Opportunities and barriers for sustainable international bioenergy trade and strategies to overcome them - A report prepared by IEA Bioenergy Task 40

Opportunities and barriers for sustainable international bioenergy trade and strategies to overcome them

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EXECUTIVE SUMMARY:

Trade of Biomass and Bioenergy (Biotrade) can provide a stable and reliable situation for sustainable production of biomass fuels, become a source of additional income and increased employment (e.g. for rural communities) and may contribute to the sustainable management of natural resources. For importers, biotrade may assist to fulfil GHG emission reduction targets in a cost-effective manner, diversify their fuel mix and lead to a more sustainable energy production. Stimulated by the renewable energy policies in several countries, rising oil prices and a wish for diversification of supply, in most Task 40 member countries, growth rates of 10-20% per year (and above) have been observed in international trade of biomass and bioenergy.

However, a multitude of different barriers currently exist, hampering the development of international bioenergy trade. These include economic, technical, logistical, ecological, social, cognitive, legal, and trade barriers, lack of clear international accounting rules and statistics, and issues regarding land availability, deforestation, energy balances, potential conflicts with food production and local use vs. international trade.

To address these barriers, a number of issues have been identified for further consideration:

To ensure *biomass sustainability*, it is recommended for actors in the various bioenergy routes both in importing and exporting countries to seek agreements on short-term (minimum) sustainability criteria, and to support a long-term development of international standards for important and generally accepted issues. Some of the Task 40 members advocate an international certification system for biomass embedded in (inter)national regulations, while others would preferably see a voluntary approach**.**

For *market transparency*, Task 40 recommends to the IEA, UNCTAD, WTO and national trade organisation to include (new) biomass types in their statistics, and to include the final application (e.g. energy, chemical feedstock, fodder etc.) where possible. Furthermore, it is recommended that the various standards that are applied today are developed into internationally accepted quality standards for specific biomass streams (e.g. CEN biofuel standards).

To *stimulate international trade*, Task 40 identifies import barriers for certain biomass and biofuels types to be a major obstacle for a smooth further development of international bioenergy trade. Some Task members emphasise that on the short-term, local industries should also be given the opportunity to develop innovative and improved processes for biomass and biofuels production. Other task members stress that such a process should be coupled to a phase-out agenda with clearly defined quotas.

To create a *stable demand-side*,

- On the longer-term, market support policies in the various countries, etc. should be designed to promote and stimulate international trade when and where trade would be the logical option. Some task member advocate a harmonization of e.g. EU policies but recognize that this will be hard to achieve in practice and would require a gradual process of adjusting the various national support systems.
- Policy incentives could also include requirements for energy and/or CO_2 balances.
- In order to create long-term incentives, policy makers in countries with biomass targets (or renewable energy targets in general) are advised to formulate sound long-term biomass policies, including new targets with a time horizon of at least 10 years or longer, e.g. 2020, in order to create clarity and security for the industry for long-term investments.

To stimulate a *stable supply side*

- Improved logistical infrastructure on the supply-side is needed, such as low-cost long-range shipping.
- Further technology development of pretreatment technologies should be stimulated
- Projects by e.g. the World Bank or FAO should recognize and increasingly stimulate the use of residues as important (by-) products and actively promote energy crops as bioenergy source.
- Stimulate and support capacity building on bioenergy trade related issues.

1. Background and Rationale

A reliable supply and demand of bioenergy is vital to develop stable market activities, aimed at bioenergy trade. Given the expectations for a high bioenergy demand on a global scale and for many nations, the pressure on available biomass resources will increase. Without the development of biomass resources (e.g. through energy crops and better use of agro-forestry residues) and a well functioning biomass market to assure a reliable, sustainable and lasting supply, those ambitions may not be achieved. The development of international markets for bioenergy may become an essential driver to develop bioenergy potentials, which are currently under-utilised in many regions of the world. This is true for both residues and for dedicated biomass production (through energy crops or multifunctional systems such as agro-forestry). The possibilities to export biomass-derived commodities for the world's energy market can provide a stable and reliable demand for rural communities, thus creating important socioeconomic development incentives and market access. Trade of biomass energy carriers (also known as biotrade) may also enable a more rational and efficient use of materials.

It is essential that this growth of biomass production and trade is realized in a sustainable manner. Compared to other traded commodities, this is of special importance for biomass, as one of the main reasons to pursue renewable energy sources are sustainability objectives.

2. Objectives

Task 40 under the IEA Bioenergy Agreement entitled: '*Sustainable International Bioenergy trade; securing supply and demand*', started in 2004 and currently has ten country members and the FAO as affiliated international body. In addition, joint activities have been organized with other institutions, e.g. the World Bank, EUBIONET II and other IEA Bioenergy Tasks. A key element of the work programme is to monitor and analyse experiences with the rapidly growing international bioenergy trade in solids, liquid fuels and power while simultaneously evaluate opportunities and barriers for the development of a sound international market. From 2004-2006, Task 40 has produced a number of reports and (jointly) organised a number of workshops (see www.bioenergytrade.org). This document summarizes the main results and the direct input from all Task 40 members, and addresses bioenergy trade from the current Task 40 member countries point of view.

The aims of this paper are to highlight the main issues currently hampering (parts of) the international trade in biomass, and to formulate recommendations on how such barriers can be addressed by the various stakeholders involved.

While this paper deals with bioenergy trade barriers and opportunities in general, a number of deliverables under the work program of IEA Bioenergy Task 40 specifically emphasize the sustainability aspects of biomass supply and demand. In some member countries of Task 40 the support measures for bioenergy are formally linked to sustainability and hence this issue receives particular attention.

Furthermore, bioenergy trade requires a good understanding of supply and demand issues. Thus, both barriers on the supply and the demand can hamper international trade and for this reason are discussed in this overview, although in passing, given the complexity of many of the issues involved. It is beyond the scope of this paper to present an exhaustive overview of all barriers related to biomass production, trade and use. Were appropriate, we have included references for more information.

It is also important to note that the field of international biotrade is developing rapidly, and thus frequent reviews of barriers and opportunities may be needed (e.g. bi-annually). The topics described in this paper reflect the situation of 2006.

3. Opportunities

Many countries have both a large technical agro-forestry residue potential and a large potential for dedicated energy plantations forming the base for efficient production of e.g. pellets (Bradley, 2006) or charcoal from energy plantations or ethanol from sugarcane (Walter et al., 2006). Given the availability of land and relatively low costs of labor in many developing countries, biomass production costs can be low, and thus offer an opportunity to export biomass based energy carriers to developed countries. The possibilities to export biomass derived fuels in form of commodities for the world's energy markets can provide a stable and reliable demand for produced fuel from rural communities particularly in many developing countries, thus creating an important incentive and market access in many areas in the world. However, availability of resources per se is not enough as there are many other factors that need be taken into account e.g. accessibility, quality, etc.

In the past decade such trade flows have been increasing rapidly. Many trade flows are between neighboring countries, but increasingly, long-distance trade is also occurring. Examples are export of ethanol from Brazil to Japan and the EU, palm kernel shells (a residue of the palm oil production process) from Malaysia to the Netherlands, and wood pellets from Canada, Eastern Europe and Brazil to Sweden, Belgium, the Netherlands and the UK.

These trade flows may offer multiple benefits for both exporting and importing countries. For example, exporting countries may gain an interesting source of additional income and an increase in employment. Also, sound biomass production can contribute to the sustainable management of natural resources. Importing countries may be able to fulfill cost-effectively their GHG emission reduction targets and diversify their fuel mix and thus contributing to greater energy security, a major driving force in most OECD/IEA countries. Today, bioenergy is found to be cost-efficient, in some cases even in direct comparison with oil (e.g. for heating purposes), etc.

For market parties such as utilities, companies providing transportation fuels, as well as parties involved in biomass production and supply (such as forestry companies), good understanding, clear criteria and identification of promising possibilities are of key interest. Investments in infrastructure and conversion capacity rely on minimization of risks of supply disruptions in volume, quality and price.

Biomass energy in general and international biomass trade offers many more opportunities. These are described in detail of the various country reports published by IEA Bioenergy Task 40 (e.g. Bradley, 2006; Heinimö and Alakangas, 2006, Junginger et al. 2006, Walter et al., 2006, see also www.bioenergytrade.org for more country reports). It is however not the main concern of this report. For an overview of the global theoretical potentials of biomass, see e.g. Smeets et al. (2005), for a general discussion of the potential of biomass energy see e.g. Turkenburg et al. (2000).

4. Inventory of Barriers

Based on Task 40 results, literature review and interviews, a number of potential barrier categories have been identified. These barriers may vary greatly in terms of scope, relevance for exporting and importing countries and how stakeholders perceive it. A summary of the main barriers is given below. At the same time, it must be emphasized that depending on the reference situation, these barriers can also be opportunities, and thus some positive examples are also included.

The categorization of the barriers is to some extent arbitrary. Some of the issues discussed under the various headings are complex and encompass elements of several barriers, e.g. logistical barriers indirectly cause economic barriers.

4.1 Economic barriers

One of the principal barriers for the use of biomass energy in general is the competition with fossil fuel on a direct production cost basis (i.e. excluding externalities). For example, the market price in 2004-2005 for biomass pellets in the Netherlands was about 7 to 7.5 €/GJ (Sambeek et al., 2004), while the cost of coal in 2005 was about 2 €/GJ. On the other hand, current production costs lie between 0.7 US$/GJ (free on board in the Amazon) and 1.7 US$/GJ (transported in the Southeast) in Brazil (Walter et al., 2006)[1]. Thus, the high prices seem to be caused by a strongly increasing demand over the last years, while cheap raw material at favourable conditions are no longer available in abundance and cannot support production increase at the same pace as the development of demand.

In order to promote bioenergy many developed and some developing countries have stimulated the development and use of biomass for electricity, heat and transportation by the introduction of

[1] It is however not clear whether these prices include capital costs, and likely the raw material is available for free.

various measures, e.g. governmental RD&D programs, tax cuts and exemptions, investment subsidies, feed-in tariffs for renewable electricity, mandatory blending for biofuels or biofuel quotas. However, an often-heard criticism from the industry is that these measures may not be sufficient (e.g. no mandatory target for the EU-25 biofuels directive). In addition, they are mostly temporary and tend to change frequently. This discourages long-term investments, as they are considered too risky. On the other hand thanks to the EU Biofuels Directive the EU production of biofuels more than tripled within the past two years and continues to grow. Thus, the European Commission argues that policy instruments adopted have attracted new investment in new production facilities (Maniatis, 2006).

Studies have indicated huge potential for biomass supply from some regions, such as Canada and Brazil. The limiting factor in biomass supply often is not the amount available, but the investment required to gather and pre-treat or densify the biomass to make transportation economic. Capital for investment in these regions may be limited, or investment may be deemed to risky until markets show some long-term stability and growth. Options to fully develop these resources include long-term contracts for biomass at prices that ensure economic return for the local investor, or integrating supply operations with demand, whereby biomass consumers in one region invest in plant in the supplying region.

Due to the often small size of bioenergy markets and the fact that biomass by-products are a relatively new commodity in many countries, markets can be immature and unstable, e.g. as in the case of the wood pellet market. During the winter of 2005/2006, this market was very volatile due mostly to supply shortages, caused by much higher demand from European households (who were replacing their expensive fossil fuels with wood pellets), higher demand from power companies, and various congestions in the supply of pellets due to a long period of cold weather. All these factors lead to circumstances in which suppliers did not manage to meet the unforeseen demand. Some emergent market areas were trying to solve the lack of supply, but turned out to be futile when it appeared that some of the new producing parties tended not to honor contracts but sold their shipments to the highest bidder (Schouwenberg, 2006). This is one example that shows the immaturity of this market.

Unstable markets make it difficult to sign long-term, high-volume contracts as this is seen as too risky. Also, with no harmonised support policy (e.g. on an EU level), new national incentives (and associated demand for bioenergy) may distort the market and shift supply to other countries within a short timeframe (Faber et al., 2006). Due to increasing international competition, Dutch traders expect a further growing demand for cheap biomass fuel streams in the mid-term (5-10 years) in developed countries, but also in developing countries due to an expected rise in local demand (Junginger et al., 2006).

Due to the small volumes, biomass fuel trade is so far basically 100% bilateral, i.e. direct agreements between buyer and seller. A few biomass exchange websites have emerged over the past year, but traded volumes remain low so far.

In summary, while the strong increase in overall biomass demand is a positive development in itself, the market is hampered at this moment by many factors such as its dependence on (short-term) policy support measures and typical problems of emerging markets such as small bilateral volumes, lacking market transparency, etc.

4.2 Technical barriers

A general problem of some biomass types is its variety in physical properties (e.g. low density and bulky nature) and chemical properties, such as high ash and moisture content, nitrogen, sulphur or chlorine content. These properties make it difficult and expensive to transport; and often unsuitable for direct use, say for co-firing with coal or natural gas power plants. Power producers are generally reluctant to experiment with new biomass fuel streams, e.g. bagasse or rice husks. As shipments within these streams often fail to meet the required physical and chemical properties, power producers are afraid to damage their installations (designed for fossil fuels), especially the boilers. While technology is available to deal with the fuels (e.g. different types of fluidized bed boilers), it may take several years or even decades before the old capacity is replaced (Heinimö and Alakangas, 2006). On the longer term, the limited ability to use different fuels may lead to a restricted availability of biomass fuels (Junginger et al., 2006). This is a particularly important issue as many European coal power plants need to be modernised or shut down in the next 5 to 10 years.

4.3 Logistical barriers

Related to technical barriers are logistical barriers. One of the problems of logistical barriers is a general lack of technically mature pre-treatment technologies in compacting biomass at low cost to facilitate transportation, although this is fortunately improving. Densification technology has improved significantly recently e.g. for pellets although this technology is only suitable for certain biomass types. Also, the final density per cubic meter is still far less than e.g. oil given the nature of biomass. Pyrolysis or torrefaction may be a possible pre-treatment option, but still needs to be proven on a commercial scale. In the case of the import of liquid biofuels (e.g. ethanol, vegetable oils, biodiesel), this is not an issue, as the energy density of these biofuels is relatively high.

When setting up biomass fuel supply chains, for large-scale biomass systems, logistics are a pivotal part in the system. Various studies have shown that long-distance international transport by ship is feasible in terms of energy use and transportation *costs* (e.g. Hamelinck, 2004) but availability of suitable vessels and meteorological conditions (e.g. winter time in Scandinavia and Russia) need be considered.

However, local transportation by truck (both in biomass exporting and importing countries) may be a high cost factor, which can influence the overall energy balance and total biomass costs (see e.g. Batidzirai et al., 2006; Hamelinck, 2004). For example, in Brazil, new sugarcane plantations are considered in the Centre-West, but the cost of transport and lack of infrastructure can be a serious constraint. Harbor and terminal suitability to handle large biomass streams can also hinder the import and export of biomass to certain regions. The most favorable situation is when the end user has the facility close to the harbor avoiding additional transport by trucks.

The lack of significant volumes of biomass can also hamper logistics. In order to achieve low costs, large volumes need to be shipped on a more regular basis. Only if this can be assured, there will be forthcoming investment on the supply side (e.g. new biomass pellet factories) at this will reduce costs significantly. The bulky nature of biomass fuels and the relatively low value per unit would restrict availability of suitable areas for handling of these fuels in busy ports. On the other hand, this bulky nature in combination with high demand for specific biomass streams means that the present capacity (incl. storage, handling equipment, etc.) of some harbors (e.g. Stockholm, Gothenburg, Immingham, several harbors in the Baltic States) is fully utilized. A further increase in biomass handling would require specific investment.

4.4 International trade barriers

As with other traded goods, several forms of biomass can face technical trade barriers. As some biomass streams have only recently been traded, so far no technical specifications for biomass and no specific biomass import regulations exist. This can be a major hindrance to trading. For example, in the EU most residues containing traces of starches are considered potential animal fodder, and thus subject to EU import levies. For example, rice residues containing 0-35% starch are levied 44 €/ton (about 3.1 €/GJ) (Junginger et al., 2006). For denaturised ethanol of 80% and above, the import levy is 102 €/m^3 (about 4.9 €/GJ), representing substantial additional costs. Brazil is planning to increase ethanol production drastically over the next 8 years, and to start up biodiesel production from soy beans, palm oil, etc., although only a fraction of both biofuels will be exported, the rest will be used domestically. Brazil could in theory export more ethanol than is scheduled so far. A major constraint is that countries with large markets (the US, Japan and the EU) are completely or partially closed due to trade barriers. The United States applies ad valorem duties of 2.5% for imports from most-favoured-nations (MFN) and 20% for imports from other countries. Japan applies ad valorem duties of 27% (MFN treatment). At present, these duties represent a significant barrier to trade, influencing the competitiveness of foreign imports. It is important to ensure that treatment takes into consideration the status of the exporting countries, to account for their level of development and potential for export. Finally, it is important to bear in mind that some technical trade barriers can be, in fact, imposed to constrain imports and to protect local producers.

Another issue connected with international trade are transport tariffs. In recent years, general transport tariffs have increased quite significantly e.g. wood pellets to the Netherlands were on average 1.75 €/GJ (on a total cost of 7-7.5 €/GJ) in 2004 (van Sambeek et al., 2004). This was partially caused by the high demand for transportation from South-East Asia, but demonstrates the dependence of biotrade on low transportation tariffs.

In addition, the risk of contamination of imported biomass with pathogens or pests (e.g. insects, fungi) is another important limiting factor in international trade. For example, undebarked untreated round wood and chips from outside Europe are (with a few exceptions) not allowed and are inspected thoroughly for import into the EU (see also Heinimö and Alakangas, 2006). Similarly, agricultural residues which could be used both as fodder and biomass, may currently be denied entry if it does not meet certain fodder requirements. However, it is important to bear in mind that these limitations are not exclusive to bioenergy, and that they are in place to protect public and animal health.

A potential future trade barrier may be the biotechnology issue. Many countries (mainly in EU) are highly opposed to import products where biotechnology was used (Cartagena Protocol on Biosafety). However, in the case of short rotation plantations and the energy crops, genetic modifications i.e. for the increasing the yield or the water content are beneficial to bring down production costs. This may for example be relevant for ethanol from genetically modified corn or sugarcane.

4.5 Ecological barriers[2]

Large-scale biomass dedicated energy plantations may in principle pose various ecological and environmental issues that cannot be ignored, e.g. monocultures and associated (potential) loss of

[2] Some task members see this as a land use issue. Responsibility for land use (changes) lies with many more actors, and is clearly not the sole responsibility of bioenergy trade alone. Also, the ecological and social barriers only have indirect influence on trade.

biodiversity, soil erosion, fresh water use, nutrient leaching and pollution from chemicals (Lewandowski and Faaij, 2004; Smeets et al, 2004). For example, the cultivation of soy beans in Brazil and palm oil in Indonesia and Malaysia for food and fodder applications have been strongly criticized by various environmental NGOs because of the negative social and environmental effects, e.g. the violation of land property rights of small farmers, or the additional pressure on land and on valuable ecosystems such as rain forests[3]. Application of soy bean oil and palm oil as feedstock for biofuels would contribute to these effects. However, studies have shown that for dedicated perennial, woody energy crop plantations in general these problems can be less serious when compared with currently common plantations for food or fodder production. If designed and managed wisely, biomass plantations can be multi-functional and generate local environmental benefits. For example, willow plantations in Sweden may be used for soil carbon accumulation, increased soil fertility, reduced nutrient leaching, shelter belts for the prevention of soil erosion, plantations for the removal of cadmium from contaminated arable land (phytoextraction), and vegetation filters for the treatment of nutrient-rich, polluted water (Berndes and Börjesson, 2006). Short rotation woody crops (SRC) in general require very few inputs of herbicides and pesticides. Rich et al. (2001) reported SRC plantations were generally better for a wide variety of wildlife than existing adjacent farmland around the ARBRE project area (UK). When established on agricultural land it usually results in an increase in bio-diversity, e.g. no significant displacement of species and in some cases an actual increase of species occurred. SRC is generally regarded as environmentally friendly and most environmental groups view the technology favorably. Also, in the UK large scale SRC monoculture is unlikely given the nature of land tenure. Rather, the most likely scenario may be large number of small plots scattered over large areas.

4.6 Social barriers[2]

Also linked to the potential large-scale energy plantations are the social implications, e.g. the effect on the quality of employment (which may increase, or decrease, depending on the level on mechanization, local conditions, etc.), potential use of child labour, education and access to health care (Lewandowski and Faaij, 2004; Douglas et al., 2004). However, such implications will reflect prevailing situations and would not, necessarily, be better or worse than any other similar activity. One example is the agricultural sector in Brazil, where the level of social benefits and child labour are still important issues, which have however significantly improved over the period of 1992-2004. Macedo et al. (2005, see chapter 12) gives an account of the positive contributions of the sugarcane and ethanol industry on job creation and income. Further examples of social benefits are highlighted by e.g. Woods and Hall (1994) for developing countries and Perlack et al. (1995) on woody biomass plantations.

4.7 Competition between and integration of biomass for energy applications and for other end uses

Various types of biomass can be utilized for different end-uses other than energy, e.g. as raw material for the pulp and paper industry, as raw material for the (chemical) industry (e.g. tall oil or ethanol), as animal fodder (e.g. straw) or for humans consumption (e.g. ethanol or palm oil). This competition can be directly for biomass, but is also often focussed on land availability.

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[3] Furthermore, a well-known feedstock for ethanol production is sugarcane. In a recent report form Task 40 members (Smeets et al., 2005) it was shown that current ethanol production from sugarcane in Sao Paulo does not pose any major ecological problems, and does also not directly threaten the Amazon rain forests.

Throughout human history biomass in all its forms has been the most important source of all our basic needs, often summarized as the six "Fs": Food, Feed, Fuel, Feedstock, Fibre and Fertiliser. Biomass products are also frequently a source of a seventh "F" - Finance. Until the early 19th century biomass was the main source of energy for industrial countries, and indeed, still continues to provide the bulk of energy for many developing countries biomass. Food versus fuel is a very old issue that is frequently brought up despite the fact that a large number of studies have demonstrated that land availability is not the real problem (Partners 4 Africa, 2005). While theoretically large areas of (abandoned/degraded) crop land are available for biomass cultivation, biomass production costs are generally higher due to lower yields and accessibility difficulties. Deforested areas may be easier as they may have more productive soil, but is generally considered unsustainable in the long term. Food security, i.e. production and access to food, would not probably be affected by large energy plantations if proper management and policies were put in place. However, in practice food availability is not the problem, but the lack of purchasing power of the poorer strata of the population. A new element to take into account is climatic change, which introduces a high degree of uncertainty.

As mentioned above, next to competition with food, there also may be competition with other applications, such as fodder. If there was a large increase in demand for energy, say of agricultural residues, scarcity of fodder products may occur, leading to price increases. Furthermore, in the Netherlands, the fodder industry sees the feed-in tariff for electricity from biomass as an indirect subsidy for agro-residues (Junginger et al., 2006). On the other hand, also the use of fodder is subsidized. Similar arguments have been voiced by the European pulp and paper industry, which fears strong promotion and subsidies for renewable energy sources in EU increasing the competition for pulpwood between the raw material and energy purposes. Increasing competition for wood will increase the price of wood and lower the supply of wood for raw material of forest industry and decreasing competitiveness of European Pulp and paper industry (CEPI, 2006). Wood use for forest products usually gives more value added and creates more jobs than the direct use of wood products for energy production (CEPI, 2003). Furthermore, there is a large potential market for bio-products and the use of woody feedstocks to replace fossil-based feedstocks; an issue we do not further address here.

4.8 Methodological barriers – lack of clear international accounting rules

Before large-scale international trade of bioenergy can be implemented, clear rules and standards need to be established e.g. who is entitled to the CO_2 credits. Another related issue concerns the methodology that should be used to evaluate the avoided emissions, considering the fuel life cycle. As these avoided emissions typically depend strongly on the chosen reference system, it is debatable whether the same methodology could be applied to all biomass sources.

Another issue is the indirect import of biomass for energy (processed biomass). Biomass trade can be considered as a direct trade of fuels and as indirect flows of raw materials that end up as fuels in energy production after the production process of the main product. For example, in Finland, the biggest international biomass trade volume is indirect trade of raw wood (including round wood and pulp chips). Almost half of these imports end up as by-products (e.g. bark, sawdust and black liquor) used for energy production (Heinimö and Alakangas, 2006).

4.9 Legal (national) barriers

International environmental laws may limit biomass for energy. For example, in the Netherlands, four out of five major biomass power producers consider obtaining emission permits as one of the major obstacles for further deployment of various biomass streams for electricity production. The main problem is that Dutch emission standards are not entirely consistent with EU emission standards. In several cases in 2003 and 2004, permits given by local authorities have been declared invalid by Dutch courts (Junginger et al., 2006). While these barriers only indirectly influence international bioenergy trade, they may cause a significant reduction of potential biomass import volumes.

4.10 Lack of information dissemination

Both the benefits of sustainable biomass energy in general and specifically the need for international biomass trade are still largely unknown to many stakeholders such as industrial parties, policy makers, NGOs and the general public. More active dissemination of information by the IEA Bioenergy programme, various UN institutions, national governments and other organizations is required.

5. Broader issues to be considered in relation to biomass trade

5.1 Energy balances and local use vs. international trade

The overall energy balance of biomass and biofuels use needs to be positive, although this is not always clear-cut. Energy balances have improved considerably in the past or so decade as productivity has increased with lower inputs e.g. as in the case of ethanol from sugar cane in Brazil (Macedo, 2005). Similarly, some oil crops like palm oil, dende and macaúba can deliver biodiesel with relatively high energy output/input ratios (Horta Nogueira, 2005). Related to energy balances are greenhouse gas (GHG) balances of biofuels[4]. As shown by a report published by the IEA (2004), the current production of ethanol from wheat and sugar beet or biodiesel from rape seed (as is currently the main practice within the EU) achieve lower GHG emission reductions, typically in the range of 20-60%) than ethanol from sugarcane (80-90%), (see also Quirin et al, 2004). Development of such first-generation biofuels with mediocre energy and GHG balances on a large scale are often driven by additional considerations such as fuel security, and employment in the agricultural sector, but could be considered unsustainable by some on the longer term[5]. Import of e.g. ethanol from sugarcane would in general show better energy and GHG balances. On the other hand these balances are somewhat worsened by long-distance transport (especially when including substantial transportation by truck).

Connected to this issue is the question whether biofuels should be used preferably locally or traded internationally. While many developing countries have a low energy consumption compared to developed countries, their energy demand is increasing rapidly. Should biomass for energy be utilized locally or for export; should market forces have the last say? For example, Finland currently exports large volumes of pellets to other EU countries, which could also be utilized domestically. The main drivers are higher incentives paid for (electricity from) pellets in other European countries. It can be expected that countries that have greater difficulties in meeting commitments (Kyoto, green policies, etc.) will introduce stronger incentives. From an energy efficiency point of view, in general, it would be more rational to use the biomass primarily

[4] GHG emissions are often coupled to energy inputs during the production of biofuels, e.g. diesel fuel for agricultural machinery. However, also emissions of other GHG gases such as methane or nitrous oxide during biomass cultivation influence GHG balance, but not the energy balance of biofuels.
[5] For example, in the Netherlands, a commission consisting of various stakeholders form government, industry and NGOs decided that minimum sustainability criteria for biomass should achieve 30% GHG emission reductions, though by 2011, this level should be increased to 50% (Cramer et al. 2006).

locally, and only the excess should be exported[6]. However, the actual energy balances and CO_2 emission reductions also depend strongly on the reference energy systems in both the exporting and importing country. Furthermore, it should be borne in mind that international competition will force domestic producers to be more competitive.

6. Possible approaches and strategies

6.1 Solving sustainability issues: International classification and certification of biomass

Certification of biomass may be one way to prevent negative environmental and social side-effects. Setting up minimum social and ecological standards, and tracing biomass from production to end-use can ensure the sustainability of biomass. In an exploratory study has been shown that certification schemes for social and environmental standards do not necessarily result in high additional costs (Smeets et al, 2005).

However, when implementing a certification scheme for sustainable bioenergy, several other issues have to be dealt with. First, criteria and indicators need to be designed and adapted according to the requirements of a biomass producing region. Also, the compliance with the criteria has to be controllable in practice, without incurring high additional costs. It is crucial that this is ensured, otherwise, those who are able to cheat the system are winners. An example of problematic certification is the logging situation in some countries. Typically, in order to prevent illegal cuttings, permits are required, and those are issued by regional and local officials, which, in practice opens up for black markets for logging permits As a warning from industry stakeholders, too strict certification without decent controls can lead to negative and unintended effects (Hektor, 2006).

Secondly, leakage[7] should be avoided. The net effect is that carbon benefits gained in one place are partially lost in (leak away) in another location. Leakage in the context of biomass trade could stand for an unwanted shift of activities from the area of biomass production to another area where it leads to negative effects on the environment (Lewandowksi and Faaij, 2004). Summarizing, in order to succeed, the certification process cannot be expensive, cannot be slow and bureaucratic and cannot add additional – and indirect – barriers.

There are several possible ways forward from the current situation:

1. The initiative for sustainable biomass certification can be left to the market stakeholders. Examples are the Green Gold Label developed by Essent. Market stakeholders develop these initiatives, but they are not binding. Thus, they are unlikely to include criteria that involve (substantial) additional costs.
2. National governments can develop sustainability requirements (e.g. in order to be eligible for subsidies) systems. This is currently being done by Belgium for the production of renewable electricity from biomass. Similarly, legislation is under preparation in the United Kingdom for biofuels, and in the Netherlands for renewable electricity from

[6] Some task members do not fully support this assumption. Also, they emphasise that we also trade food products all over the world, and that rules for biomass should not be too ambitious – environmental and other principles should be applied equally across sectors.

[7] Leakage can be defined as activity-induced changes in land use that occur outside the area in which the activity takes place An example for a leakage effect is the shift of logging activities to Myanmar and Cambodia after the ban on logging forests in Thailand, instituted in 1989 (Lewandowski and Faaij, 2004).

biomass. These national criteria could be initially based on minimum sustainability demands, but raised over time (e.g. to include avoidance of leakage effects, increased demands on GHG balances etc.). However, a multitude of different commercial or national certification systems with different sustainability criteria would likely create additional barriers for biomass trade. Therefore, a joint declaration of general basic principles on an international level (e.g. EU or OECD) would be useful.

3. Develop an international certification standard for sustainable biomass. This should be done by a consortium of all stakeholder groups producing, trading and utilizing biomass, and would allow for a uniform standard. While this would probably take several years to develop, it would offer the possibility for harmonizing minimum sustainability standards. Such an international system could also include a methodology on how to allocate the CO_2 reduction benefits.
4. Leave the issue to the parties in the supply chains to find reasonable ways and means to handle the issues. “Good Business Practice”, pressure from NGOs, control from the Part in the chain that has strong or specific requirements, transparency, etc. will enable the trade to find efficient ways forward. Abusers will (may) be black-listed (or “punished” by “clean” competitors)

To achieve both growing markets and long-term sustainable biomass trade, a pragmatic approach is needed. It is recommended to focus first on routes with low barriers regarding its sustainability (e.g. wood pellets from sustainable forestry), and to identify the routes that allow larger benefits, considering all aspects that are used to identify sustainable biofuel production. A compromise should be found between ensuring sustainability of bioenergy and developing the market. While not all bioenergy routes may fulfil the entire set of sustainability criteria initially, the emphasis should be on the continuous improvement of sustainability. For such an approach, public information dissemination and support is crucial. Furthermore, it is interesting to note that so far mainly importing countries are known to prepare sustainability criteria for biomass, while also exporting countries should define what in their view constitutes a sustainable biomass supply. **It is recommended for actors in the various bioenergy routes both in importing and exporting countries to seek agreements on short-term (minimum) sustainability criteria, and to support a long-term development of international standards for important and generally accepted issues. Some of the Task 40 members advocate an international certification system for biomass embedded in (inter)national regulations, while others would preferably see a voluntary approach.**

In the case of an (inter)national certification system, such a system must be carefully designed, and meet boundary conditions such as existing international treaties and WTO rules. Also, many (feedstocks for) biofuels and biomass streams, such as ethanol, vegetable oils or wood chips, are also used for food, fodder and as feed stock in the pulp and paper industry. Careful consideration is necessary to decide whether sustainability criteria should (and in practice can) only be applied to biomass/biofuels for energy applications, or for all application in general.

6.2 Setting up technical biomass standards and recording international statistics (volumes and prices) on bioenergy trade

For biomass to become a large-scale commodity, which can be traded on an exchange, technical standards are needed. **It is recommended that the various standards that are applied today are developed into internationally accepted quality standards for specific biomass streams (e.g. CEN biofuel standards).** Biomass end users may also have a higher confidence in using different biomass streams if they meet such quality standards. Task 40 may possibly contribute to this, e.g. by collecting information on technical specifications required by consumers and convey them to potential suppliers. Furthermore, classification of organic matter streams as specific biomass fuel may aid WTO classification as environmental goods and services (EGS). In this context we reemphasize that technical standards should be defined to foster trade, not to impose additional barriers.

Furthermore, as mentioned above, there are two main problems with biomass trade statistics: either, no international statistics are kept at all (e.g. wood pellets), or there are statistics available on the flows, but the end use is unknown. For example, there are statistics for ethanol or palm oil, but it is unclear how much is used for energy purposes, and how much for or other purposes (e.g. as food, fodder or chemical feedstock etc.)

Task 40 recommends to the IEA, UNCTAD and national trade organisation to include (new) biomass types in their statistics, and to include the final application (e.g. energy, chemical feedstock, fodder etc.) where possible.

Also, in order to create more market transparency, both industry stakeholders and policy makers are advised to encourage the establishment of exchanges for biomass products.

6.3 Lowering of trade barriers

On the topic of technical trade barriers, Coelho (2005) suggests that biofuels could help industrialized countries to promote reduction of carbon emissions but, in some cases – as is the case of ethanol export to US and EU – exporting countries face trade barriers. Most of these barriers are established based on technical reasons, but often the intention is also to protect local producers that have production costs much higher than developing countries. For example, the EU argues that Brazil has subsidized its ethanol industry for several decades, and it can be argued that other technologies (especially second-generation technologies) should be given the opportunity to be further developed. On the other hand, Brazil points out that that almost all new technologies have been subsidized in many – if not all – countries, including first-generation biofuels in the EU.

A solution pointed by some analysts is to liberalize environmental goods and services – EGS – and to include biofuels as such. The Doha Round negotiations on the liberalisation of environmental goods and services with a view of phasing out tariffs could provide some opportunities for expanded national markets, but will not solve the issue of protecting agricultural markets. Also, so far there is no consensus whether biofuels should be included as environmental goods (Melendez-Ortiz et al., 2005).

Task 40 identifies import barriers for certain biomass and biofuels types to be a major obstacle for a smooth further development of international bioenergy trade. Some Task members emphasise that on the short-term, local industries should also be given the opportunity to develop innovative and improved processes for biomass and biofuels production. Other task members stress that such a process should be coupled to a phase-out agenda with clearly defined quotas. Furthermore, Task 40 recognises the need for sustainability criteria for biomass to prevent the unchecked and unsustainable production of biomass.

6.4 Long-term support policies, creating a stable demand-side

Short-term policy incentives to stimulate the use of biomass are crucial and should be kept to provide investment security. Also, national support systems are often specifically in place to compensate for specific local characteristics. However, varying policy incentives can also disturb market mechanisms, as was recently shown for biomass trade between Germany and the Netherlands (Faber et al., 2006).Therefore, **on the longer-term, market support policies in the various countries, etc. should be designed to promote and stimulate international trade when and where trade would be the logical option**. **Some task member advocate a harmonization of e.g. EU policies but recognize that this will be hard to achieve in practice and would require a gradual process of adjusting the various national support systems**. It is not necessarily a requirement to use a uniform support system throughout the EU, the different systems could be better adjusted to each other to avoid large-scale market distortions and waste of subsidies.

Connected to this, the issue of uncertain governmental support policies should be addressed. For instance, within the European Union, not a single country has set binding biomass or biofuel targets beyond 2010. **In order to create long-term incentives to invest in bioenergy markets, policy makers in countries with biomass targets (or renewable energy targets in general) should consider the benefit of long-term bioenergy policies, including new targets with a time horizon of at least 10 years or longer, e.g. 2020, in order to create clarity and security for the actors in the bioenergy trade routes for long-term investments.**

6.5 Creating a sustainable supply side

Since the beginning of 2006, demand for biomass for energy has been rising rapidly, and has caused strong price increases in e.g. pellets. This is increasing the risks of unsustainable exploitation of biomass resources[8]. Therefore, within biomass sustainability agreements (such as a possible biomass certification system), it is important to stimulate a sustainable increase in the supply-side. Investments are required in several areas. First of all, the agricultural and forestry residues currently being produced are often inaccessible due to logistical obstacles (both prohibitive costs due to accessibility and high energy requirements for transportation). Improved infrastructure and pretreatment technologies (such as mobile forest slash bundlers or pyrolysis units) could make a larger potential of unused residues accessible. **Further technology development in this direction should be stimulated**. Second, **projects by e.g. the World Bank or FAO should recognize and increasingly stimulate the use of residues as important (by-) products and actively promote energy crops as bioenergy source**. Finally, as residue potentials are limited, investments in energy crops for production of solid and liquid biofuels will become increasingly necessary. If unchecked, there is no guarantee that these additional energy crops will be produced sustainable, reemphasizing the need for sustainability criteria. Increasing end-user consumer awareness will also require the sustainable production of biomass.

Stable low-cost supply also requires competitive long-range transportation to be in place. This can be promoted with high-volume contracted movements of biomass as opposed to small volume one-off shipments. Transportation options may also have to be studied for products such as pyrolysis oil, which will require special transportation needs owing to acidity.

6.6 Stimulate both economic efficiency and energy efficiency

In general, free markets should be able to ensure economic efficiency. To ensure additional efficiency from an energy point of view, **policy incentives could include requirements for energy and/or CO_2 balances**. For example, authorities of both main regions of Belgium,

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[8] Some task members remark that this depends on the specific biomass resource, and that we are still very far from that situation. Other Task members point at the current production and expansion of palm oil, for which different stakeholders have stated clear concern on sustainability.

Flanders and Wallonia (www.vreg.be, www.cwape.be) require the determination of the energy balance for all biomass (domestic and imported) used for renewable electricity generation. Support mechanisms for renewable electricity certificates (avoided penalty calculated per MWh) are granted according to the primary energy balance (Flanders) or the fossil CO_2 balance (Wallonia). The balances take into account fossil energy and electricity used during production and transportation of biomass. Thus, there is an economic incentive to use biomass streams with low amounts of fossil CO_2 emissions in the supply chain.

In addition, sustainability from an economic point of view means production with no subsidies on the long term. So, subsidies to foster local production, or subsidies for biomass chains with negative or only marginally positive energy balances, are undesirable policies.

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