

# INTERNATIONAL DEBATE ON INTERNATIONAL BIOTRADE

A. Faaij<sup>a</sup>, A. Wiczorek<sup>b</sup>, M. Minnesma<sup>b</sup>

<sup>a</sup>Dept. of Science, Technology and Society, Copernicus Institute, University Utrecht  
Heidelberglaan 2, 3584 CS Utrecht, The Netherlands, [A.Faaij@chem.uu.nl](mailto:A.Faaij@chem.uu.nl)

<sup>b</sup>Institute for Environmental Studies, Free University of Amsterdam, the Netherlands

**ABSTRACT:** This paper summarizes the outcomes of the international workshop held in Amsterdam in September 2002, as well as information gathering prior to that event (literature, other events) and separate interviews. The overall impression of the material and thoughts provided through discussion papers, interviews and the workshop covered by this project, is a sense of excitement around the concept of international bio-energy trade. It is recognized that there are opportunities of developing international bio-energy markets for rural development and poverty alleviation, which increase the economic efficiency and the total use of bio-energy use worldwide.

Key issues raised are that there are no clear sustainability criteria available yet for biotrade schemes. These should be developed. There are also potential (or real) opposing interests in the arena around bio-energy trading schemes: the private versus public sectors, environmental focus versus a market focus and a regulatory approach versus the market oriented approach. Partly, the lack of consensus may also be caused by the different backgrounds and availability of information (both scientific and from ongoing activities). Flexibility in development, usage and application of the right incentives and policy schemes may be a key element of an expected 'chaotic' transition process towards building international bio-energy markets. Overall, there is a clear need for the type of debate that took place during the workshop. A key recommendation is therefore to structure and institutionalize this debate for a longer period of time, involving all key stakeholders.

## 1 INTRODUCTION

The Dutch Ministries of VROM and EZ are currently developing (international) policies in the field of trade in bio-energy. The rationale for international bio-energy trade starts from the insights that the theoretical potentials for the production of biomass on a global scale for energy (orders of magnitude vary from 100 up to over 1000 EJ on the long term (i.e. 2050). In addition, various world regions have a (much) larger bio-energy production potential than others, with the potential to become net exporters of bio-energy over time.

Insights in the actual biomass production potentials for energy on a regional scale are however limited and depend on a very complex set of factors: physiological, technical, socio-economic, political as well as cultural. Key issues include for instance the extent to which agriculture can be modernized and what type of criteria (ecological and socio-economic) apply to sustainable (large scale) bio-energy utilization.

Various drivers of international bio-energy trade can be distinguished:

1. Cost effective GHG emission reduction. At present, the demand for biomass is especially growing due to climate policies of various countries. In situations where indigenous resources are insufficient (or better; the amount of resources available with specific qualities and costs) import is currently sometimes more attractive than exploiting local biomass potentials. On longer term, several world regions would have inherent advantages in producing lower cost biofuels than other parts of the world.
2. Socio-economic development; many institutions and much research has indicated the potential strong positive link between developing bio-energy use and local development. Furthermore, for various

countries that may export bio-energy in the future, doing so may provide substantial benefits for their trade balances.

3. Sustainable management and use of natural resources. This may be a less clear and obvious argument in favor of international bio-energy trade at first glance, but it may prove to be essential. Large-scale production and use of biomass for energy will involve use of (additional) land. When biomass production can be combined with better agricultural methods, restoration of degraded and marginal lands and provide a sustainable source of income for rural communities, the export market can be the trigger for exactly obtaining such benefits.
4. Fuel supply security. Biomass may diversify the total portfolio of fuels used and important by countries and thereby adding to reducing risks of supply disruptions both in terms of quantity and in price. This argument is particularly strong when biofuels for the transport sector are concerned, since they would replace oil imports.

Altogether, bio-trade schemes have a very large potential to mitigate greenhouse gas emissions and contribute to sustainable development. Thus, in general, international bio-energy trade has very promising prospects and could in fact be a key component of the future world's energy system. However, when the bio-trade schemes fail to meet stringent objectives on a multitude of criteria (e.g. competition with food production, avoid deforestation) public support for them may dwindle soon.

Therefore, considering large-scale implementation of such schemes requires answering a large number of (research) questions covering ecological, social and economic dimensions.

It is this array of questions that was the starting point for

the discussion process reported here. It summarizes the outcomes of the international workshop held in Amsterdam in September 2002, as well as information gathering prior to that event (literature, other events) and separate interviews.

On behalf of the Ministries of Economic Affairs and Environment, Novem asked IVM and the University of Utrecht to organise this international workshop and to make sure that all key actors were consulted.

Key objectives of the meeting were to explore the current knowledge, give a review of available data and literature on the potential of a sustainable large-scale international trade of energy from biomass and to provide for a platform for relevant stakeholders to exchange ideas, opinions and contextual information.

Furthermore, the need and interest for future actions in this field, such as strategic supportive research for policy development and recommendations on how to proceed with the concept of international trade in (energy from) biomass were to be identified.

Participants of the workshop were sought from the institutions and countries that are expected to be affected by and/or involved in the potential export and import of bio-energy. These included key international players (WTO, FAO, EU-DG Agriculture and DG Transport); (inter)national decision-makers (Dutch Ministries, STEM, NGO's (Greenpeace and Stichting Natuur en Milieu), scientific community (IEA, University of Campinas, Embrapa, Utrecht Universiteit, Vrije Universiteit, King's College) and Industry/Market parties (Essent, Vattenfall, Shell Global Solutions, Swedish Ethanol Association). Some institutions were visited afterwards (World Bank, GEF, UNECE).

## 2. RESULTS OF THE WORKSHOP & DIALOGUE

### 2.1 Ecological issues and land-use

On short term, trading available and underutilized biomass resources is a logical and in most cases desirable route. International biomass trade then serves to connect demand and supply, leading to increased use of biomass for energy and potentially solving waste treatment problems at the place where biomass resources are available.

This argument should be treated with care in case competing applications are present (such as fodder, material applications and local use for energy production).

On the longer term, considering that biomass use for energy will be pursued on a worldwide scale, real net surplus biomass resources are unlikely to occur when only wastes and residues are considered, due to the limited volumes concerned. Considering many countries will deploy biomass in their energy supply mix, surplus potential biomass resources will have to be produced by biomass production and supply systems, implying pure energy crops or multiproduct cropping systems of which energy is one of the commodities supplied.

Although the technical (and even economic) energy potential worldwide is large, it is impossible to produce what that contribution of biomass to the world's energy supply will be on the longer term. Biomass is a primary energy source which is probably most sensitive to policy

choices and developments on different levels. This also implies though that policy (in particular agricultural and development strategies in developing countries) has a major role to play in developing bio-energy potentials around the world.

Due to the very diverse conditions found worldwide with respect to soil quality, climatic conditions, biodiversity and agricultural and forestry practices, the type of biomass production which is most suited and desirable will also vary widely. Two key recommendations were formulated during the workshop in this respect:

- One should be able to *design and develop* biomass production systems that meet a diverse set of (sustainability and ecological) criteria on forehand. Procedures and knowledge on how to do so need to be developed still. A key element to take into consideration in doing so is avoiding undesirable leakage effects due to indirect land use. Conventional land use (agriculture, cattle raising and forestry) and active production of biomass for energy must be addressed in an integrated manner.

- There is a strong link between developing bio-energy (production) potentials, their exploitation and rural development. The linkages between the two is a crucial aspect for developing countries. Bio-energy use should go hand in hand with sustainable development schemes. This creates both major opportunities as complex questions for implementation of such systems. The acceptance of developing biomass production schemes for export may to a large extent depend on to what extent they can contribute to poverty alleviation and rural development in exporting countries. This aspect was in particular stressed by FAO and experts working on development programmes. Such developments can then contribute to strengthening conventional agriculture as well, e.g. by investments in infrastructure and availability of capital and knowledge. Improved agricultural practices (including better soil management, intercropping and water management to name a few aspects) should then lead to more sustainable land use as a whole.

The need for clear criteria of what is to be considered sustainable is obvious. Much can be learned from e.g. the FSC schemes or the first stages of the implementation of the Clean Development Mechanism. The debate on what really is considered sustainable is far from finalized and should be continued. The need for pilot activities and monitoring was stressed.

### 2.2 Technology and infrastructure

Bio-energy trade already takes place under current conditions. Examples are Sweden and the Netherlands, importing substantial amounts of biomass for producing electricity and heat.

Key to developing any infrastructure and capacity for biomass utilization is cost reduction. Biomass import can currently be one way of reducing costs compared to using indigenous resources. In general though, bio-energy has difficulty competing with fossil fuel based power (and fuel) production. A key question for biotrade is therefore to what extent it can contribute to cost reduction of producing energy carriers from biomass.

From a technical point of view many alternatives exist that can improve the competitiveness and efficiency of

biomass use over time. Partly, those improvements can be achieved by technology development and learning over time. Investing in RD&D over prolonged periods of time is essential for obtaining such progress. Furthermore, cost reductions can be achieved in gaining more experience in biomass production and supply systems. Partly, this can be achieved by developing and gaining experience with crop production systems and the crops themselves.

Another key element is the building of infrastructure and supply chains, in which economies of scale also play their role. For various circumstances (e.g. Sweden and Brazil) clear cost reductions of per unit of energy produced from biomass have been observed over time over the past decades.

Large scale international trade could contribute to such developments further. Interesting examples are the proposed trading schemes between Russia and the Port of Rotterdam, which are investigated by the UN Economic Commission for Europe (UNECE) and the Harbour authority. Creation of markets for biomass could then serve as a trigger for "opening up" potential exporting areas and at the same time provide a basis for building, developing and optimizing the required infrastructure. The realization of the right transport, transfer and storage facilities and the increasing attractiveness for dedicated equipment (e.g. ships) may provide a basis for ongoing technological learning.

For parties or regions interested in purchasing biomass (or biomass based energy carriers) a more diverse supply of resources and, eventually, a global market, may be a factor in itself reducing risks for investing in biomass conversion capacity and infrastructure.

A difficult matter is the in principal large number of options available or possible to transport biomass or energy carriers produced from biomass from one region to the other. Transporting untreated, pre-treated, liquid fuels or even gaseous fuels, will set very different demands for investing in infrastructure, conversion and transport capacity. The liquid fuels have the inherent advantage that transport is more efficient and therefore export of fuels may seem preferable. On the other hand, this requires the exporting country to make substantial investments in conversion capacity, for which a stable biomass supply over a long period (i.e. 15-20 years) must basically be guaranteed. Such an infrastructure may be vulnerable to market fluctuations or changes in land-use in the producing areas concerned.

Ethanol may have special position in this, especially when the Brazilian PRO-ALCOOL programme is concerned. Brazil produces the largest amounts of bio-ethanol in the world and a working infrastructure is available. In fact, ethanol export is considered to the US market. For export to Europe, trade barriers are in the way (protection of the sugar industry).

Clearly, any scheme that is to compete fully with the energy prices of fossil fuels will require RD&D support over prolonged periods of time to become fully competitive. The winners and optimal schemes are not known yet and once biotrade would develop into a substantial business it is logical that various schemes will develop in parallel depending on local conditions and market demands.

### *2.3 Socio-economics, development and criteria*

Key elements discussed with respect to socio-economic impacts of large-scale bio-energy trade are the desire to combine any bio-energy production (for export) with gaining benefits for rural development and poverty alleviation and to take great care with interfering with local markets (food and biofuels alike) by creating an additional demand for biomass. In many areas in the world where biomass plays a key role as energy source for the poor, the use of biomass should first go through a modernization phase first. Modernising the non-commercial use of biomass is an important issue for many developing countries. Poverty is a key reason why biomass as key energy source. Use of resources is often combined with unsustainable harvest rates, leading to forest loss and soil degradation. Furthermore, gender issues play a role here; gathering fuel(wood) for cooking is generally dominated by women, which are likely to be pay the highest price when the fragile local biomass resources and markets are affected by a new demand.

Technology transfer is a key element of the steps towards modernization of biomass production and use. This is true for biomass production as well as the logistics, conversion and distribution of energy produced. Selecting the right technologies, suited for local conditions and capabilities is important. Prioritizing and selecting technologies and systems is on the other hand still difficult on short term due to the large number of possibilities and uncertain market developments over time. More research, e.g. supporting specific pilot projects, is needed in this area.

Also existing international markets may be (adversely) affected by the setting up of bio-energy trading schemes. Examples of critical sectors may be the forestry sector and possible market distortions of the pulp and lumber markets or the fodder markets. Impacts of supporting measures as tax exemption for green energy carriers or direct subsidies may have significant effects on such markets. The potential effects of doing so are so far poorly understood and deserve further analysis and sophisticated policy making. Also, dialogue with stakeholders involved is recommended to steer the formulation and implementation any policy strategy aimed for supporting bio-energy markets and trading schemes.

So far, clear criteria for what is to be considered desirable or sustainable are not available for bio-energy trading schemes as such. Much can be learned though from existing schemes as FSC and FairTrade or the way the CDM develops and is deployed over time.

Conflicting views with regard to developing international bio-energy markets seem to be present depending on the actors involved. Some parties would prefer to let the market develop over time. Overregulation and setting strict criteria on forehand could become a barrier in itself. On the other hand, bio-trade is in the first place seen as an attractive scheme because of reducing GHG emissions and creating a more sustainable energy supply. When sustainability is the leading objective, this must be ensured by excluding all sorts of unwanted impacts,

undoubtedly requiring some forms of control and verification with accepted standards.

Overall though, it is concluded from the debate that international bio-energy trade offers many opportunities for sustainable development and strengthening rural economies. In fact, it was also argued that one can question why biomass and bio-energy should not be traded internationally like any other energy source, whether those are fossil fuels, electricity, uranium and the like.

#### 2.4 Policy, actors and institutions.

An essential remark made in the discussion on policy and possible actions was that trade of energy from biomass is not a goal in itself. Biomass resources generally have a value or at least a potential value at the place where they are available. A first consideration concerning biomass resources should always be local utilization before export options are considered. A crucial aspect in the international debate and climate policy in this respect is the trade of green certificates or emission credits, which on itself can be a competing scheme for 'physical' biomass energy trade. When biomass projects are realized elsewhere with investments from other countries, emission credits could be exported. An integral comparison between the pro's and con's of certificate or emission trading and physical trade is not available at this stage. Neither is it known what the potentials of both type of schemes in relation to each other could become. On longer term however, envisaging a future in which various world regions would be able to export biomass derived energy carriers on top of their own needs, certificate trading and physical bio-energy trade would not really compete. On shorter term, this may be different however.

It is therefore essential to get a better understanding on how certificate and bio-energy trading may compete and how they may compete over time (assuming different scenario's). In addition it is elementary to have international agreement on accounting rules that are to be applied on trading schemes. So far, this is not fully clear and determining the Greenhouse Gas balances of trading schemes, verification procedures to be applied which is likely to be an essential part of a certification procedure for sustainable trading schemes, need to be addressed in detail. Once again, research as well as pilot schemes are most desired to work out these issues, but in particular on the point of emission credits the various international bodies involved (such as the, FAO, WTO, UNFCCC) need to be involved in the debate.

Clearly, also in connection to the issues raised concerning developing technology and infrastructure, stable policies over a prolonged period of time are required to guarantee necessary developments occur. Typically, the development of commercial systems making use of advanced technologies and involving large scale production, infrastructure and conversion capacity need decades of time. For various systems what can be called a 'development box' may be required; regions and time periods where sufficient support from government bodies, industry and other actors is guaranteed. For bio-energy trading schemes this may be possible by bilateral schemes supported by international entities as the

European Commission or the World Bank, besides the essential national support

### 3. SUMMARY AND RECOMMENDATIONS

The overall impression of the material and thoughts provided through discussion papers, interviews and the workshop covered by this project, is a sense of excitement around the concept of international bio-energy trade. It is recognized that there are opportunities of developing international bio-energy markets for rural development and poverty alleviation, which increase the economic efficiency and the total use of bio-energy use worldwide.

Still, main questions were put forward. First of all, there are no clear sustainability criteria available yet for biotrade schemes. These should be developed. There are also potential (or real) opposing interests in the arena around bio-energy trading schemes: the private versus public sectors, environmental focus versus a market focus and a regulatory approach versus the market oriented approach. Partly, the lack of consensus may also be caused by the different backgrounds and availability of information (both scientific and from ongoing activities). Flexibility in development, usage and application of the right incentives and policy schemes may be a key element of an expected 'chaotic' transition process towards building international bio-energy markets.

Overall, there is a clear need for the type of debate that took place during the workshop. A key recommendation is therefore to structure and institutionalize this debate for a longer period of time, involving all key stakeholders. Key recommendations:

- Good practice guidelines for production & trade; leakage impacts potential key element
- Learning more from experience; set up pilot projects and learn from e.g. the CDM.
- Develop clear strategies on the various relevant levels from local to international, which can support the identification of promising systems, regions and schemes.
- Identify the right incentives and policy schemes for supporting the whole process.
- Flexibility in development, usage and application to anticipate on the expected 'chaotic' transition process toward building international bio-energy markets.
- Techno-economic optimisation (studies) and impact analyses (both socio-economic and ecological) on biomass trading schemes.
- Supportive R&D for ongoing market activities.
- Structural dialogue, exchange and learning; setting up an international network for a prolonged period time.

#### REFERENCES

Faaij, A., A. Wieczorek, M. Minnesma, *International debate on international biotrade; International Workshop Report*, Published by NOVEM, reportnumber 2GAVE-03.06, April 2003. Pp. 65

#### ACKNOWLEDGEMENT

This work was funded by NOVEM (Netherlands Organisation for Energy and the Environment) via the GAVE programme

