WORKING PAPER

Avoiding deforestation in the context of biofuel feedstock expansion

An analysis of the effectiveness of market-based instruments

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Working Paper 73

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Pacheco, P., German, L., van Gelder, J.W., Weinberger, K. and Guariguata, M. 2011 Avoiding deforestation in the context of biofuel feedstock expansion: an analysis of the effectiveness of market-based instruments. Working Paper 73. CIFOR, Bogor, Indonesia

Cover photo by Iddy Farmer/CIFOR
Cleared land for oil palm plantation. Jambi, Indonesia

This report has been produced with the financial assistance of the European Union, under a project titled, 'Bioenergy, sustainability and trade-offs: Can we avoid deforestation while promoting bioenergy?' The objective of the project is to contribute to sustainable bioenergy development that benefits local people in developing countries, minimises negative impacts on local environments and rural livelihoods, and contributes to global climate change mitigation. The project will achieve this by producing and communicating policy relevant analyses that can inform government, corporate and civil society decision-making related to bioenergy development and its effects on forests and livelihoods. The project is managed by CIFOR and implemented in collaboration with the Council on Scientific and Industrial Research (South Africa), Joanneum Research (Austria), the Universidad Nacional Autónoma de México and the Stockholm Environment Institute. The views expressed herein can in no way be taken to reflect the official opinion of the European Union.

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Table of contents

List of boxes and tables

Boxes

Tables

Abstract

This working paper assesses the likely effectiveness of market-based instruments (MBIs) in ensuring that expansion of biofuel feedstock development does not occur to the detriment of natural forests. We employ a detailed literature review, including a look at select case studies, to evaluate the effectiveness of 3 main types of instruments:

1. those governing production practices and access to markets;
2. those governing the provision of finance for biofuel feedstock production and processing; and
3. those aiming to safeguard the environmental services provided by forestlands that could be threatened by the expansion of biofuel feedstock cultivation.

The selected instruments are diverse in scope and scale. In most cases, these instruments have evolved into relatively complex global systems (e.g. certification) driven by multi-stakeholder processes, with non-state actors taking an active role; to some extent, they are supported by state authority and regulations, such as those linked to the adoption of procurement policies in consumer countries (e.g. EC) to ensure compliance with legality and sustainability principles. Furthermore, while some MBIs operate at smaller scales, such as in numerous emerging initiatives linked to compensation for the provision of environmental services, others are implemented at broader national scales, with the state playing a more active role.

The key message in this working paper is that no single instrument is likely to reduce the potential pressure of biofuel development on forests and thus avoid deforestation; rather, a host of complementary mechanisms will be needed to achieve this aim. Furthermore, the effectiveness of discrete MBIs depends on several factors related to their design, scope and scale, and the degree to which they are adopted and independently monitored in practice. In addition, for any measure to make a difference in avoiding deforestation, it would have to have an effect in economic terms so as to shape everyday practices of landholders and biofuel companies in meaningful ways. For this to happen, an instrument must be accompanied by measurable and verifiable indicators and conditionalities and – often – complementary state regulatory functions. In many contexts, this will in turn imply strengthening the overall governance system in which the different instruments are embedded. Therefore, we argue that there is a need to build greater synergies – both amongst the various MBIs and between MBIs and state regulatory frameworks at various scales – to reduce the direct and indirect threats of potential biofuel feedstock production to forests.

1. Introduction

Efforts by Western nations to reduce their dependence on fossil fuel imports and mitigate climate change by increasing their use of biofuels have precipitated a debate about the implications of biofuel feedstock development for food security, deforestation and local people's rights (Cotula *et al.* 2008, FAO 2008, Bringezu *et al.* 2009). Despite current criticism, for industrialised countries, biofuels hold promise as a way of increasing fuel security, meeting climate change mitigation targets and providing a stimulus for investments in the agriculture sector. Developing countries aiming to produce for the biofuel market also see promise in the sector for its potential to improve the balance of trade by reducing the fuel import bill, replacing fossil fuels and providing opportunities for growth in the agriculture sector (MEWD 2008). However, several potential risks are associated with biofuel production in relation to the increase in global demand, which could lead to competition with food consumption and increases in commodity prices, as well as displacement of agricultural land, infringements on customary land rights, growing pressures on deforestation and other environmental problems (Altieri 2009, Croezen *et al.* 2010, Timilsina and Shrestha 2010).

This work aims to assess the effectiveness of a diverse set of mechanisms and processes that fit into a broader definition of market-based instruments (MBIs), with a focus on examining the extent to which these instruments might be able to ensure that biofuel feedstock production and processing do not create pressures leading to the conversion of natural forests. Given our emphasis on avoiding deforestation, it is beyond the scope of this paper to tackle the discussion on the (direct and indirect) implications of biofuel development for forests, which has been explored elsewhere (Mathews and Tan 2009, Havlík *et al.* 2010, Lapola *et al.* 2010), or the ability of diverse MBIs to address the social and economic effects of biofuel development. Rather, our focus is on ways to avoid likely deforestation due to biofuel cultivation.

A number of important MBIs have evolved in the recent past linked to a range of approaches, involving both state and non-state actors, that are designed to stimulate the adoption of more sustainable production across sectors related to natural resources extraction and that may have the potential to promote sustainable production of biofuel feedstocks. We examine here MBIs that operate through their effect on 3 dimensions: (1) production practices and access to markets; (2) financing of primary production and processing; and (3) provision of environmental services linked to existing forest areas that could be threatened by forest conversion. Therefore, we examine 3 sets of MBIs that have evolved to deal with these dimensions, namely instruments governing production and trade, finance and payments for environmental services (PES). Even within each of these sets, different approaches tend to prevail.

Numerous challenges are associated with evaluating and fostering sustainable biofuel feedstock production – issues that these instruments need to address. The first is that some biofuel feedstocks (e.g. sugarcane, soybean and oil palm) are used to supply both food and fuel markets – making it difficult to attribute impacts to the biofuels sector, especially given that biofuel markets demand only a small portion of the total feedstock production. Second, the production of biofuels involves a range of feedstocks suitable for various agro-climatic conditions and thus grown in a diversity of ecosystems, leading to differentiated impacts on forests. A third challenge is that biofuel development is not necessarily driven by open markets but by policy-making by states (and coalitions of states) that shapes demand and supply.

Taking these issues into account, this working paper discusses the basic working components of MBIs and their likely effectiveness in avoiding deforestation from possible biofuel development; they may function either by reducing the pressures of feedstock production expansion on forests, or by shifting such pressures to non-forest areas.

The assessment provided here is based on a literature review that examines various MBIs and implementation processes that rely on market and economic incentives to induce changes in actors' behaviour. In some cases, these instruments have evolved into relatively complex global governance systems, some of which are primarily driven by non-state actors (e.g. forest certification and labelling; Cashore 2002) whilst others are driven in large part by state actors but involving multiple stakeholders and mediated by market forces (e.g. REDD+ schemes emerging to provide compensation for reduction of deforestation and forest degradation; Angelsen *et al.* 2009). In other cases, these instruments operate at smaller scales, such as in numerous emerging initiatives seeking to internalise externalities through PES voluntary agreements to ensure biodiversity conservation and water resources provision (Wunder 2005).

It is not always easy to draw a clear distinction between MBIs and state regulations, because the implementation of many MBIs entails the intervention of state authority through the approval of formal regulations and enforcement; others are primarily driven by non-state actors but are later promoted by governments. We exclude from the analysis mechanisms that are purely regulatory in nature as well as several instruments involving regulatory elements, such as policy measures influencing agents' decision-making through price-based (e.g. taxes, levies, subsidies) or quantity-based (e.g. cap-and-trade schemes, offset mechanisms) instruments (Whitten *et al.* 2004). However, we do include a host of instruments, mechanisms and multi-stakeholder processes. Some of these are voluntary but others may involve heavy state involvement, such as emerging efforts to support public investment under responsible investment guidelines, or state involvement as part of broader multi-stakeholder processes in REDD+ compensation schemes. The inclusion of the latter is justified by our use of a broad definition of MBI and by such instruments' direct relevance for avoided deforestation.

The key message in this working paper is no single instrument is likely to reduce the potential threat of biofuel development to forests and thus avoid deforestation; rather, a host of complementary mechanisms will be needed to achieve this aim. Furthermore, the effectiveness of discrete MBIs depends on several factors related to their design, scope and scale, and the degree to which they are adopted and independently monitored in practice. For any voluntary measure to make a difference in avoiding deforestation, it would have to either have a noticeable impact in economic terms or be accompanied by some form of state regulation. Therefore, in many cases, the effectiveness of the various MBIs in avoiding forest conversion due to biofuel feedstock expansion will depend on the active involvement of the state in promoting and enforcing their adoption. In many contexts, this will in turn imply strengthening the overall governance system in which the instruments are embedded. Therefore, there is a need to build greater synergies – both amongst the various MBIs and between MBIs and state regulatory frameworks at various scales – to ameliorate the likely (direct and indirect) threats that biofuel expansion poses to forests.

This paper is organised in 6 sections including this introduction. The second section describes the methodological approach employed in the analysis. The third section provides an overview of the different MBIs selected for analysis, as a means of ensuring a common understanding of what the label means. The fourth section discusses the strengths and weaknesses of the MBIs assessed in this study in terms of their contributions to reduced or avoided deforestation. The analysis considers both the instruments' inherent design features and their actual implementation within and outside the biofuels sector, drawing on lessons from past experience. The fifth section seeks to assess the likely effectiveness of the MBIs when, or if, they are applied to the biofuels sector. The final section pulls together the main conclusions and suggests some ways forward.

2. Methodological approach

Many methodological challenges are associated with this review. The first is that many MBIs, although operational in other sectors, are still in their infancy in the biofuels sector; this requires that we draw on experiences from other sectors to analyse the risks and opportunities associated with their likely implementation in the biofuels sector. Second, it is difficult to assess implementation outcomes of some of these instruments (such as biofuels finance) because of the absence of prior analyses of their effectiveness or limited information disclosure. Note, though, that the issue of access to information is not exclusive to cases governing the biofuels sector: it also applies to other mechanisms such as PES, where information gaps often hinder the assessment of their effectiveness in achieving additionality and reducing leakage (several reviews deal with this issue). A third factor is that biofuel markets are largely driven by state policies and regulations (e.g. blending targets, premiums, sustainability criteria applied to sourcing) which shape their magnitude and dynamics; this influences the likely effectiveness of MBIs as they can be sensitive to regulatory incentives.

These methodological caveats increase the difficulty of drawing conclusions about the effectiveness of various MBIs in terms of their ability to reduce or avoid deforestation in the biofuels sector. Nonetheless, this review provides some initial insights based on the defining features of these instruments and drawing on literature reviews, case studies and circumstantial evidence.

This review adopts a 3-pronged methodological approach. The first step is to adopt a basic definition of MBIs and develop a typology of instruments to be considered in our analysis. Step two involves evaluating the effectiveness of each instrument based on its inherent design features. The final step consists of developing a common set of criteria for assessing each instrument's effectiveness in practice, as well as conducting a literature review to evaluate each instrument against some broadly agreed criteria as a means of encompassing the specificities of the MBIs under review.

2.1 Defining and selecting 'market-based instruments' for analysis

No common definition of 'MBI' exists. These types of instrument are often devised to overcome market imperfections or to pay for economic externalities. In contrast with mandatory command-and-control directives or state regulations, they are incentive-based instruments, designed to encourage or persuade economic agents to make certain choices to alter their practices. Some common definitions of MBIs are provided in Table 1.

Common to these definitions is a view of MBIs as economic instruments mediated by prices or other economic variables to provide incentives for patterns of behaviour that will lead to certain outcomes, such as the provision of environmental services (ESCAP 2004, MEA 2005). Yet while all of the

Table 1. Definitions of market-based instruments

Institution	Year	Instruments	Definitions
OECD	1994	Economic	Tools that affect estimates of the costs and benefits of alternative actions open to economic agents
Stavins and colleagues	2003	Market-based	Instruments or regulations that encourage behaviour through market signals rather than through explicit directives
Millennium Ecosystem Assessment (MEA)	2005	Market-based	Mechanisms that create a market for ecosystem services, or affect existing markets, in order to improve efficiency in the way the service is used
ESCAP	2010	Market-based	Use price or other economic variables to provide incentives [for polluters to reduce harmful emissions] (bracket added)

above definitions stress the role of the market in providing price signals to promote or deter particular sets of behaviours, these definitions have slightly different orientations in relation to the degree of involvement of state and non-state actors, and the scope and aims of the instrument. Consideration of the role of government in setting policies that shape market signals (e.g. charges, subsidies, deposit/refund systems, licensing, taxes, property rights) and inclusion or not of voluntary initiatives from the private sector in the definition of MBI, for example, vary. Therefore, the distinction between market-based instruments and actions taken by public authorities to set up market-based incentives and to *regulate* is not equally clear in all cases. The Millennium Ecosystem Assessment (MEA 2005) definition, for example, uses the term MBI to include 'actions such as taxes, subsidies, or *regulations* that affect existing markets'. Stavins (2003) understands MBI to encompass *regulatory instruments*. The above definitions also differ in scope (e.g. markets for ecosystem services) and aims (e.g. reducing harmful emissions vs. improved efficiency). Yet such variations are not critical to this analysis, because a definition applying to a particular domain (e.g. markets for ecosystem services) or outcome (e.g. economic efficiency) can be broadened for the purposes of this research without affecting the underlying definition of MBIs.

A further ambiguity emerges in the tendency to exclude from the definition of MBIs voluntary agreements established amongst private sector actors, given the focus on *policy instruments*, adopted by states, using price or other economic variables *to provide incentives to economic agents.* Nonetheless, the development of sustainability standards and norms by corporate actors and financiers themselves constitutes a form of governance that is rapidly proliferating as a means of quelling the concerns of civil society. Furthermore, these have emerged *in response to market pressures,* which can be mediated or not by government-led initiatives (Detomasi 2008). For these reasons, we include these sustainability standards in this study as emerging MBIs with effects on biofuels.

In addition, many processes are emerging that involve non-state actors (e.g. financial institutions, corporations, buyer groups, chain stores); such processes range from self-regulated initiatives to institutional platforms with little or no state intervention. While some of these take place at the global level involving, for example, collective statements (e.g. the financial institutions that adopted the Equator Principles), others occur through individual intentional statements, such as those adopted by specific financial institutions. There are also many PES initiatives that involve only local agreements between private users to pay to secure the provision of a specific environmental service to some specific service providers; and in many cases, scaling-up to expand the geographical scope of these transactions has only been possible through some state intervention.

Implementing MBIs commonly requires some form of regulation and, in some cases, some type of state intervention. Therefore, rather than exclude instruments in which regulatory functions come into play, we include such 'hybrid' schemes. These tend to emerge, for example, when governments of consumer countries promote the adoption of certified biofuel production involving independent monitoring and verification schemes, when public financial institutions adopt conditions for responsible investment tied to the provision of lending to the private sector, or when governments decide to allocate public finance to compensate private landholders for protecting the provision of specific environmental services.

To encompass such scenarios of direct relevance to avoided deforestation, we adopt a relatively broad definition of MBI in this review, as follows: 'instruments and processes driven by state and/or non-state actors for which price or other economic incentives are used to promote particular patterns of behaviour'. Based on this definition, we develop a typology of MBIs and related processes based on their mode of operation, namely those that shape: (1) production and trade, (2) the provision of financial resources for biofuel feedstock production or processing, and (3) the maintenance of environmental services from forests threatened with conversion to other land uses. These 3 sets of MBIs are classified based on their objectives and scope, and their expected effectiveness in reducing deforestation and forest degradation with potential applicability to the biofuels sector. Definitions and a more detailed description of the types of MBI selected are presented in Section 3.

2.2 Evaluation of effectiveness of market-based instruments based on design features

The second methodological step is to compare MBIs based on their design features. Factors considered include the following:

- market mechanism through which the instrument operates;
- presence of any regulatory elements to enhance compliance;
- nature of the incentive involved;
- actors driving or initiating the mechanism;
- actors the instrument is designed to influence;
- diversity of actors in instrument design and/or implementation; and
- mechanisms for avoided deforestation.

By comparing these features, the likely effectiveness of the instrument is assessed based on the nodes in the production and supply chain where the instruments is applied (e.g. finance, production, processing, trade); the instrument's relative independence (e.g. whether the actor initiating the instrument is the same as the actors the instrument intends to influence); key motivations driving actors to comply, or not; and the extent to which the instrument is designed to target the end goal.

2.3 Literature review based on a set of common assessment criteria

The final step in the methodology is to assess the effectiveness of the selected MBIs *in practice* through a comprehensive literature review. To enable comparison, common criteria are identified to assess effectiveness. Four key indicators are selected for this purpose: (1) the extent to which a standardised set of internationally recognised and verifiable criteria are employed to assess compliance; (2) the extent to which the instrument, or certain variants of it, provides for independent monitoring and verification; (3) scope and scale of influence; and (4) the likelihood of achieving impact (based on an evaluation of the viability of the pathways through which impacts are intended to be achieved). We have chosen to organise our discussion based on very broad criteria because each group of MBIs involves specific features that make comparison difficult.

Where possible, this analysis draws on specific case studies to provide concrete examples to illustrate the basis for the evaluation.

3. Overview of the instruments applicable to biofuels

3.1 Instruments influencing production and trade

Some principles and guidelines aimed at promoting sustainable production are designed to govern the production of specific feedstocks (e.g. soybean, sugarcane, oil palm), whilst others target biofuel production as a whole. The aim of these instruments is to encourage individual landholders or companies to adopt sustainable production standards through incentives to secure access to markets. Instruments in this group range from criteria that corporations impose on themselves (self-regulation) to standards that are developed within wider frameworks comprising legal, social, economic and environmental aspects and involving a wide range of stakeholders, and that may or may not be certified by an independent third party. Instruments within this group can be distinguished according to the type of criteria aiming to sustainability outcomes, and the rigour of the (independent) verification process. These instruments include the following.

Criteria developed by corporations for self-regulation constitute a form of corporate social and environmental responsibility built into a business model in which a corporation opts to follow a set of standards in its business practices, which are usually documented through publicly available reports (Mikkilä and Toppinen 2008). Often 'corporate social responsibility' (CSR) is composed of 3 dimensions: social, economic and environmental. Companies may choose to follow any one or all of these dimensions. The caveat with corporate self-regulation is that image-building and communication can improve the reputation of a company in a manner that deviates from corresponding sustainable practices (Mikkilä and Toppinen 2008).

Sustainability standards are sets of requirements applied to the production, processing and trade of commodities including biofuel feedstocks (e.g. oil palm and soybean). Standards are structured according to a set of principles providing the general orientation of action, a set of criteria for each principle and technical guidance and recommendations, which often include indicators for assessing compliance. To be used in the formulation of a certification standard, criteria have to be operational and measurable (Lewandowski and Faaij 2005). Their application is voluntary, but becomes binding once a company has decided to become certified. Sustainability standards are being developed with a range of criteria related to greenhouse gas (GHG) emissions, conservation of biodiversity, soils, water, promotion of good agricultural practice in degraded land and mitigation of indirect land use change.

Certification and labelling is the process whereby an independent third party verifies – assesses (certifies) and officially recognises (labels) – the quality of management in relation to a set of predetermined standards along with verifiable criteria and indicators. Certification schemes can cover production only, the end part of the chain or the entire value chain (van Dam *et al.* 2008). Often, the decision to enter into certification is driven by downstream supply chain actors that consider the certification of their raw products as an opportunity to reduce risk to their operations, and are likely to obtain some premium price from 'green markets'. However, *per se* voluntary certification tends over time to constitute a prerequisite for producers to enter the markets such as in timber markets.

Standards and certification processes for biofuels and biofuel feedstocks are under development, mostly based on existing frameworks for certification of forestry, agriculture and energy operations. Overall, the sustainability aspects of most of these emerging initiatives consider environmental, socio-economic, governance and food security issues along the production chain but they often lack adequate or validated criteria and indicators (van Dam *et al.* 2008, Buchholz *et al.* 2009, Hennenberg *et al.* 2010). There are various initiatives for the development of biofuels and biofuel feedstock sustainability criteria, including the EU Renewable

Energy Directive (EU-RED), and the Renewable Transport Fuel Obligation (RTFO) (Box 1). All of these initiatives include legal, social, economic and environmental criteria. The existing certification schemes that serve as a benchmark for biofuel certification include the Roundtable on Sustainable Biofuels (RSB), Sustainable Agriculture Network/ Rainforest Alliance (SAN/RA), the Round Table on Responsible Soy (RTRS), Integrated Farm Assurance for Combinable Crops (EurepGAP in 2007 changed to GLOBALGAP). For commodities such as palm oil, soybean or sugarcane – which are used as biofuel feedstock – roundtables have been established to include a range of stakeholders (government, NGOs, industry, importers, exporters) along the production chain. The standards are seen as a potentially effective means of gaining insight into ways to make such instruments operationally effective (e.g. in the case of the RSPO) for eventual certification. In July 2011, the EC approved 7 voluntary certification schemes that can certify that biofuels are produced in a sustainable way; the list includes RSB, RTRS, 2BSvs and Greenergy, among others.

Potential benefits from implementation of sustainability standards include enhanced access to certain markets, price premiums, compliance with agreed reductions in GHG emissions from fossil fuels (e.g. EU-RED) and other co-benefits such as reduced pressures from civil society and/or the media. Nonetheless, while these benefits may apply to the adoption of sustainability standards across different agricultural commodities, the biofuels sector has some particularities because of the market regulations and price premiums imposed by consumer countries.

Box 1. Environmental criteria for biofuel production standards

The environmental criteria under development include indicators for greenhouse gas (GHG) emissions, biodiversity, soil (in terms of carbon stocks or quality or both), water and air quality.

- For the *EU Renewable Energy Directive* (EU-RED), the environmental criteria include: (1) a minimum 35% GHG emission savings compared with fossil fuels; (2) that biofuels not be made from raw materials produced from land with high biodiversity value, including natural forest and native woodlands; and (3) that biofuels not be made from raw material produced from land with high carbon stocks or from peatland drained for this purpose.
- Under the *Roundtable on Sustainable Biofuels* (RSB), some criteria indicates that biofuel production should (1) reduce significantly GHG emissions, taking direct and indirect land changes into account; (2) avoid negative consequences on biodiversity, ecosystems and high conservation value areas; (3) promote practices that seek to improve soil health and minimise degradation; (4) optimise surface and groundwater use; and (5) minimise air pollution along the supply chain (RSB 2010a).
- Criteria of the *Netherlands Technical Agreement* 8080 (NTA 8080) cover 6 principles: (1) a positive GHG balance of the production chain and application of the biomass; (2) protected or vulnerable biodiversity must not be affected; (3) biomass production must not be at the expense of carbon sinks; (4) soil and soil quality are retained or improved; (5) ground and surface water must not be depleted and quality must be maintained and (6) air quality must be maintained (Mikkilä *et al.* 2009).
- The *Renewable Transport Fuel Obligation* (RTFO) Biofuel Sustainability Meta-Standard of the UK involves 5 environmental principles, namely that biofuel production should not: (1) destroy large above- or belowground carbon stocks; (2) destroy or damage high biodiversity areas; (3) lead to soil degradation; (4) lead to contamination or depletion of water sources; or (5) lead to air pollution (RFA 2009).
- The *Roundtable on Sustainable Palm Oil* (RSPO) comprises 8 principles, one of which deals with environmental responsibility and conservation of natural resources and biodiversity, which in turn embraces 6 criteria related to: (1) plantation and mill management, including replanting, for which environmental impacts are identified; (2) the status of rare, threatened or endangered species and high conservation value habitats shall be identified and their conservation taken into account in management; (3) waste is reduced, recycled, re-used and disposed of in an environmentally and socially responsible manner; (4) efficiency of energy use and use of renewable energy is maximised; (5) use of fire for waste disposal and for preparing land for replanting is avoided; and (6) plans to reduce pollution and emissions, including GHGs, are developed, implemented and monitored (RSPO 2007).

3.2 Instruments governing biofuel finance

Private financial institutions (domestic and foreign banks and institutional investors) and public financiers (domestic and foreign governments and multilateral banks) both play an important role in financing the growth of the biofuels sector. As the availability of finance is a crucial precondition for the further growth of this sector, these actors could play an important role in channelling the expansion of biofuel (and related feedstock) production to already deforested lands rather than prompting conversion of natural forests. The instruments governing sustainable finance can be divided into 2 groups: (1) responsible investment instruments used in the financial sector and (2) conditions tied to public finance of biofuel feedstock production and processing leading to the adoption of sustainable production.

Responsible investment instruments. A clear responsible investment policy needs to give guidance on how and where a financial institution can apply its investment instruments. In practice, however, the responsible investment policies of different financial institutions vary in their ability to play this guiding role. Responsible investment instruments can be divided into 2 groups: (1) intentional statements that show the goodwill of a financial institution but do not include well-defined criteria, and (2) responsible investment policies that do include compliance with well-defined criteria.

1. **Intentional statements** express the intention to apply responsible investment policies to (some) investment decisions, although it is uncertain whether the statement will lead to the actual adoption of responsible investment practices. There are 2 types of intentional statements: single institution and collective. Single-institution statements are available on the websites or in annual reports of many financial institutions, who express a promise that their investments will 'contribute to a more sustainable world' or something similar. Collective statements are more formalised and are undersigned by a number of financial institutions who promise to 'take into account' or 'integrate' social and environmental criteria in their investment decision processes. Examples of these collective statements are the UNEP-FI Statements and the UN Principles for Responsible Investment.
2. **Responsible investment policies** need to contain well-defined, verifiable criteria which the financial institution can apply when evaluating a proposed investment. Ideally, these criteria are derived from internationally recognised standards. Many financial institutions have set up their own benchmarks which meet these criteria, but there are also collective responsible investment policies undersigned by a group of financial institutions. The most important and best-known collective responsibility investment policy is the Equator Principles (Box 2).

It is noteworthy that during the past 10 years, more and more financial institutions have developed their own responsible investment policies for various sectors and sustainability issues (Perez 2007). Leading this development was the World Bank Group. Its

Box 2. Existing standards for sustainable finance

The *Equator Principles* (EP) is a financial industry benchmark for determining, assessing and managing social and environmental risk in project financing. The signatories to the EP commit to adhering to the environmental and social guidelines (Performance Standards) of the International Finance Corporation (IFC) when providing project finance or related advisory services for projects costing US$10 million or more. The Performance Standards of the IFC address a wide range of social and environmental risks, such as protection of human rights, protection and conservation of biodiversity, use and management of dangerous substances, impacts on affected communities and indigenous peoples, labour rights, pollution prevention and waste minimisation. Currently, 67 financial institutions have adopted the Equator Principles (Equator Principles 2010a).

It is noteworthy that the IFC's actual performance deviates considerably from its policy prescriptions. In this regard, the World Bank Group suspended its investments in the palm oil sector in late 2009, and committed to reviewing lessons learnt and to consulting with stakeholders about its policy investment in oil palm, a process which took place in 2010. The IFC lifted the suspension in early 2011 with the adoption of a new framework to guide future engagement in the global palm oil sector.

private-sector subsidiary, the International Finance Corporation (IFC), has more than 2 decades of experience with assessing investment proposals against its Performance Standards, which define criteria on a broad range of social and environmental issues. Other public banks have since followed this trend. The issues and sectors for which banks have developed policies or benchmarks vary, and only a few banks have developed benchmarks relevant to the biofuels sector. A BankTrack study involving 49 large international banks indicates that 16 out of the total had developed a forest(ry) policy and 9 had developed an agriculture policy (van Gelder *et al.* 2010). Only a few private financial institutions have developed a specific biofuels policy, amongst them Rabobank (the Netherlands) and Standard Chartered (UK) (Box 3).

Conditions tied to public finance. Various conditions can be tied to all forms of public finance for feedstock and biofuel production to ensure that the expansion of biofuels (and related feedstocks) is restricted to already degraded land, rather than prompting conversion of natural forests. These include public finance (e.g. subsidies, tax breaks) for domestic feedstock and biofuel production; loans by multilateral development banks; development financing and foreign investment loans; export credit loans; and guarantees and investments by state-owned companies.

The ways in which social and environmental conditions can be tied to forms of financing and the due diligence process are very similar to the responsible investment instruments used in the financial sector. Leading in this respect are the multilateral development banks, which now all have a system in place to assess whether investments meet basic social and environmental criteria. All have formulated general social and environmental criteria which are also applicable to feedstock and biofuel investments, and some have also developed

Box 3. Examples of single-institution responsible investment policies

Rabobank policy
Rabobank's Biofuels Policy states that Rabobank wants to 'contribute to the realisation of a sustainable biofuels supply chain by client assessment and client engagement'. Specifically, Rabobank has formulated the following 'conditions for investments' for upstream and downstream companies in the biofuels sector:

- to show the legality of their operations and comply with all applicable local, national and international ratified laws and regulations;
- to have a policy in place that guarantees that the feedstock used comes from a company that adheres to the conditions described in Rabobank's Palm Oil, Sugarcane, Soy and Forestry Supply Chain Policies;
- not to produce biofuels or other bioliquids that contain raw material obtained from land with high carbon stock;
- to produce biofuels that provide clear GHG benefits after considering the entire life cycle of raw materials from cultivation, production and uses compared with fossil fuel;
- to ensure to their best ability that the biomass used for biofuels does not replace (land for) staple crops when there are indications of local food insecurity; and
- to work in accordance with the human rights guidelines as described in the Human Rights policy of the Rabobank Group (Rabobank 2010).

Standard Chartered policy
Standard Chartered states that it is concerned about 'the unintended environmental, social and economic consequences of inefficient biofuels and unsustainable industry practices'. Therefore, the bank will evaluate financing requests from biofuel producers against the following criteria:

- impact on food prices and food security, directly by reducing food supply or indirectly through land use change;
- energy and GHG emissions savings; and
- potential for deforestation.

Based on these criteria, the bank will suspend financing to new first-generation production facilities that use corn or wheat as feedstock for ethanol production. The bank will also support the use of palm oil as feedstock only where it is produced sustainably (SCB 2010).

specific criteria for the biofuels sector (van Gelder and Kouwenhoven 2011). Notable examples in this respect are the Biofuels Sustainability Scorecard of the Inter-American Development Bank (IDB), which is very active in the biofuels sector via its Sustainable Energy and Climate Change Initiative (SECCI) programme, and the Performance Standards of the IFC (Box 4).

3.3 Instruments rewarding the provision of environmental services

Mechanisms for securing the provision of environmental services are designed to provide incentives in the form of payments, compensation or rewards to landholders to internalise the externalities pertaining to the development of land uses that lead to forest conversion, in turn halting the flows of

Box 4. Multilateral development bank criteria relevant for biofuels

IDB Biofuels Sustainability Scorecard
To ensure that its biofuel investments contribute to sustainable development, the Inter-American Development Bank (IDB) has initiated a partnership with the Roundtable on Sustainable Biofuels to integrate the Roundtable's sustainability principles into its lending policies, and to test these principles in projects that it supports. The resulting 'IDB Biofuels Sustainability Scorecard' aims to 'encourage higher levels of sustainability in biofuels projects by providing a tool to think through the range of complex issues associated with biofuels' (IDB 2010).

In September 2009, the IDB released a new version of the its Biofuels Sustainability Scorecard. The first version, released in 2008, addressed 23 key variables including GHG emissions, water management and biodiversity. The updated version includes new categories to more thoroughly capture the environmental and social dimensions of biofuels investments. Specifically, there are 6 new categories that address issues relating to, amongst others, indigenous people, local grower arrangements and impact on food security (IDB 2009).

The IDB Biofuels Sustainability Scorecard raises questions about proposed projects and assigns points for each answer. Issues covered include the conservation value of the project site and the impact of direct land use change on GHG emissions. The Scorecard also seeks to address emissions from indirect land use change by assigning more points to the use of degraded lands and discouraging the use of forestland. Another category concerned with biodiversity loss includes the extent to which field burning is used as a harvesting method (IDB 2010).

Performance Standards in the IFC's sustainability policy
The sustainability policy of the International Finance Corporation (IFC, the private sector subsidiary of the World Bank) includes 8 'Performance Standards' that define clients' roles and responsibilities for managing their projects and the requirements for receiving and retaining IFC support. The IFC applies the standards to manage social and environmental risks and impacts and to enhance development opportunities in its private sector financing (IFC 2006).

Standard 6 addresses the issue of 'biodiversity conservation and sustainable natural resource management'. This standard reflects the objectives of the Convention on Biological Diversity and addresses how clients can avoid or mitigate threats to biodiversity arising from their operations as well as sustainably manage natural resources. The requirements for IFC support set out in this standard include rules of behaviour for natural, modified and critical habitats and legally protected areas; for the introduction of invasive alien species; and for operations in freshwater and marine systems. With regard to deforestation, one requirement is specifically important (IFC 2006, 2010). Forests are in particular principal providers of natural resources and therefore need to be managed in a sustainable manner. This includes that:

- clients involved in natural forest harvesting or plantation development cannot cause any conversion or degradation of critical habitat or areas defined as High Conservation Value (HCV);
- where possible, the client has to locate plantation projects on unforested land or land already converted (not in preparation for the project); and
- the client has to ensure that all natural forests and plantations under its management are independently certified as meeting performance standards compatible with internationally accepted principles and criteria for sustainable forest management.

Box 5. Types of payment for environmental services mechanisms

User-financed PES programs

- The classic program in both developing and developed countries involves a single buyer and a single-service and work often at the landscape level
- Several programs used external funds to co-finance start-up costs, and are thus not purely user-financed
- Non-governmental organisations (NGOs) frequently function as intermediaries between buyers and sellers

Government-financed programs

- Most rely on annual allocations through the normal budgetary process, but some have dedicated funding sources through earmarked user fees.
- Developed-country programs sometimes receive funding from several levels of government, while developing-country programmes can receive donor funding.
- The borders between user- and government-financed PES programmes can become blurred because many programmes are in fact hybrids, mixing government and user financing.

Source: Elaborated by authors based on Wunder and colleagues (2008)

environmental services associated with forest cover (e.g. water provision, soil conservation, carbon storage, biodiversity and landscape beauty). These mechanisms thus entail a system through which the beneficiaries of the environmental service (buyers), at either the local or the landscape level (e.g. water) and at the global level (e.g. carbon), transfer a monetary value to the providers of the service (sellers), which ultimately is translated into land use change decisions with effects on service provision. Payments should compensate for the foregone benefits or the opportunity costs from using the forest for some alternative land use. As a way to reduce deforestation, a new mechanism is emerging, known as reduction of emissions from deforestation, forest degradation and enhancement of carbon stocks (REDD+); REDD+ is a form of global PES, although its likely architecture and scope are still the subject of intense debate and will vary across countries (Angelsen *et al.* 2009).

Payments for environmental services (PES) are defined as voluntary transactions where a well-defined environmental service (ES) or a land use likely to secure that service is 'bought' by a (minimum of one) service buyer from a (minimum of one) service provider if, and only if, the service provider secures service provision (conditionality) (Wunder 2005). Typical PES programmes are often identified with user-financed initiatives, which often operate at the landscape scale and are associated with the provision of a specific environmental service. However, PES conditions do not always apply, and, in practice, other institutional arrangements which do not correspond to typical PES systems tend to emerge (Pascual *et al.* 2010). The latter are often labelled compensation and rewards (or non-typical PES), where the provision of multiple services (such as water, biodiversity, carbon, landscape beauty) is included in the contractual agreements, although without a clear conditionality (Swallow *et al.* 2009). These often correspond to government-financed programmes which embracing multiple environmental services, and working often at the national level (Wunder *et al.* 2008) (Box 5).

Reduction of emissions from deforestation and forest degradation (REDD+) constitutes a global initiative aimed at reducing carbon emissions and enhancing forest carbon stocks in developing countries. Although there is not yet any global agreement on how REDD+ will work, some countries have already started to develop national REDD+ strategies and policies, and several REDD+ projects have been initiated across the tropics; however, such projects are still in their infancy and it is difficult to assess their effectiveness in reducing deforestation or maintaining current forest cover. There are still many design and implementation challenges involving REDD+, which are beyond the scope of this paper and have been discussed elsewhere (Angelsen 2008). Main REDD+ design challenges are: (1) designing the optimal incentive mix to

change the behaviour of landholders depending on their opportunity costs; (2) embedding REDD+ interventions in existing institutional systems and overcoming governance deficits; and (3) ensuring participation and benefit capture amongst poor stakeholders (Börner *et al.* 2010). Many national REDD+ strategies, currently being designed, will have to rely heavily on incentive- and disincentive-based policy instruments (e.g. conditional compensation transfers) and enforcement of land and forest regulations.

The mechanisms through which MBIs that aim to secure the provision of environmental services or to directly reduce deforestation may contribute to reducing deforestation depend on the compensation systems and the conditions of the agreements. Whereas PES contributes to reducing deforestation by offering compensation for the provision of environmental services, REDD+ will work by compensating the reduction of carbon emissions or the enhancement of carbon stocks. For example, one way to link the expansion of biofuel feedstocks to the reduction of deforestation could be to tie carbon credits to development of plantations on non-forest or degraded lands. In addition, direct compensation schemes for avoiding deforestation can constitute an incentive to halt forest conversion. However, several issues linked with efficiency and equity are yet to be resolved.

4. Evaluating the effectiveness of market-based instruments

The findings on the effectiveness of the selected MBIs are organised according to the methodology employed. The first section evaluates effectiveness based on the instruments' design features, and the second section evaluates them based on experience in applying them within, or beyond, the biofuels sector.

4.1 Evaluating effectiveness based on design features

As noted, we first evaluate the MBIs (those operating in relation to production and trade, biofuel finance and the provision of environmental services) based on their design features. After briefly describing the design features of various sets of instruments, we compare and contrast these features as a step towards drawing out hypotheses about how these features are likely to shape the instruments' relative effectiveness.

4.1.1 Design features

Instruments influencing production and trade. A key characteristic of the design features is related to the type of standards devised. Hennenberg and colleagues (2010) compared the principles and criteria for 7 biofuel sustainability standards (EU-RED, RTFO, RSB, RTRS, RSPO, FSC and SAN), some of which are described in Box 1. All standards include criteria related to conservation of biodiversity and most of them include criteria on the need to protect or restore native ecosystems or include language directed against the conversion of forest for production of the relevant commodity. All standards, except SAN, prohibit conversion of high conservation value (HCV) areas for feedstock production. Whereas the RTFO and RSPO ban all cultivation in HCV areas, the RTRS and RSB authorise limited exploitation of HCV areas so long as the HCV is maintained. Most notably, comparison of these 7 standards reveals lack of consensus on criteria related to mitigation of impacts of indirect land use change. Four standards allow cultivation on degraded lands and the EU-RED gives a premium (doubling factor for the EU biofuel quota) to biofuels feedstocks produced on degraded land and through biofuels from residues and waste. However, none of the standards specifically *promotes* land use planning or cultivation on abandoned or degraded land to mitigate leakage. Establishing the sustainable production and processing of biofuels is a challenge because of the different technologies employed in the production process, as well as feedstock- and location-specific differences.

Instruments governing biofuel finance. For a responsible investment policy to be effective in guiding the investment decisions of a financial institution, it needs to contain well-defined, verifiable criteria and indicators that the financial institution can use to evaluate the proposed investment; these should also be reasonably clear for all parties involved (e.g. the employees of the financial institution, the company seeking investment and possible third parties). To avoid deforestation and channel biofuel investments to already degraded land, clear criteria on avoided deforestation, biodiversity and GHG emissions related to land cover change should be included in the responsible investment policy. At one end of the spectrum are the intentional statements discussed above, which lack well-defined criteria; at the other end is the most important collective responsible investment policy used in the financial sector – the Equator Principles – which is based on detailed Performance Standards developed by the IFC. However, the Performance Standards have only limited relevance for the biofuels sector, because they are only applied to forms of project finance that are not attractive to the biofuels sector. The Performance Standards of the IFC point to 'internationally accepted principles and criteria for sustainable forest management' but do not specify certification schemes. The criteria included in the IDB's Biofuels Sustainability Scorecard were developed in collaboration with the RSB. Other public financiers follow World Bank/IFC policies.

Instruments rewarding the provision of environmental services. The effectiveness of PES to secure or improve the provision of environmental services is largely related to the design of PES schemes, particularly with regard to:

- the type of services whose provision is compensated (either single or multiple services);
- the compensation mechanisms which are adopted;
- the conditionality requests involved in the provision of the service; and
- the continuity of payments over time.

The implementation of PES schemes varies depending on a number of ecological, socio-economic or institutional conditions, thus configuring diverse conditional arrangements between service providers and buyers with diverse impacts on additionality and linkages between land uses and environmental services provision. A PES programme will secure additional services only if it induces changes in the provision of the service (e.g. water provision, biodiversity, carbon) that would otherwise not have occurred. In addition, changes in land use do not automatically result in the provision of a determined environmental service; therefore, such changes will only deliver services when they are of appropriate quality and in a suitable location (Pattanayak *et al.* 2010). Although REDD+ is emerging as an alternative compensation mechanism for reducing deforestation and forest degradation at nested local and national scales, it is not fully assessed here because it is still subject to negotiation, and the various REDD+ pilot projects underway are only in the initial stages of implementation (Wertz-Kanounnikoff and Kongphan-apirak 2009).

4.1.2 Comparing and contrasting instruments' design features

As the above descriptions suggest, the selected MBIs differ in their design, scope and aims. These instruments are contrasted in Table 2 through examination of such distinguishing features as the market mechanism through which the instrument is expected to affect an agent's decisions, the incentives which shape such decisions and the role of different actors in the instrument's design and implementation.

Two important observations deserve mention here. The first is the extent to which regulatory elements complement the MBI and thus provide stronger motivation or means for compliance. Such instruments (e.g. certification and labelling, PES) could be expected to out-perform those which rely on either market-based or regulatory instruments alone. Second, and linked to the first point, instruments involving a meaningful role for multiple sets of actors (public and private, civil society), although more complex and thus potentially subject to challenges, can be expected to out-perform those relying on single sets of actors because of the presence of checks and balances in the system. Certification and labelling, certain forms of PES including REDD+ and conditions tied to public finance are examples of such instruments.

In addition to looking at such generic design features, it is also important to look at the pathway through which the instrument is intended to achieve the end goal of shifting investments to already converted lands in preference to prompting the conversion of natural forests. Key features of the selected MBIs as they relate to the aim of avoided deforestation are set out in Table 3.

The instruments presented in Table 3 are designed to shape behaviour at different nodes in the production and supply chain. While some are designed to shape biofuels finance (a precursor to production), others are designed to influence production or the provision of feedstocks by processing facilities (and thus the impact of production on deforestation or the provision of environmental services), or market access. The fact that different instruments target different actors (e.g. financial institutions, individual landholders or large corporations producing feedstocks, processing companies, buyers) and different processes (e.g. finance, production, trade) means that they are inherently complementary to one another. The application of different instruments in combination is therefore likely to ratchet up governance standards for achieving, for example, avoided deforestation more effectively than any instrument when applied in isolation.

These instruments also vary in terms of their strength and independence in ensuring rules or conditionalities are met. Those based on self-

Table 2. Market-based instruments with potential to contribute towards avoiding deforestation due to biofuel production

Market-based instrument	Market mechanism	Regulatory elements	Incentive	Stakeholders	Role of various actors in instrument design and/or implementation	
					Public	Private
Principles and practices governing production and trade						
Criteria developed by corporations for self-regulation	Anticipated benefits associated with a good corporate image encourage practices deemed to be environmentally beneficial or benign by key stakeholders	None	• Improved relations with local communities • Reduced civil society pressure • Reduced risk to operations • Marketing tool	• Affected communities • Civil society in developed and developing countries • Government in developing countries • Shareholders	None	• Establishment and implementation of policies • Voluntary reporting to shareholders
Sustainability standards	Anticipated benefits associated with a good corporate image encourage portfolio of land uses to shift to align with standards	Identification of effective criteria	• Access to certain markets • Optimisation of production processes	• All actors along the supply chain	Definition of standards	• Negotiation of standards • Sometimes driven by actors further downstream
Certification and labelling	Strict standards for accessing benefits encourage portfolio of land uses to shift to provide uses or services required by the instrument	Identification of effective criteria and verification of compliance	• Access to niche markets • Price premium	• All actors along the supply chain • Consumers	• Identification of effective criteria • Setting targets	Independent verification

Market-based instrument	Market mechanism	Regulatory elements	Incentive	Stakeholders	Role of different actors in instrument design and / or implementation	
					Public	Private
Instruments governing biofuel finance						
Responsible investment instruments	Anticipated benefits associated with a good corporate image encourage financiers to invest only in those corporate actors whose practices are considered sustainable or low risk	Identification of criteria	• Reduced civil society pressure • Reduced risk of investments • Improved public image	• Financiers (design and application of instrument) • Corporate actors (complying with criteria so as to access finance) • Civil society (lobbying for responsible investment practices)	None	Financiers: • Establishment of criteria • Application of instrument • Verification of compliance • Biofuel corporations: • Implement-ation of actions to meet criteria
Conditions tied to public finance	To ensure that biofuels are a sustainable alternative to fossil fuels, governments tie conditions to their financing of the sector	Identification of criteria	Policy coherence: replacing fossil fuels with biofuels should bring sustainability gains	• Government bodies (incl. multilateral development banks) • Corporate actors (complying with criteria so as to access finance) • Civil society (lobbying for responsible investment practices)	Governments need to set criteria and tie to all forms of finance	Corporate actors: implementation of actions to meet criteria

Market-based instrument	Market mechanism	Regulatory elements	Incentive	Stakeholders	Role of different actors in instrument design and / or implementation	
					Public	Private
Compensation and rewards for environmental services						
Payments for environmental services (PES) and other reward schemes	Cash payments for the secure provision of a service encourage land uses which actually enhance the service	Verification of compliance with agreements before payments are made	Conditional payments	• The state (as sellers, buyers or facilitators) • Local individuals or groups (as sellers) • Corporate actors (as sellers or buyers) • Civil society (as buyers or facilitators)	• Sellers (through regulatory control on land use) • Facilitators (e.g. provision of policy framework, supporting pilots)	• Sellers (negotiation of agreements, service provision) • Buyers (negotiation of agreements, verification of compliance)
Reduction of emissions from deforestation and forest degradation (REDD+)	Compensation for reducing carbon emissions or enhancing carbon stocks	Diverse set of regulations required to make REDD+ operational	Conditional compensation, although can be linked to command-and-control instruments	State across multiple levels of government (e.g. national, provincial, municipal), and multiple stakeholders	Definition of tenure and carbon rights, mechanisms for benefits distribution, monitoring and verification, and others	Responsible for making the land use decisions through which carbon stocks are maintained or modified

Table 3. Features affecting the pathways by which market-based instruments contribute towards avoided deforestation

Market-based instrument	Main attributes defining the scope and outcomes of market-based instruments			
	Main focus of the instrument	Actor the instrument is designed to influence	Mechanisms for making and enforcing rules	Mechanism for incentivising avoided deforestation
Affecting production and trade				
Corporate social responsibility practices	Influence on production and/or processing practices, by conditioning market access	Often large-scale corporations	Corporate self-regulation integrated into the business model	Reputational risks lead to adoption of improved practices
Collectively sanctioned sustainability standards	Regulates production and/or processing practices	Feedstock producers and processing companies	Regulation of suppliers through procurement contracts	Restrictions in market access lead to adoption of defined standards
Certification and labelling	Regulates primary production, processing and the whole value chain	Feedstock producers and processing companies	Multi-stakeholder decision-making / independent certification based on performance	Restrictions in market access or price premiums in niche markets lead to adoption of defined standards
Affecting the provision of financial resources				
Responsible investment instruments	Constrains loans and investments for non-responsible production and/or procurement practices	Feedstock producers and processing companies	Corporate self-regulation of financiers	Reputational gains and reduced risks to financiers from adoption of responsible investment policies
Conditions tied to public finance	Constrains loans, guarantees, subsidies and investments for non-responsible production and/or procurement practices	Feedstock producers, processing companies, equipment suppliers and biofuel buyers	Conditional finance backed up by self-reporting or independent verification	Access to public finance
Affecting the provision of environmental services				
Payments for environmental services (PES) and other reward schemes	Compensates for the foregone benefits of not using a resource	Landholders with potential to produce feedstocks	Voluntary transactions based on compliance of a service provision	Monetary value of service-providing land uses increases
Reduction of emissions from deforestation and forest degradation (REDD+)	Compensates for the foregone benefits of not using a resource	Landholders with potential to produce feedstocks	Compensation based on the reduction or enhancement of carbon stocks	Compensation, can be linked to command-and-control measures

reporting or self-regulation (e.g. corporate social responsibility practices, responsible investment instruments) may be assumed to have less 'teeth' than those based on independent monitoring and verification (e.g. certification and labelling) because of the varying degrees of independence.

They also differ in relation to the key motivations for compliance, and the extent to which the actor operations would be harmed by non-compliance. Some MBIs are adopted with the aim of reducing reputational risks or enhancing market access through reputational gains. These benefits may be diffuse and hard to measure, which could be expected to result in either softening of standards or adherence to lower standards set to avoid major risks rather than to enhance performance itself. Other MBIs are adopted to improve access to markets or financial resources or to receive rewards in exchange for behaviours which enhance the provision of environmental services or result in foregone economic benefits. The nature of the benefits from compliance (levels of finance, market premiums) can be expected to shape compliance.

While some MBIs involve relatively complex agreements along the value chain between buyers, intermediaries and sellers conditioned on compliance with predetermined production or management standards (e.g. forest certification and labelling), others depend on performance-based or conditionality agreements between buyers, sellers and institutional brokers (e.g. PES). Yet another group of MBIs are based on corporate self-regulation, while others constitute processes involving multiple stakeholders (e.g. roundtables for the adoption of sustainability standards as part of common agreements between multiple stakeholders).

4.2 Assessment of market-based instruments based on experience

We now turn to the literature review to assess the extent to which the above design features shape an instrument's effectiveness in practice. We examine each instrument from the perspective of the extent to which a standardised set of internationally recognised and verifiable principles, criteria and indicators is employed to evaluate compliance; the extent to which the instrument is, or may be, subject to third-party involvement (i.e. independent monitoring and verification); the instrument's scope and scale of influence; and the likelihood of achieving impact.

4.2.1 Instruments influencing production and trade

Sustainability standards and the establishment of certification schemes are possible strategies that can help to ensure that biofuels are produced, processed and traded in a sustainable manner. As mentioned earlier, a number of initiatives have been introduced that propose criteria to ensure sustainable biofuel production, aiming to address legal, social, economic and environmental concerns. Such standards require biofuel producers to consider the entire life cycle of their crops, including plans for water management and the preservation of land with HCV through the establishment of buffer zones. GHG emissions from biofuels production must be reduced over time, soil health must be maintained or enhanced, and air pollution minimised. Standards also include social provisions, such as land rights and prohibition of child labour. The initiatives aimed at sustainable production of biofuel feedstocks and biofuels are at different stages of development and most are still incipient; thus, it is not possible to fully assess their effectiveness in relation to mitigation of environmental impacts, although lessons can be drawn from comparable initiatives in other sectors, such as timber certification. Below we provide a discussion of their effectiveness based on the criteria introduced in Section 2.

Standardised criteria and indicators. The extent to which instruments influencing production and trade have a standardised set of criteria and indicators varies considerably. CSR practices generally lack such criteria altogether. Industry standards and certification instruments, on the other hand, tend to have a standardised set of measurable and verifiable criteria and indicators to enable evaluation of actor compliance. The extent to which these are internationally recognised may, however, vary.

Monitoring and verification. The effectiveness of standards in reducing the environmental costs of biofuel production depends on the effectiveness of the monitoring and control systems. Designing effective monitoring protocols goes hand in hand

with the operationalisation of indicators and verifiers – a process that is, for the most part, still under development, as mentioned above. Sustainable biofuel standards vary widely in terms of the stringency of their criteria (Schubert and Blasch 2010), which will clearly influence the degree of their adoption and compliance in practice. For example, the RSPO has been criticised for lacking the capacity to adequately monitor and enforce its own standards even when available resources appear to be abundant (Laurance *et al.* 2010). Currently, the certification scheme for biofuel production and processing of the RSB is in the testing phase. This system aims to provide a comprehensive scheme for verification of compliance with the RSB standards for responsibly produced, processed and traded biomass/biofuels (RSB 2010b).

Another relevant issue is the institutional system of authority under which the agreed sustainable standards are implemented and compliance verified in practice. Certification systems may contribute towards ensuring that standards are implemented as long as these are expressed in unambiguous language so that firms can satisfy the requirements and compliance can be verified. Whereas it is relatively easy to propose criteria for sustainable biofuel production and processing systems, the capacity to measure and objectively verify indicators is still limited, and both the detection and the interpretation of changes in environmental variables are difficult (Hecht *et al.* 2008). There are 2 main approaches to certification. First, companies could voluntarily seek a third-party entity to certify their production processes. In the second approach, a government mandate could be established, under which only those products that meet certain standards would be eligible, for example, to receive subsidies or price premiums, or benefit from market access. In this regard, different approaches for the governance of sustainable practices can be distinguished, according to their mandatory or voluntary character and their spatial scale (van Dam *et al.* 2008).

Voluntary schemes are characterised by an approach where multi-stakeholder groups (e.g. industry, landholders, other interested parties) voluntarily adopt standards and certification schemes, such as the RSPO. A starting point could be, for example, the establishment of minimum standards for cultivation and harvesting practices for producers. In this process, multinational financing institutions are relevant players as they start to introduce sustainability standards for their project operations, as discussed in next section. Implementation of 2 voluntary certification systems (GGL and Electrabel) that cover the complete biomass chain is currently underway. The most notable case of certification of relevance to biofuels is forest timber certification using the FSC standards. This is a relatively complex system that governs the whole value chain from the extraction of timber resources to sales by final retailers (Cashore 2002). Forest timber certification has shown that it is difficult to develop an effective chain of custody control that tracks timber from the raw material to finished product; moreover, the system tends to be biased against smallholders (Box 6).

Scope and scale. Approaches based on mandatory government regulations for minimum standards exist at the national level in the UK, Belgium and the Netherlands. At a regional supra-national level, the EC is currently developing and refining standards and a policy framework to secure sustainable biomass imported into the EU. At an international scale, no agreements based on generic sustainability standards (voluntary or legally binding) presently exist for biofuels. Options for regulating standards internationally in a legally binding form might include adopting a multilateral environmental agreement or integrating standards into existing international agreements or standards (van Dam *et al.* 2008).

While a minimum global scale of application should not be completely overlooked, following specific approaches to introducing sustainability standards may be necessary to encourage adoption. Complications from developing a global certification system arise as there are obvious differences between regions in production systems and spatial scales as well as socio-economic settings for a given biofuel feedstock including major differences in their ecological footprint (Groom *et al.* 2008). To date, no clear consensus exists among bioenergy experts and other stakeholders on which indicators are critical and which framework should become the international standard or best practice. Furthermore,

Box 6. Impact of certification schemes on forests and forestry

Forest certification is one of the most significant non-state market-driven processes introduced to advance sustainable forest management. This market-based certification scheme was created largely because of increasing concern among environmental NGOs and other stakeholders over the rapidity of forest degradation and the failure of governments to curb inappropriate industrial logging. The 2 largest players in forest certification are the Forest Stewardship Council (FSC), created in 1993, and the Pan-European Forest Certification (PEFC) scheme, created in 1998. These organisations' schemes are based on standards for definitions of well-managed forests, covering issues such as tenure, use rights and responsibilities; indigenous peoples' rights; community relations and workers' rights; use of forest products and services; maintenance of biodiversity and high conservation value forests; forestry planning, monitoring and assessment; and planning and management of plantations.

The adoption of these standards by logging companies, communities and other forest producers can be one indicator of the schemes' effectiveness. Towards the end of 2007, PEFC- and FSC-certified lands totalled nearly 300 million hectares (7.6% of world's forest cover). This shows that adoption of certification has been relatively slow and mainly in temperate and boreal forests (Auld *et al.* 2008) – a result that has increased scepticism about the effectiveness of certification schemes for forest conservation and their ability to reduce external pressures on forests in tropical latitudes. Forest certification has also been criticised because it tends to favour large-scale forest operations as other actors are often unable to pay the high costs of certification. Furthermore, forest certification may tend over time to introduce a barrier to trade (Taylor 2005). However, others have shown that forest certification constitutes an example of how private environmental rule-making can effectively complement hierarchical regulation and thereby play an important role in making progress towards global environmental governance of forest resources (Ebeling and Yasué 2009).

their application at smaller spatial scales is virtually non-existent (Buchholz *et al.* 2009). As in the case of FSC-certified timber in tropical countries, smallholders will inevitably experience several limitations in meeting sustainable and affordable biofuel certification requirements. Standards should ideally remain flexible with regard to the geographical origins, raw materials and conversion technologies as well as to the different levels of agro-chemical inputs and soil degradation encountered, particularly in relation to planting biofuel crops on degraded lands. A broad global standard may be useful to the extent that it may trigger the development and adaptation of more detailed national standards, as occurred with the FSC scheme (Auld *et al.* 2008).

A critical issue in determining the scope of standards and certification relates to the ability to address second-order impacts of energy consumption. Certifying only direct effects on deforestation can result in the displacement of deforestation to another place where biofuel production is not being certified. Recently, serious concerns about carbon and biodiversity displacement have been reported (Institute for European Environmental Policy 2008). This leads to the question of the scale at which the burden of proof should be placed – country or firms. By placing the burden on firms, production of unsustainable biofuels may indirectly be promoted in other areas of the same country, whereas placing the burden of proof on countries may induce negative externalities to other, non-certified countries. Firms may have an incentive to participate in firm-level certification to improve their reputation, whereas country-level certification that presents itself as a public good may induce a free-rider problem. Firm-level certification presents itself as a problem especially where externalities cannot be easily measured and monitored at the site of production. This may be the case for some of the indirect impacts, such as loss of biodiversity or in relation to measuring GHG emissions due to indirect land use change.

Likelihood of achieving impact. Standards and certification schemes that govern the production and processing of biofuels will only have an impact on reducing deforestation if there is a causal relationship between increased biofuel production and deforestation. This then begs the question of how standards and certification schemes will be able to curb indirect effects on deforestation. Even well-designed standards may not, on their own, be sufficient to mitigate indirect land use change. Hence, standards and certification systems will need

to be complemented by other policy instruments. Effective land use planning is potentially critical in this regard. Promotion of best management practices such as those included in the eco-agriculture literature is warranted as such practices can be adapted for any biofuel production effort (Scher and McNeeley 2007). In the standards introduced earlier (Box 1), explicit calls for good cultivation practices that address biodiversity are almost completely absent. In this regard, the relationship between deforestation rates and the amount of residual forest cover in countries with FSC-certified forests is inadequate, if not non-existent (Auld *et al.* 2008). This calls for a word of caution on the extent to which certified biofuel operations are expected to generate biodiversity benefits.

Furthermore, the likelihood of existing standards having an impact may be product-specific and depend on standards that remain flexible to cover varying spatial and temporal scales. The likely impacts will also depend on standards' ability not to discriminate against producer groups within countries or certain producer countries. Again considering the experience with forest certification schemes, it has been shown that they are biased against small and medium enterprises in developing countries, because these actors cannot meet the high costs of certification (Auld *et al.* 2008). In this context, the proliferation of many different types of standards is a concern because it increases the transaction costs of certification due to information needs and bureaucratic complexities.

Certification requirements should also not be biased against countries with weak state capacities (Hausmann and Wagner 2009). For an effective biofuels certification regime to be practicable, it must be compatible with WTO agreements, because labelling and certification requirements can be construed as discrimination and thus potentially be subject to trade agreements administered by the WTO. In employing certification as a tool to ensure sustainable production and processing practices, where standards are linked to tax exemptions and subsidies they need to be designed in such a way as not to discriminate between countries.

4.2.2 Instruments governing biofuel finance

Evaluating the effectiveness of responsible investment policies in the financial sector in channelling the expansion of biofuel (and related feedstock) production to already converted and/or degraded lands, rather than prompting conversion of natural forests, poses a number of challenges. For many financial institutions, a reliable assessment requires 2 comprehensive lists: a positive list of the biofuel companies in which they have decided to invest since the adoption of their responsible investment policy and a negative list of biofuel companies they have decided not to invest in (accompanied by the reasons for rejection). As most financial institutions do not publish either positive or negative lists concerning their investments in the biofuels sector, making an empirical evaluation of the effectiveness of their responsible investment policies is impossible. The following assessment, therefore, is based mainly on theoretical considerations and circumstantial evidence.

Standardised criteria and indicators. Although instruments for governing (biofuel) finance usually have a set of predefined criteria, such criteria are not always defined at a level that makes them unambiguous and operational. Two examples are presented in Box 4. While the policies of those 2 banks are more detailed than those of many other banks, they still leave some aspects open for interpretation. For example, it is not clear what Rabobank defines as 'land with high carbon stock'. Its statement about the replacement of food crops also is unclear. Neither does the bank explain what it means by 'when there are indications of local food insecurity'. Stating prerequisites in such a general way leaves much open for interpretation by the bank's employees and its clients. Furthermore, the inclusion in a responsible investment policy of criteria based on internationally accepted standards adds considerably to its credibility.

These internationally accepted standards may be derived from well-documented best practices in an industry, criteria defined in certification schemes or other multi-stakeholder initiatives, or criteria derived from international treaties (e.g. UN, ILO). When the responsible investment criteria are derived from such international standards, it is clearer for all parties what the criteria entail and the criteria – and

the responsible investment procedure as a whole – become much more credible (van Gelder *et al.* 2010). In the case of investments in feedstock production for biofuel, or in biofuel processing itself, the criteria in the responsible investment policies could be based upon a number of standards developed by multi-stakeholder initiatives such as FSC, RSPO, RSB and RTRS (see previous section).

Responsible investment policies can use such standards in 2 ways: they can copy the individual criteria included in these standards, or they can refer to the standard as a whole. In the first case, the financial institution has to assess whether the proposed investment meets all the individual criteria, which can involve a rather labour-intensive assessment process. In the second case, the financial institution can rely on the verification or certification process of the standard itself. For example, if a bank states that it will lend only to companies in the forestry sector that have adopted FSC certification, the assessment procedure for the bank will be very simple and efficient. However, this will preclude the bank from doing business with clients that do meet FSC criteria but are not (yet) FSC certified. Despite the obvious advantages, therefore, many financial institutions may choose not to commit fully to the FSC standard for commercial reasons.

Monitoring and verification. Public (multilateral) banks generally have developed much better monitoring and verification mechanisms than private banks, both for internal monitoring and for external compliance procedures. These mechanisms can strengthen the implementation of responsible investment policies, and correct any errors made. The private financial sector has not yet followed multilateral financial institutions in creating independent complaint mechanisms, mediation procedures, compliance mechanisms or access to decision makers for people harmed or potentially harmed by projects financed by their institutions (van Putten 2008, van Gelder *et al.* 2010). This is also true for the collective responsible investment policies in which private banks participate, such as the Equator Principles. O'Sullivan and O'Dwyer (2009) argue that a perceived lack of accountability at an institutional, organisational and individual project level constitutes a central reason for the reduction in legitimacy of the Equator Principles.

Since the World Bank Inspection Panel was set up in 1993, all multilateral banks have developed monitoring, compliance and accountability mechanisms. Although much can be improved in how these mechanisms function, they can strengthen the implementation of responsible investment policies and correct errors made (Bissell and Nanwani 2009). It is noteworthy that after much NGO criticism on this mechanism, the banks undersigning the Equator Principles set up an association and in July 2010 announced their governance rules. The rules define the obligations of the banks undersigning the Equator Principles; the main obligations are to pay an annual fee and report annually on implementation (Equator Principles 2010b). According to some independent evaluations, these new governance rules may lead to improved cooperation and decision-making among Equator Principles financial institutions, but fail to produce new commitments on transparency and external accountability (BankTrack 2010).

Scope and scale. The scope or reach of a responsible investment instrument is defined by 2 elements. The first element is the extent to which the instrument is applied to all forms of financing. Single-institution responsible investment policies generally are applied to all financial services offered by the financial institution, with the exception of asset management services on behalf of third parties (i.e. private banking and management of investment funds). Most financial institutions take the view that responsibility for this type of investment rests with their clients. The financial institution does, however, take responsibility for loans, credits, underwriting and investments in shares and bonds which are financed by its own funds (i.e. funds attracted from its shareholders, accountholders and policyholders and funds borrowed from other banks). These categories include a large part of the investments by banks and other private financial institutions in the biofuels sector.

The scope of the only relevant collective responsible investment policy, the Equator Principles, is much more limited as it is confined to project finance for projects with a value over US$10 million. Although the signatories of the Equator Principles represent more than 90% of the global project finance market, project finance itself is a niche market within the

wider financial market, accounting for no more than 2% of the total corporate financing market (van Gelder and Kouwenhoven 2011). For some sectors, such as infrastructure, oil and gas, and electricity, it is a fairly important source of financing, especially in more difficult and unstable countries. For other sectors, such as agriculture (including biofuel feedstock production), project finance is not at all an important source of finance (BankTrack 2004). Some companies developing biofuel processing plants might consider attracting project finance, but in general the biofuels sector has many other financing opportunities outside the project finance market – offered both by Equator Principles signatories and other financial institutions – which are not covered by the Equator Principles.

The second element defining the scope or reach of a responsible investment instrument is the extent to which it is applied to all types of companies active in the biofuels sector. If a responsible investment policy would, for instance, demand RSPO certification as a precondition for investments in the palm oil sector, this would be applicable only to existing plantations and traders, but not to new plantations. This is because the certification scheme of the RSPO certifies the palm oil but not the palm oil producer. NGOs such as Greenpeace fear that some companies will develop a few model plantations to obtain RSPO certification, while continuing to operate and develop unsustainable plantations elsewhere and selling oil produced in these plantations as RSPO certified (Greenpeace 2008). As financial institutions are often asked to finance new plantations before they are established – and therefore long before their palm oil production can become RSPO certified – they cannot always rely on RSPO certification in their assessment process (van Gelder and Taylor 2008).

Public finance provided by foreign countries – in the form of multilateral bank loans, development bank loans, investments by state-owned companies and export credits – is another relevant source of finance for biofuel development in forest-rich countries in Asia, Africa and Latin America. Some forms of public finance, but not all, are tied to meeting social and environmental safeguards. For export credit agencies (ECAs), the FERN study concluded: 'no ECAs have the relevant procedures in place to identify and address the flawed operating and expansion model that much of the pulp and paper sector has followed. What's more, by aiming for very low-transaction costs, most ECAs have little internal capacity for assessing the environmental or social impacts of the operations they help to finance' (FERN 2008, pp. 5-6).

Likelihood of achieving impact. The financial sector as a whole could wield significant influence over the development of the global biofuels sector – which includes feedstock producers, biofuel producers and trading companies – by applying responsible investment instruments to their investment decisions. However, hundreds of financial institutions are involved in financing biofuel developments in forest-rich countries, ranging from multilateral institutions and other public financiers, to domestic and foreign banks, pension funds, private equity funds and other private financial institutions. These various financial institutions provide a wide range of forms of financing to companies in the biofuels sector (van Gelder and Kouwenhoven 2011).

The likelihood of a responsible investment instrument having a significant impact in channelling the expansion of biofuel (and related feedstock) production to already converted lands is therefore dependent on 2 elements: the quality of the responsible investment instrument and the use of the instrument by financial institutions. Quality depends on several factors: the inclusion of clear criteria, preferably derived from international standards; implementation in a financial institution's investment decision-making process; the scope of the instrument; and compliance monitoring. In regard to dissemination, to date, only a couple of dozen financial institutions have implemented responsible investment instruments for the biofuels, forestry and/or agriculture sectors which meet the quality criteria mentioned above. Many more financial institutions have issued or undersigned intentional statements or have adopted collective responsible investment instruments with a limited scope (i.e. the Equator Principles). When this group of financial institutions – as well as the larger group which has taken no action at all – develops and implements responsible investment instruments which meet the quality criteria set above, the impact on developments in the biofuels sector could be very significant. An example about the pulp mill sector is provided in Box 7.

Box 7. Gunns pulp mill in Tasmania

Gunns Limited, an Australian logging company, is planning to build a A$2.2 billion pulp mill in Tasmania, Australia. The pulp mill would consume 4.5 million tonnes of wood every year, of which 80% would be sourced from Tasmania's native forests. Over 25 years, the pulp mill would lead to the destruction of at least 200 000 hectares of irreplaceable native forests. As the pulp mill would also have negative consequences for the environment and for local employment, most Australians oppose it. After conducting an independent assessment, Gunns' long-term banker ANZ announced in May 2007 that it would not be part of the project. Since then, the company has been looking for finance in vain. In April 2009, Australian NGO The Wilderness Society ran an advertisement in the Financial Times, with a list of banks which have refused to finance the project. In January 2010, the bank Nordea, after initial discussions with Gunns, also refused to finance the pulp mill. Because of this failure, the strongest proponents of the project – John Gay and Robin Gray – were forced to step down from the board of Gunns in May 2010. The Wilderness Society believes this creates the opportunity to achieve permanent and lasting resolution of the conflict over forestry in Tasmania (TWS 2010).

Source: Van Gelder and Kouwenhoven (2011)

If the governments of forest-rich feedstock-producing countries were to tie conditions to public financing, the impact could be significant, because these governments are major financiers of the sector. To date, however, there is little or no evidence that this is taking place. Conditions tied to public financing by foreign governments are also relevant. However, foreign governments could have an even greater impact by tying environmental and social conditions to their imports of feedstocks and biofuels from forest-rich countries. For most foreign governments, the areas abroad that they need for the production of sufficient feedstock to meet their biofuel demand are probably larger than the areas they directly finance. Whether and how foreign governments apply criteria to their imports of feedstocks and biofuels from forest-rich countries are discussed in the section on the instruments governing production and trade.

4.2.3 Instruments rewarding the provision of environmental services

Compensation and rewards for environmental services are commonly encapsulated in the notion of payment for environmental services (PES) schemes, which are seen as a new, more direct and efficient way to promote conservation (Wunder 2007). Different reviews have been undertaken to assess the effectiveness of PES schemes as a tool for tropical conservation and their collateral implications for poverty alleviation (Bulte *et al.* 2008, Wunder *et al.* 2008, Pattanayak *et al.* 2010). Most of the comparative studies rely on findings from qualitative case studies on PES implementation. Some others have also conducted analyses of PES in both theory and practice in order to show the complexity of the practical arrangements (Muradian *et al.* 2010). A common finding is that PES initiatives have produced mixed results, and that in many cases there is not yet sufficient evidence is not there yet to evaluate the effectiveness of PES (Pattanayak *et al.* 2010). As noted previously, this review does not assess REDD+ implementation because it is still subject to negotiation, and REDD+ pilot projects are still in their infancy (Wertz-Kanounnikoff and Kongphan-apirak 2009).

Standardised criteria and indicators. While the question of criteria and indicators in the case of instruments rewarding the provision of environmental services differs slightly from that for other categories of instruments, it is possible to evaluate this criterion based on the degree to which payments are conditional on the delivery of the service – something which in turn requires the ability to measure the benefits. Wunder and colleagues (2008) find that user-financed programmes are more effective than government-financed programmes in this regard. This is because user-financed programmes tend to compensate for a single service (e.g. watershed protection, carbon sequestration), and purchase the environmental service to the extent that the service is provided by securing continuity in payments over time. Thus, user-financed programmes have a greater capacity to enforce conditionality.

These features of user-financed programmes carry a number of other co-benefits (Wunder *et al.* 2008). They tend to be more closely tailored to local conditions and needs. They also tend to have fewer confounding objectives than government-financed programmes given the focus on single services. User-financed PES deals also tend to multiply more quickly over time, although government-financed PES programmes are also growing in number. Some examples of the latter type of programmes are the Sloping Land Conversion Program (SLCP) in China, which aims to protect watersheds, and the Payments for Hydrological Environmental Services (PSAH) in Mexico, which targets watershed and aquifer protection. Some other programmes are hybrids, such as the PES programme in Costa Rica that encompasses multiple services such as water, biodiversity, carbon, scenic beauty, which is financed by government funding, as well as by independent users, international donors and NGOs (Pagiola 2008).

Monitoring and verification. PES schemes need to have monitoring systems in place to evaluate compliance with the conditional agreements between environmental service providers and buyers through which the service providers (e.g. landholders holding forest resources with potential to protect the continued provision of water resources, restore ecosystems for enhancing biodiversity and improve carbon stocks) commit to put into practice (in exchange for compensation) specific land use actions which could lead to the provision of the expected environmental service. In all cases, therefore, payments from private users or governments are conditional on performance; therefore, appropriate monitoring is required in order to determine whether PES beneficiaries comply with their contracts (Pattanayak *et al.* 2010).

There are different ways in which the monitoring of the forest change conditions can be performed (Ostrom and Nagendra 2007). In forest-based PES programmes, monitoring can be conducted through the analysis of remote sensing imagery, although this is much more difficult for agriculture-based PES programmes. Usually, monitoring is carried out by the institutions that broker the deals between sellers and buyers, although local monitoring is involved in some cases. Monitoring quality varies greatly across PES programmes because it often depends on the availability of resources and time.

Monitoring constitutes a critical step in PES programmes to ensure compliance with the conditions agreed in the contracts, but it is useless unless non-compliance is sanctioned. In most cases, sanctions against landholders consist of the loss of future payments. Wunder and colleagues (2008) indicate that conditionality was lower in government-financed programmes than in user-financed ones. This tendency occurred largely because of the political goals that are embedded in government programmes; by contrast, smaller programmes tend to target specific environmental services which follow more closely market rules, and thus tend to define better the conditions that landholders have to comply with to justify the provision of the environmental service. However, monitoring is not particularly strong even in the case of small-scale user-financed programmes, although compliance with the conditions stipulated in the transaction tends to be higher than for government-financed programmes. A related factor is that the provision of environmental services is easy to monitor in cases in which the PES programme deals only with a single service, compared with government-programmes which embrace multiple services, or when what is monitored is just forest cover, which, as noted above, is easier to monitor. Ultimately, the quality of monitoring has implications for a successful PES system (Meijerink 2008).

Scope and scale. PES programmes target different types of user depending on the type of outcomes that the programme implementers expect to achieve. Often they target landholders who receive compensation for protecting the forests they manage or for developing a specific land use activity (e.g. reforestation) to provide a related environmental service. A contentious issue is linked to the extent to which PES schemes target actors that represent a credible threat to the environment (e.g. large-scale farmers or ranchers); in many cases, such actors are better off than other actors (e.g. smallholders and indigenous people) who retain significant control over forest resources but put little pressure on them (Wunder 2007, Pascual *et al.* 2010). Many PES schemes, mainly user-financed ones, have been developed to focus on relatively confined locations, often related to specific watersheds, which likely

meet the need for specific environmental services of a relatively limited group of people at the local level. A few programmes that encompass wider landscapes have been developed, such as the Regional Integrated Silvopastoral Approaches to Ecosystem Management Project (RISEMP) with sites in Nicaragua, Costa Rica and Colombia (Box 8) (van Hecken and Bastiaensen 2010), and others have a national coverage, such as the PES initiative implemented in Costa Rica (Zbinden and Lee 2005).

Although it is likely that only PES programmes developed at a broader landscape level or national scale might achieve considerable impacts in avoiding deforestation or promoting the enhancement of forest carbon stocks, these programmes also have problems related to the effectiveness of their outcomes. Such problems arise because the programmes do not necessarily target the actors that represent a real threat to the forests; rather, they often undertake to make payments to landholders that likely never intended to convert the mature forests they had placed under PES contracts. Furthermore, they often lack a strong monitoring and sanction mechanism. It is often assumed to be politically inappropriate for these programmes to punish landholders for their lack of compliance with the terms defined in the contracts (Wunder *et al.* 2008, Arriagada *et al.* 2009).

Likelihood of achieving impact. The impact of the PES programmes depends on a different set of conditions than from other other MBIs. These are mainly related to enrolment, additionality, leakage and land use–service linkages (Pattanayak *et al.* 2010). Enrolment refers to the likelihood of the PES programme attracting service sellers (e.g. landholders) to become part of the negotiated deals; this aspect is partly related to the service providers' land use opportunity costs with respect to the payments offered by buyers. Additionality refers to the added service (e.g. watershed protection, carbon sequestration) that providers generate with respect to a business-as-usual situation – that is, whether the PES programme will lead to land use changes that generate a service which would not have occurred in the absence of compensation. This issue is in part related to monitoring, to the extent that the additional contribution of compensation payments has to be determined.

Box 8. The RISEMP project for PES in Nicaragua

The RISEMP project, supported by GEF/World Bank, operated in Nicaragua from 2002 to 2008. This was a pilot initiative aimed at promoting silvopastoral practices in degraded pasture areas through PES and technical assistance. This project was also implemented in locations in Costa Rica and Colombia. In Nicaragua, the project site corresponded to an old agricultural frontier in the buffer zone of the Cerro Musun nature reserve, and the Quirragua nature reserve. When the project started, only 20% of the total land area was covered with forest, and about 60% was under pasture, mainly under extensive cattle ranching systems, about half of which was degraded pasture. This project targeted a range of landholder groups, from poor smallholders to rich large-scale holders, and included a control group in order to assess the impacts achieved.

Payments were made annually after the observed land use changes, with the amounts estimated based on an 'environmental service index' (ESI), which takes into account biodiversity protection and carbon sequestration. Payments equalled US$75 per incremental ESI point, and the baseline ESI points in 2003 were remunerated with an initial payment of US$10 per point. An assessment of the impacts of this project (van Hecken and Bastiaensen 2010) indicates that the total area of pasture remained the same, although there were some changes in its composition. The extent of degraded pasture decreased from 30% to 10%; this land was replaced by improved pasture with trees, the area of which grew from 9% to 23%, fodder banks, which tripled in area, and living fences, which quadrupled in area. Interestingly, the highest reduction in degraded pasture took place in the control group (8 times more than in the PES group); the highest increase in natural pasture was also in the control group, although the control group was also the only group in which forest area decreased. These outcomes in land use changes raised questions about the effectiveness of PES in achieving target outcomes. Some argued, however, that the control group was poorly chosen because it comprised mostly rich large-scale farmers. Nevertheless, the results made it clear that factors besides PES influence land use change decisions, possibly linked to the growing scarcity of land, access to capital and market conditions.

Source: Adapted by authors based on van Hecken and Bastiaensen (2010)

However, 2 other factors hamper additionality. The first factor is related to leakage effects. Leakage refers to the transferral of threats to forests under PES contracts to other areas/locations (i.e. people protecting forests under PES but then shifting pressures to other forest areas). The second factor is related to the fact that land use changes do not necessarily result in changes in the provision of the environmental service. While there are some links between the impacts of forest regeneration on carbon sequestration (Gibbs *et al.* 2007), it is much more difficult to establish clear cause–effect linkages between forest conservation and watershed function (Bonell and Bruijnzeel 2004). This makes it difficult to monitor the effectiveness of outcomes in practice.

Comparative reviews on PES implementation suggest that most PES programmes have little difficulty in attracting participants; indeed, in some cases, such as in Mexico and Costa Rica, applications exceeded the available funding (Pattanayak *et al.* 2010). Additionality is perhaps one of the most contentious issues in PES programmes, particularly when no direct links between land use and service provision exist (e.g. watershed management). Wunder and colleagues (2008) reviewed a range of PES cases and suggested that some programmes have been able to reverse deforestation trends in targeted areas, such as in Pimampiro (Ecuador), thus likely having positive effects in terms of additionality. However, this was not the case in all areas, such as in Los Negros (Bolivia), where the programme targeted low-threat areas. Additionality effects have also been questioned in the RISEMP programme (Box 8), as targeted users did not change their land use practices any more than the control groups did, and some beneficiaries even invested income from payments in deforestation in another location, thus increasing leakage (van Hecken and Bastiaensen 2010). Pattanayak and colleagues (2010) argue that more careful assessments of the effectiveness of PES schemes are needed because it is yet not well understood under which conditions PES has positive environmental and socio-economic impacts and, therefore, cost effectiveness.

5. Discussion

The previous sections discussed the main strengths and weaknesses of 3 types of MBI that aim to promote sustainable production by: stimulating the adoption of appropriate production practices; imposing conditions on access to financial resources; or providing rewards to protect the provision of environmental services. Four challenges arise for these different instruments in terms of their ability to influence individual or corporate actors' land use decisions in relation to avoiding or reducing deforestation. The first type of challenge is inherent in the MBI design – considering the criteria that an instrument adopts or the processes through which it operates. The second type lies in the associated required monitoring systems and the actors' compliance levels. The third type of challenge relates to the scope and spatial scale that the instrument encompasses. The fourth type of challenge arises in relation to these instruments' likelihood of having an impact in practice, due to factors such as the number of actors participating in the mechanism and other more complex issues related to leakage and additionality.

Well-defined standards are an important factor for instruments governing production, as the literature reviewed here reiterates. Recently, such standards have proliferated, although not always with common criteria on priorities for conservation, or considerations of cultivation in degraded or abandoned lands. A further complication is that the leading biofuel feedstocks currently being produced differ in their short- and long-term ecological footprints and overall sustainability (see Groom *et al.* 2008). Ideally, therefore, standards should be adapted to specific geographical origins, raw materials and conversion technologies, as well as to the different levels of agro-chemical inputs and soil degradation encountered in the context of planting biofuel crops on degraded lands. Van Dam *et al.* (2008) argue that the proliferation of certification schemes should be avoided because the presence of numerous schemes will increase transaction costs and introduce information asymmetries amongst the actors involved. Although no clear consensus exists on which indicators are critical and which framework should become standard practice, it is clear that measurable and verifiable indicators are a pre-condition for any instrument based on standards. In this regard, Schubert and Blasch (2010) provide a proposal for a minimum set of binding standards for bioenergy.

Furthermore, even well-designed standards will not by themselves be sufficient to reduce direct deforestation from biofuel development or mitigate indirect land use change. The literature reviewed here suggests that standards and certification systems will need to be complemented by other policy instruments and practices. Effective land use planning, including agro-ecological zoning, is potentially critical in this regard. For example, Hennenberg and colleagues (2010) found almost no calls for cultivation practices that address biodiversity amongst the standards they assessed. Furthermore, as the impacts of land expansion from either fuel or food crops are virtually indistinguishable, it could be argued that equal standards should be applied for all agricultural commodities traded internationally.

Monitoring and verification constitute another critical component for MBIs, but likely face most challenges on the ground. Roundtables such as the RSPO have experienced problems with this issue, and may need to develop real monitoring and enforcement capabilities. It is expected that the RSB certification scheme will prove more comprehensive for verification of compliance. However, this process needs to take into account several factors if it is to avoid undesired effects on producer countries and small-scale actors, which face difficulties competing in biofuel markets. It has therefore been argued that only a global certification scheme could prove effective in regulating the biofuels sector (Kaditi 2009). Even after biofuels sustainability standards are put in place, issues of international trade may have to be resolved – mainly in some developing countries – before significant impacts are felt. It has also been noted that only an international, legally binding biofuels sustainability standard will preclude

exporting countries from diverting their bioenergy exports to those countries where minimum import standards are weak or non-existent (Schubert and Blasch 2010). It is not yet clear how these minimum standards are to be agreed.

For voluntary standards to be effective at the global level, they may require the introduction of international agreements, as suggested by Hektor (2006, cited in van Dam *et al.* 2008). These agreements could be established through written general guidelines or 'codes of behaviour' for all actors that are directly involved. Such a system would consist of 2 pillars: a bio-energy labelling organisation (BLO) and an International Agreement on Bio-Energy (IAB). The BLO, which is based on the FSC, would be able to penetrate the market within a short time and could offer stakeholder participation and standards that address most sustainability concerns. The BLO has the advantage that it seems to be acceptable to both the industry and the World Trade Organization (WTO) (Verdonk *et al.* 2007), although it needs to overcome a structural bias against smallholders. Instruments based on fair trade could enhance the attractiveness for small-scale producers and producers from developing countries. A framework of universal sustainability principles would enable geographical differentiation of standards and accommodation of different feedstocks (van Dam *et al.* 2008).

Another approach is the establishment of private labels with stricter standards than those mandated by national or regional regulations. Certification would be based on government regulations using minimum standards, and these could be combined with a set of private standards, based on voluntary agreements by biomass producers. The latter would include companies in the chain of custody whose statutes or internal regulations contain several biomass standards. Several institutions could be responsible for certification: governmental institutions would certify with regard to governmental guidelines whereas private certification institutions would certify governmental guidelines combined with stricter private guidelines.

With regard to finance, it is likely that rapid growth in the biofuels sector will require significant amounts of investment which cannot be financed exclusively by the owners of companies producing feedstocks and biofuels. Both private financial institutions (banks, institutional investors) and public financiers (development banks, export credit agencies, state-owned companies) will play very important roles in financing the global expansion of biofuels and associated feedstocks. This important financing role potentially gives financiers considerable leverage to ensure that the expansion of biofuels takes place on already degraded land, rather than prompting conversion of natural forests, although there many factors working against this, as discussed above. Implementation of responsible investment policies should be strengthened by integrating all necessary applicable investment instruments – screening, engagement with companies, setting conditions in financing contracts, monitoring and voting on shareholder meetings – in the decision-making process. Independent monitoring and accountability mechanisms following the example of multilateral banks need to be established by other private and public financiers.

To achieve their full potential impact, responsible investment policies (or the social and economic conditions tied to public finance) need to be based on clear, well-defined and measurable criteria, preferably derived from international standards. Furthermore, these criteria should be adopted by all private and public financial institutions, and should be applied to the whole range of investment services they offer and all investments they make. Responsible investment policies need to comprise a diverse set of instruments (e.g. screening, engagement with companies, setting conditions in financing contracts, monitoring and voting on shareholder meetings). While multilateral banks have generally implemented these instruments in a comprehensive way, implementation seems to be poor among other public financiers. Furthermore, independent monitoring and accountability mechanisms are needed, to provide feedback to financial institutions on the application of their responsible investment policies. All multilateral development banks have such mechanisms in place, which provide valuable learning opportunities, but other public and private financial institutions often lack them.

Nevertheless, multilateral development banks are still struggling to improve the way in which they learn

from their accounting mechanisms, as shown by the debate around the IFC's palm oil policy, already mentioned in Box 2. After NGO complaints, the Office of the Compliance Advisor/Ombudsman (CAO) of the IFC in 2009 concluded that the IFC 'did not meet the intent or requirements of its own Performance Standards for its assessment' of loans to an oil palm company, Wilmar. IFC management then suspended investments in the oil palm sector and conducted a broad consultation process to improve the review procedures for investments in the oil palm sector (IFC 2010). As result of the consultation, IFC has adopted a new framework to guide future engagement in the global palm oil sector.

It is not obvious how PES would contribute to reducing deforestation from biofuel development. Two possible situations are likely. The first is that compensation for environmental services would prevent landholders from converting forests that otherwise would have been removed to plant biofuel crops. However, this is not likely to happen in practice because of the relatively high profits which can be obtained from these crops, particularly from oil palm and soybean (Butler *et al.* 2009). Even if payments could compensate for the opportunity costs of reducing the expansion of biofuel feedstocks into forestlands, large leakage effects could be expected. Second, some have argued that payments for carbon sequestration in the context of REDD+ could be used as a way to provide incentives for the production of biofuel feedstocks in degraded lands, thereby reducing the pressures on primary forests (Killeen *et al.* 2009). This, however, requires well-developed standards, as well as mechanisms for monitoring and verification of compliance, as discussed above. Even more, this would require clear(-er) global agreements and national targets for the reduction of carbon emissions, the analysis of which is beyond the scope of this paper.

Nonetheless, despite the above limitations, PES and REDD+ can play an effective role in helping to 'close the frontiers', thus contributing to the gradual placement of forest areas with lower opportunity costs for the expansion of agriculture (e.g. extensive cattle ranching) under conservation uses, which can likely reduce the pressures from biofuel feedstock production. Yet this is more evident for the Amazon, where feedstock production, specifically soybean, tends to expand primarily on already converted lands (Morton *et al.* 2006), and it likely will not prove effective in cases where feedstock expansion is a proximate driver of forest conversion, such as oil palm in Indonesia (Butler *et al.* 2009).

In this context, instruments aimed at rewarding the provision of environmental services could, ultimately, become a way of halting deforestation. However, there is not enough evidence on whether these rewards will be able to counter the expansion of biofuel feedstock cultivation given the lack of other land use regulations and weak state enforcement. In addition, containing deforestation should shift the pressures to non-forestlands or degraded lands. However, there may not be a sufficient amount of re-convertible wasteland that could be used for biofuel feedstock expansion because those lands may already perform a function in the production cycle (e.g. as fallow) or have important biophysical restrictions (e.g. not suitable for highly productive agriculture) or even social constraints (e.g. conflict-ridden tenure situation). Thus, the issue on degraded lands will likely constitute one of the main issues requiring discuss with regard to expansion of biofuels under low-carbon development goals.

6. Conclusions

This review reveals an important development – the introduction of numerous MBIs supported by a range of actors and pursuing diverse pathways to promote sustainable production of and responsible investment in biofuel feedstocks, whilst securing the provision of environmental services. Whereas some of these instruments are initiatives from non-state actors (e.g. landholders and industry associations, environmental NGOs, private financial institutions), others have actively involved state actors (e.g. governments in consumer countries, multilateral development banks). It is likely that over time, forms of hybrid instruments will emerge prominently from greater synergies between state and non-state actors, and linkages between MBIs and state regulations. Although development in this area has been greater in sectors outside the biofuels sector, growing concerns about the implications of biofuel development have motivated increasing interest in the definition of production standards and certification for the biofuels sector. Responsible investment practices for shaping biofuel investments remain limited, and no clear linkages exist between biofuel expansion and the implementation of compensation and rewards for environmental services.

No single instrument will be able to ensure that biofuel development takes place only on already converted forestlands or degraded lands. Neither will a single instrument be able to reduce the pressure on natural forests because of the multiple factors driving the expansion of biofuel feedstocks and biofuel demand. Therefore, there is a need to adopt a more integrated approach to promoting complementarities among the different instruments as a way of effectively contributing to reduced net rates of deforestation. This will entail, for example, more explicit linkages between biofuel finance and certification, as well as the adoption of rewards for the provision of environmental services within a broader approach to landscape conservation and compensation schemes for forest conservation, such as those promoted under REDD+. Although PES and REDD+ will likely have little direct impact on halting direct forest conversion due to biofuel production, they may play an important role as part of a broader protection function that other MBIs directly affecting biofuel producers (e.g. certification) will not be able to provide. Thus, the various MBIs can play important complementary roles.

Finally, it is important to stress that for any voluntary measure, an MBI has to have a noticeable impact in economic terms if it is to make a difference; otherwise, it must be accompanied by state regulations if it is to be effective. Therefore, since many MBIs do not provide real incentives for the adoption of more sustainable practices, their effectiveness in terms of their ability to reduce forest conversion due to biofuel feedstock production will require a more active role of the state in promoting their adoption. This will entail stronger governance in the systems in which the instruments are embedded. Thus, there is a need to build greater synergies – both amongst MBIs and between MBIs and state regulatory frameworks – at various scales to reduce the direct and indirect threats of biofuel development to forests.

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This report assesses the potential effectiveness of market-based instruments in ensuring that biofuel feedstock development does not expand in detriment of natural forests. We employ a detailed literature review, including a look at select case studies, to evaluate the effectiveness of three main types of instruments:

- those governing production practices and access to markets;
- those governing the provision of finance for biofuel feedstock production and processing; and
- those aiming to safeguard environmental services emanating from forestlands which could be threatened by the expansion of biofuel feedstock.

No single instrument is likely to ensure that biofuel development will reduce its potential pressure on forests hence avoiding deforestation. A host of complementary mechanisms will be needed to achieve this aim. Additionally, for any measure to make a difference in avoiding deforestation, it must matter in economic terms so that it shapes everyday practices of landholders and biofuel companies in meaningful ways. For this change to occur, it must be accompanied by measurable and verifiable indicators and conditionalities and – often – complementary state regulatory functions. In many contexts, this will in turn imply strengthening the overall governance system in which the different instruments are embedded. There is a need to build greater synergies both between different market-based instruments themselves and between these instruments and state regulatory frameworks at various scales.

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