland	Finnish Forest Certification Council	Finnish Forest Certification Scheme
France	PEFC France	French Forest Certification Scheme (2006)
Germany	PEFC Germany e.V.	Revised German Forest Certification Scheme (2005)
Italy	PEFC Italy	Italian Forest Certification Scheme
Latvia	PEFC Latvia Council	Latvian Forest Certification Scheme
Luxembourg	PEFC Luxembourg	Luxembourg Certification Scheme for Sustainable Forest Management
Norway	PEFC-Norway	Norwegian Living Forest Standard and Certification Scheme
Portugal	Portuguese Forestry Sector Council	Portuguese Forest Certification Scheme
Slovakia	Slovak Forest Certification Association	Slovak Forest Certification Scheme
Spain	PEFC España	Spanish Forest Certification Scheme
Sweden	Swedish PEFC Cooperative	Swedish Forest Certification Scheme
Switzerland	PEFC Switzerland and HWK-Zertifizierungsstelle	Swiss Q-label certification scheme
United Kingdom	PEFC UK Ltd.	UK scheme for Sustainable Forest Management
United States	SFI	Sustainable Forestry Initiative

The following schemes are listed, but not yet endorsed:

- The scheme of the Belarusian Association of Forest Certification
- Estonian, Lithuanian, Polish, Russian, and Slovenian Forest Certification schemes
- PAFC Gabon Forest Certification Scheme
- The scheme of the Malaysian Timber Certification Council, and:
- American Tree Farm system.

The website <http://www.forestrycertification.info> of the International Council of Forest and Paper Associations (ICFPA) shows features of all main PEFC, FSC related and national forestry certification schemes.

³¹ http://www.pefc.org/internet/html/members_schemes/4_1120_59.htm

Schemes that are endorsed by FSC or seek for endorsement by FSC

- Cameroon National Working Group
- Forest Certification New Zealand Inc
- Forest Stewardship Council US
- FSC Bolivia
- FSC Brazil
- FSC Canada British Columbia
- FSC Canada Maritimes
- FSC Canada Ontario
- FSC Estonia
- FSC Germany
- FSC Poland
- FSC Russia
- FSC Sweden
- FSC UK
- Latvia Forest Certification Council
- UK Woodland Assurance Standard

D. COMPARISON ENVIRONMENTAL CRITERIA FSC AND PEFC

The comparison of environmental criteria FSC and PEFC is based on an analysis presented in (Fritsche, Hünecke et al. 2006).

	FSC	PEFC
Bio-diversity	<p>6: Forest management shall conserve biological diversity and its associated values, water resources, soils, and unique and fragile ecosystems and landscapes, and, by so doing, maintain the ecological functions and the integrity of the forest</p> <p>6.2: Safeguards shall exist which protect rare, threatened and endangered species and their habitats; conservation zones and protection areas shall be established, appropriate to the scale and intensity of forest management and the uniqueness of the affected resources; inappropriate hunting, fishing, trapping and collecting shall be controlled</p> <p>6.3 Ecological functions and values shall be maintained intact, enhanced, or restored, including:</p> <p>a) Forest regeneration and succession.</p> <p>b) Genetic, species, and ecosystem diversity.</p> <p>6.4 Representative samples of existing ecosystems within the landscape shall be protected in their natural state and recorded on maps, appropriate to the scale and intensity of operations and the uniqueness of the affected resources.</p> <p>6.5 Written guidelines shall be prepared and implemented to: control erosion; minimize forest damage during harvesting, road construction, and all other mechanical disturbances;</p> <p>6.9: Use of exotic species shall be carefully controlled and actively monitored to avoid adverse ecological impacts</p> <p>6.10: Forest conversion to plantations or non-forest land uses shall not occur, except in circumstances where conversion:</p> <p>a) entails a very limited portion of the forest management unit; and</p> <p>b) does not occur on high conservation value forest areas; and</p> <p>c) will enable clear, substantial, additional, secure, long term conservation benefits across the forest management unit</p> <p>9. Management activities in high conservation</p>	<p>4.2 a. Natural regeneration should be preferred, provided that the conditions are adequate to ensure the quantity and quality of the forests resources and that the existing provenance is of sufficient quality for the site.</p> <p>4.2 b. For reforestation and afforestation, origins of native species and local provenances that are well adapted to site conditions should be preferred, where appropriate. Only those introduced species, provenances or varieties should be used whose impacts on the ecosystem and on the genetic integrity of native species and local provenances have been evaluated, and if negative impacts can be avoided or minimized.</p> <p>4.2 c. Forest management practices should, where appropriate, promote a diversity of both horizontal and vertical structures such as uneven-aged stands and the diversity of species such as mixed stands. Where appropriate, the practices should also aim to maintain and restore landscape diversity.</p> <p>4.2 e. Tending and harvesting operations should be conducted in a way that does not cause lasting damage to ecosystems. Wherever possible, practical measures should be taken to improve or maintain biological diversity.</p> <p>4.2 f. Infrastructure should be planned and constructed in a way that minimizes damage to ecosystems, especially to rare, sensitive or representative ecosystems and genetic reserves, and that takes threatened or other key species - in particular their migration patterns - into consideration.</p> <p>4.2 g. With due regard to management objectives, measures should be taken to balance the pressure of animal populations and grazing on forest regeneration and growth as well as on biodiversity.</p> <p>4.2 h. Standing and fallen dead wood, hollow</p>

	<p>value forests shall maintain or enhance the attributes which define such forests. Decisions regarding high conservation value forests shall always be considered in the context of a precautionary approach.</p> <p>10.2: [plantations:] Design and layout of plantations should promote the protection, restoration and conservation of natural forests, and not increase pressures on natural forests; wildlife corridors, streamside zones and a mosaic of stands of different ages and rotation periods, shall be used in the layout of the plantation, consistent with the scale of the operation; scale and layout of plantation blocks shall be consistent with the patterns of forest stands found within the natural landscape</p> <p>10.4: [plantations:] Selection of species for planting shall be based on their overall suitability for the site and their appropriateness to the management objectives; in order to enhance the conservation of biological diversity, native species are preferred over exotic species in the establishment of plantations and the restoration of degraded ecosystems; exotic species, which shall be used only when their performance is greater than that of native species, shall be carefully monitored to detect unusual mortality, disease, or insect outbreaks and adverse ecological impacts</p> <p>10.5: [plantations:] Proportion of the overall forest management area, appropriate to the scale of the plantation and to be determined in regional standards, shall be managed so as to restore the site to a natural forest cover</p> <p>10.7: [plantations:] Measures shall be taken to prevent and minimize outbreaks of pests, diseases, fire and invasive plant introductions; integrated pest management shall form an essential part of the management plan, with primary reliance on prevention and biological control methods rather than chemical pesticides and fertilizers</p> <p>10.8: [plantations:] No species should be planted on a large scale until local trials and/ or experience have shown that they are ecologically well-adapted to the site, are not invasive, and do not have significant negative ecological impacts on other ecosystems</p>	<p>trees, old groves and special rare tree species should be left in quantities and distribution necessary to safeguard biological diversity, taking into account the potential effect on health and stability of forests and on surrounding ecosystems.</p> <p>4.2 i. Special key biotopes in the forest such as water sources, wetlands, rocky outcrops and ravines should be protected or, where appropriate, restored when damaged by forest practices.</p>
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Soil	<p>6.5: Written guidelines shall be prepared and implemented to: control erosion; minimize forest damage during harvesting, road construction, and all other mechanical disturbances</p> <p>10.6: [plantations:] Measures shall be taken to maintain or improve soil structure, fertility, and biological activity; techniques and rate of harvesting, road and trail construction and maintenance, and the choice of species shall not result in long term soil degradation</p>	<p>5.1.a. Forest management planning should aim to maintain and enhance protective functions of forests for society, such as protection from [...] soil erosion [...] and from adverse impacts of water such as floods or avalanches.</p> <p>5.2.a. Special care should be given to silvicultural operations on sensitive soils and erosion prone areas as well as on areas where operations might lead to excessive erosion of soil into watercourses. Inappropriate techniques such as deep soil tillage and use of unsuitable machinery should be avoided on such areas. Special measures to minimize the pressure of animal population on forests should be taken.</p> <p>5.2.c. Construction of roads, bridges and other infrastructure should be carried out in a manner that minimizes bare soil exposure [...].</p>
Agro chemical	<p>6.6: Promote the development and adoption of environmentally friendly non-chemical methods of pest management and strive to avoid the use of chemical pesticides World Health Organization Type 1A and 1B and chlorinated hydrocarbon pesticides; pesticides that are persistent, toxic or whose derivatives remain biologically active and accumulate in the food chain beyond their intended use; as well as any pesticides banned by international agreement, shall be prohibited if chemicals are used, proper equipment and training shall be provided to minimize health and environmental risks</p> <p>6.7: Chemicals, containers, liquid and solid non-organic wastes including fuel and oil shall be disposed of in an environmentally appropriate manner at off-site locations</p> <p>10.7: [plantations:] Plantation management should make every effort to move away from chemical pesticides and fertilizers, including their use in nurseries</p>	<p>2.2. c. The use of pesticides and herbicides should be minimized, taking into account appropriate silvicultural alternatives and other biological measures.</p> <p>2.2 d. In case fertilizers are used they should be applied in a controlled manner and with due consideration to the environment.</p> <p>5.2. b. [...] Inappropriate use of chemicals or other harmful substances or inappropriate silvicultural practices influencing water quality in a harmful way should be avoided.</p>
Water	<p>6.5: Written guidelines for the protection of water resources shall be prepared</p> <p>10.6: Techniques and rate of harvesting, road and trail construction and maintenance, and the choice of species shall not result in adverse impacts on water quality, quantity or substantial deviation from stream course drainage patterns</p>	<p>5.1. a. Forest management planning should aim to maintain and enhance protective functions of forests for society, such as protection [...] of water resources and from adverse impacts of water such as floods or avalanches.</p> <p>5.2. b. Special care should be given to forest management practices on forest areas with water protection function to avoid adverse effects on the quality and quantity of water resources. Inappropriate use of chemicals or</p>

		<p>other harmful substances or inappropriate silvicultural practices influencing water quality in a harmful way should be avoided.</p> <p>5.2 c. Construction of roads, bridges and other infrastructure should be carried out in a manner that [...] avoids the introduction of soil into water sources and that preserve the natural level and function of water courses and river beds. Proper road drainage facilities should be installed and maintained.</p>
GMO	6.8: Use of biological control agents shall be documented, minimized, monitored and strictly controlled in accordance with national laws and internationally accepted scientific protocols; use of genetically modified organisms shall be prohibited	

E. FSC PRINCIPLES

Principle #1: Compliance with laws and FSC Principles

Forest management shall respect all applicable laws of the country in which they occur, and international treaties and agreements to which the country is a signatory, and comply with all FSC Principles and Criteria.

Principle #2: Tenure and use rights and responsibilities

Long-term tenure and use rights to the land and forest resources shall be clearly defined, documented and legally established

Principle #3: Indigenous peoples' rights

The legal and customary rights of indigenous peoples to own, use and manage their lands, territories, and resources shall be recognized and respected.

Principle #4: Community relations and worker's rights

Forest management operations shall maintain or enhance the long-term social and economic well-being of forest workers and local communities.

Principle #5: Benefits from the forest

Forest management operations shall encourage the efficient use of the forest's multiple products and services to ensure economic viability and a wide range of environmental and social benefits.

Principle #6: Environmental impact

Forest management shall conserve biological diversity and its associated values, water resources, soils, and unique and fragile ecosystems and landscapes, and, by so doing, maintain the ecological functions and the integrity of the forest.

Principle #7: Management plan

A management plan -- appropriate to the scale and intensity of the operations -- shall be written, implemented, and kept up to date. The long term objectives of management, and the means of achieving them, shall be clearly stated.

Principle #8: Monitoring and assessment

Monitoring shall be conducted -- appropriate to the scale and intensity of forest management -- to assess the condition of the forest, yields of forest products, chain-of-custody, management activities and their social and environmental impacts.

Principle #9: Maintenance of high conservation value forests

Management activities in high conservation value forests shall maintain or enhance the attributes which define such forests. Decisions regarding high conservation value forests shall always be considered in the context of a precautionary approach.

Principle #10: Plantations

Plantations shall be planned and managed in accordance with Principles and Criteria 1 - 9, and Principle 10 and its Criteria. While plantations can provide an array of social and

economic benefits, and can contribute to satisfying the world's needs for forest products, they should complement the management of, reduce pressures on, and promote the restoration and conservation of natural forests.

F. INTRODUCTION WTO

The WTO was established in 1995 as a result of the Uruguay Round of multilateral trade negotiations (1986-1994). It is an organisation that sets global rules of trade between nations. The core of the WTO system, referred to as the multilateral trading system, are the WTO agreements, which lay down the legal ground rules for international trade, as well as the market-opening commitments taken by its members.

The WTO is composed of governments and political entities (such as the EU) and is a member driven organisation with decisions mainly taken on a consensus basis. A vast majority of its members are developing countries. The EU is one of the key players in the WTO. Since the EU has a common trade policy the European Commission negotiates on behalf of the EU's 27 Member States (Petillion, 2005).

WTO principles

The fundamental principle of the World Trade Organization (WTO) is non-discrimination. Every WTO member agrees to treat the products of another member the same as it treats its own, or the same as it treats the products of any other member, in return for reciprocal treatment. These are the principles of National Treatment (NT) and Most Favoured Nation (MFN). If a WTO member extends preferential treatment for a good to one member it must apply this equally to the same good of all other members (Sell *et al*, 2005). This rule has two exceptions, which the WTO permits under strict conditions. The first exception applies to preferential regional trade agreements. The second exception applies to trade with developing countries, particularly the least developed countries (Dufey, 2006).

These basic substantive rules (and exceptions) of WTO law are set out in the annexes to the 1994 Marrakesh Agreement Establishing the World Trade Organization (the 'WTO Agreement'). These annexes contain in total 19 WTO agreements, which are not all of relevance in the frame of this study. In this study, the focus is on the obligations and exceptions set out in the WTO agreements on trade in goods, and in particular, the General Agreement on Tariffs and Trade ('the GATT 1994'), the Agreement on Technical Barriers to Trade (the 'TBT Agreement'), the Agreement on Subsidies and Countervailing Measures (the 'SCM Agreement') and the Agreement on Agriculture (Van den Bossche *et al*, 2007).

Resolving disputes under WTO Law

Any trade measure will have to confirm to WTO principles and agreements. It is difficult to predict the legitimacy of measures that stray into regions for which the WTO's agreements provide no guidance, or that conflict with narrow interpretations of WTO jurisprudence but not with expansive ones. The legality of these measures can only be decided by one of two means: (1) by the ruling under the **dispute settlement understanding** (DSU), or (2) by a **WTO agreement**. Precedent provides some guidance, and although not bound by jurisprudence, the WTO's DSU has traditionally relied upon precedent in its judgements (Sell *et al*, 2005).

The **Agreement on Technical Barriers to Trade (TBT Agreement)** aims to ensure that technical regulations and standards and uniformity assessment procedures do not create unnecessary obstacles to international trade. Most notably, the TBT Agreement admonishes WTO Members to use “international standards” as a basis for their technical regulations, where possible (Art. 2.4), and insists that such regulations not create unnecessary obstacles to international trade, meaning that they be more trade restrictive than necessary to fulfill a legitimate objective, which may include protection of human health or safety or the environment, *inter alia* (Art. 2.2). There is a rebuttable presumption (Art. 2.5) that a measure adopted or applied for one of the explicitly mentioned legitimate objectives in Art. 2.2 fulfills the “least trade restrictive” requirement of Art. 2.2 where it is “in accordance with international standards” (Howse *et al.*, 2006).

The TBT Agreement applies to **mandatory measures** that specify the characteristics of products and their “related processes and production methods (Annex 1:1).” The TBT Agreement also contains a code of good practice urging WTO Members to examine **voluntary standards** “for products or related processes and production methods” including those established by non-governmental bodies within their jurisdiction (Howse *et al.*, 2006).

GATT

If sustainable produced biomass and biofuels is regarded as ‘like’ non-sustainable produced biomass and biofuels, the use of certification systems to hinder or prevent the use of non-sustainable biofuels, is potentially conflicting at least with GATT 1994 Articles I and III. In the box below the term like products is investigated in more detail.

“LIKE” PRODUCTS

The term “like” has been interpreted more or less broadly depending on its place in the GATT 1994. To determine whether a product is “like”, WTO panels look at: (i) the product’s end-use in the market; (ii) consumers’ tastes and habits; (iii) the product’s properties, nature and quality; and (iv) the product’s tariff classification. It has not been clearly defined whether or not products distinguished based on how they were produced could be considered as “not like”. But there is a good chance that a WTO panel would find biofuels produced in different manners “like” if the method of production did not affect the final product (WWF International, 2006).

Howse *et al.* (2006) mention that the more remote distinguishing criteria are from features (although non-physical) that consumers can associate, if properly informed, with a particular product, the more probable the products themselves are considered to be ‘like’. Building on this line of arguing, biofuels of many different origins would be considered ‘like’.

If it is concluded that biofuels from sustainable and non-sustainable sources are probably regarded ‘like’.

Article XX of the GATT 1994, entitled ‘General Exceptions’, states

Subject to the requirement that such measures are not applied in a manner which would constitute a means of arbitrary or unjustifiable discrimination between countries where the same conditions prevail, or a disguised restriction on international trade, nothing in this Agreement shall be construed to prevent the adoption or enforcement by any [Member] of measures:

- a. necessary to protect public morals;
- b. necessary to protect human, animal or plant life or health;**
- c. relating to the importations and exportations of gold and silver;
- d. necessary to secure compliance with laws or regulations which are not inconsistent with the provisions of this Agreement, including those relating to customs enforcement, the enforcement of monopolies operated under paragraph 4 of Article II and Article XVII, the protection of patents, trade marks and copyrights, and the prevention of deceptive practices;
- e. relating to the products of prison labour;
- f. imposed for the protection of national treasures of artistic, historic or archaeological value;
- g. relating to the conservation of exhaustible natural resources if such measures are made effective in conjunction with restrictions on domestic production or consumption;
- h. undertaken in pursuance of obligations under any intergovernmental commodity agreement;
- i. involving restrictions on exports of domestic materials necessary to ensure essential quantities of such materials to a domestic processing industry ...;
- j. essential to the acquisition or distribution of products in general or local short supply

Subsidies and WTO law

Sustainability standards can be linked to subsidies and tariffs. These may affect international trade and are therefore included in WTO rules.

Subsidisation can have multiple purposes and these purposes may vary in their consistency with the underlying norms of world trade law. A government may subsidise consumers so as to provide them with an incentive to switch from conventional fuel to biofuel (in whole or part) by compensating, or more than compensating, for the added cost. Or it may attempt to achieve the same objective by subsidising R&D that can lead to more efficient technologies for the production of biofuels. Neither of these kinds of subsidies need affect the relative competitive position of domestic and foreign producers (assuming the knowledge generated by subsidised R & D is not largely proprietary to domestic firms and leads to generalised innovation that foreign producers can also exploit - an assumption that is difficult to substantiate). On the other hand, a government may subsidise the domestic production of biofuels; this may not be a cost-efficient way of providing an incentive for consumers to switch from fossil fuels to biofuels, since the lowest-cost, most efficient producers of the biofuels in question may be foreign

producers. Such subsidies are sometimes justified, as a policy matter, on “infant industry” grounds (Howse *et al.* 2006).

Subsidies are arranged in the Agreement of Agriculture (AoA) and the Subsidies and Countervailing Measures Agreement (SCM Agreement).

The **Subsidies and Countervailing Measures Agreement (SCM Agreement)** prohibits export subsidies and subsidies contingent (*de jure* or *de facto*) upon the use of domestic products over imported products. Biofuels subsidies are generally not tied to export performance and therefore would not fall into this category of prohibited subsidies. However, production subsidies contingent upon the use of domestic products, such as locally produced feedstock crops, are an issue in the biofuels area (Howse *et al.* 2006).

Based on the SCM Agreement, subsidies should not have certain kind of adverse trade affects or cause adverse effects (injury) to a group and be non-specific, not directed at limited group of particular products (Howse *et al.* 2006).

Within the **Agreement on Agriculture**, WTO Member countries have agreed to pursue the harmonisation of subsidies. A number of approaches allow countries to subsidise products. ‘Green boxes’ are permitted. In order to qualify for the ‘green box’, a subsidy must not distort trade, or at most cause minimal distortion; it has to be government-funded, must not involve transfer from consumers and must not have the effect of providing price support to producers. The ‘green boxes’ tend to be programmes that are not directed at particular products, and include direct income supports for farmers that are decoupled from current production levels or prices. The Green Box covers many government programmes such as research in connection to environmental programmes, as well as payments made under certain environmental programmes (Petillion, 2005). At the moment ‘green box’ subsidies are allowed within WTO but may be difficult to maintain if liberalization of the agricultural sector proceeds (Fritsche *et al.* 2006).

Biofuel classification and WTO

(Howse *et al.* 2006) presents a discussion of **classification** issues. The classification of a product is important to define which tariff levels and which set of disciplines and domestic subsidies are applicable. Product classifications for biofuels are not consistently aligned with the actual consumer market in question, which leads to a number of problems with respect to consistency, certainty and non-discrimination of existing WTO obligations. An approach would be to define ‘new’ products for biomass-derived energy carriers. However, this is a complex process that can take many years.

G. WTO COMPLIANCY OF TRADE MEASURES BY BOSSCHE ET AL

The study authored by Messrs. Peter van den Bossche, Nico Schrijver and Gerrit Faber and entitled “*Unilateral Measures Addressing Non-Trade Concerns. A Study on WTO Consistency, Relevance of other International Agreements, Economic Effectiveness and Impact on Developing Countries of Measures concerning Non-Product-Related Processes and Production Methods*” looked in close detail into *inter alia* the compliancy of hypothetical trade measures giving effect to the Cramer criteria for the sustainable production of biomass.

(Bossche, Schrijver et al. 2007) looked in close detail into the compliancy of hypothetical trade measures giving effect to the Cramer criteria for the sustainable production of biomass (and also the protection and promotion of animal welfare) to WTO provisions. Hypothetical trade measures considered included:

- Import prohibition
- Preferential custom duties
- Country-specific duties
- Domestic prohibition
- Technical regulations
- Government or private standards
- Compulsory blending requirements
- Mandatory or voluntary labelling
- Voluntary certification programmes or schemes
- Tax reductions, exemptions or rebates
- Border tax adjustments
- Government procurement requirements
- Direct subsidies
- Export refunds
- Reporting requirements

With regard to WTO consistency, the table below indicates the most relevant WTO provisions and refers to the legal analysis presented in the study.

Unilateral nPR PPM (Non-Product-Related Processes and Production Methods) measures	Relevant WTO provisions	Relevant analysis
Import prohibition on products not produced consistently with nPR PPMs (e.g. an import prohibition on biomass not produced consistently with the Cramer sustainability criteria;	Art. XI of GATT 1994	See p.85.
Preferential customs duties for products produced consistently with nPR PPMs (e.g. lower customs duties for biomass produced consistently with the Cramer sustainability criteria	Article I.1 of GATT 1994	See p.18
Country-specific customs duties for imports from countries that have national legislation incorporating specific nPR PPMs (e.g. lower customs duties for biomass imported from countries that have been certified as requiring that the production of biomass conforms to the Cramer sustainability criteria and equivalent criteria)	Article I.1 of GATT 1994	See p.18
Domestic prohibition on the use or sale of products produced	Article III.4 of	See p.51

inconsistently with the nPR PPMs (e.g. a prohibition on the use in the production of biofuels of biomass produced inconsistently with the Cramer sustainability criteria)	GATT 1994	
Technical regulations (mandatory) setting out nPR PPMs for products used or sold	Art. III.4 of GATT 1994 (and TBT Agreement?) Art. XX of GATT 1994	See p.51 and p.136. See p.89.
Government or private standards (voluntary) setting out nPR PPMs for products used or sold (e.g. a standard agreed upon by oil and electricity companies that the biomass they use must meet the Cramer sustainability criteria)	TBT Agreement & Art. III.4 of GATT 1994?	See p.51 and p.136.
Compulsory blending requirements specifying that the products blended must be produced consistently with nPR PPMs (e.g. a regulation excluding from the compulsory blending of fossil and biofuels, biofuels from biomass not produced consistently with the Cramer sustainability criteria)	Art. III.4 & III.5 of GATT 1994 (and TBT Agreement?); Art. XX of GATT 1994	See p.51 and p.72 (and p.136). See p.89.
Mandatory or voluntary labelling regarding nPR PPMs	TBT Agreement & Art. III.4 of GATT 1994	See p.51 and p.136.
Voluntary certification programmes or schemes regarding nPR PPMs (e.g. a government or private organization certifying that specific biomass has been produced consistently with the Cramer sustainability criteria)	Art. III.4 of GATT 1994 (and TBT Agreement?); Art. XX of GATT 1994	See p.51 and p.136. See p.89.
Tax reductions, exemptions or rebates for products produced consistently with nPR PPMs (e.g. a reduction in excise duties on biofuels from biomass produced consistently with the Cramer sustainability criteria)	Art. III.2 of GATT 1994, the SCM Agreement and the AoA. Art. XX of GATT 1994	See p.27, p.158 and p.160. See p.89.
Border tax adjustments levied on imported products to offset nPR PPM-based domestic taxation	Art. II.2 of GATT 1994 Art. XX of GATT 1994	See p.74. See p.89.
Government procurement requirements favouring products produced consistently with nPR PPMs (e.g. a requirement that public buses must use biofuels from biomass produced consistently with the Cramer sustainability criteria)	Article III:8 of the GATT 1994 and the WTO Agreement on Government Procurement	See p.73
Direct subsidies to assist producers with the additional cost incurred in meeting nPR PPMs (e.g. payments to oil companies or electricity	The SCM Agreement and	See p.158 and p.160.

companies to offset the additional costs of using biomass or biofuels from biomass produced consistently with the Cramer sustainability criteria)	the AoA	
Export refunds to overcome the competitive disadvantage that producers have on the world market as a result of stricter domestic regulation setting out nPR PPMs	The SCM Agreement and the AoA	See p.158 and p.160.
Reporting requirements relating to nPR PPMs (e.g. the requirement for industrial users of biomass (oil and electricity companies) to report whether biomass they use is produced consistently with the Cramer sustainability criteria (and subsequently leaving it to the consumers/civil society to act on the basis of that information)	Art. III.4 of GATT 1994 (and TBT Agreement?); Art. XX of GATT 1994	See p.51 and p.136. See p.89.

Apart from the question whether it would be permitted under EU and WTO law, (Bossche, Schrijver et al. 2007) find it questionable whether it would be wise to impose other sustainability criteria than those relating to greenhouse gas emissions, for several reasons.

- Firstly, an importing country has a potential impact on part of the production only (the EU currently imports only 1 per cent or less of all bioethanol produced in Brazil). Even if the exporting country meets the sustainability criteria for that small part of the production, little would change in the sector. The exporting country may also respond by shifting its exports to less demanding markets. Thus, trying to encourage an entire economy to adopt more sustainable methods of production by imposing conditions on a tiny part of its production for export, would be a case of the tail wagging the dog.
- Secondly, even if the exporter were to adapt the production process throughout the sector, the regulatory situation would differ significantly from the rest of the economy. This may greatly distort relative prices and wages. It cannot be assumed that the sustainability and welfare of the exporting economy as a whole would improve; it might even deteriorate.
- Thirdly, exporting developing countries may perceive these criteria as a form of eco- or labour protectionism. Given the experiences of these countries in the recent past, and the imminent risk that regulatory systems of importing countries are captured by rent-seeking groups, this perception is not without grounds. The practical effect of implementing the criteria will be an increase in the cost of production.