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Global Aspects of Bioenergy Imports

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Global Aspects of Bioenergy Imports

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1 Background

This report is part of a collection of smaller reports under the Nordic Bioenergy Project "***Opportunities and Consequences of an Expanding Bioenergy Market in the Nordic Countries***", which aims to provide factual background information on the status of bioenergy in the Nordic countries. These factual reports cover the following themes:

Econ Pöyry-Report no. 2008-057: Status and Potentials of Bioenergy in the Nordic Countries - Summary

Econ Pöyry-Report no. 2008-054: Facts and Figures on the Use of Bioenergy in the Nordic Countries

Econ Pöyry-Report no. 2008-055: Facts and Figures on the Use and Potential of Biomass Resources for Bioenergy in the Nordic Countries

Econ Pöyry-Report no. 2008-052: Current Bioenergy Application and Conversion Technologies in the Nordic Countries

Econ Pöyry-Report no. 2008-0563 Current Bioenergy Policies and Measures in the Nordic Countries

Econ Pöyry-Report no. 2008-056: Global Aspects of Bioenergy Imports

The Nordic Bioenergy Project was launched in May 2007 by the Nordic Council of Ministers with the aim to help coordinate bioenergy activities in the Nordic countries and improve the visibility of existing and future Nordic solutions in the complex field of bioenergy, energy security, competing uses of resources and land, regional development and environmental impacts.

In addition to the collection of smaller background reports, the Nordic Bioenergy Project has prepared the report"***Energy, Economic and Regional Perspectives in an Expanding Bioenergy Market in the Nordic Countries***". This report provides an overview and analysis of the issues at stake for the Nordic countries in terms of the role of bioenergy in meeting various energy, industrial and regional development policy objectives. The report raises a number of questions in this regard and offers a number of perspectives to inspire future Nordic framework conditions.

During the project, two workshops were held on the themes "***Bioenergy in the Nordic Countries: Status, Opportunities and Risks***" and"***Bioenergy in the Nordic Countries: Lessons & Future Framework Conditions".*** Presentations and summaries from the workshops along with the above mentioned reports are published on the following website:

http://www.nordicenergy.net/bioenergy

2 Global Aspects of Bioenergy Imports to the Nordic Countries

This report provides an overview of imports to the Nordic countries from Europe and the rest of the World. Main issues and aspects of a growing import of biomass to the Nordic countries are raised.

3 Trade in Biomass for Heat and Electricity

Global biomass use accounted for 47,000 PJ, of which 32,000 PJ was traditional use and 15,000PJ industrial use (IEA, 2006). The current international trade of biomass fuels remains relatively small, less than 1,000 PJ or 7 per cent of industrial use of biomass. It is, however, expected that trade in biomass over time will increase significantly. Estimates of future quantities of international biomass trade range from 80,000 PJ to 150,000 PJ (Junginger et al. 2007, Heinimö 2006a, Heinimö 2006b).

Bioenergy trade of pellets is especially significant between the Baltic Sea countries, where more than 70 per cent of the global production of pellets (4 million t per year) is traded. Table 3.1 below provides information on the amount of imports and exports from the Nordic countries within Europe in 2004. Total import of biomass in the Nordic countries represented between 41 PJ and 45 PJ while exports from the Nordic countries were approximately half (23 PJ). These numbers exclude imports and exports of biofuels for transport (See Table 4.1).

Table 3.1 Import and Export of Biomass in Europe, 2004

Denmark	**Import (PJ)**	**Source**	**Export (PJ)**	**Destination**
Forest residues	3.098	Baltic States, Germany	0.125	n/a
Wood waste	1.622	Baltic States, Poland	0	n/a
Pellets	2.964	Baltic States, Poland	0.023	n/a
Biodiesel	-	-	65000 (t)	Germany, Sweden, …
Finland	**Import (PJ)**	**Source**	**Export (PJ)**	**Destination**
Sawdust	0.324	Russia, Latvia	0.004	Sweden, Norway
Bark	0.0012	Russia, Estonia	-	-
Chips	0.012	n/a	0.923	n/a
Waste Liquors	2.139	Sweden, Russia	4.45	n/a
Firewood	0.917	Latvia, Russia	-	-
Peat	0.6	Sweden	1.5	Sweden, Netherlands, Germany
Chopped & split firewood	-	-	0.056	Norway
Pellets	-	-	2.9	Sweden, UK, Netherlands, Italy, Germany

Sweden	**Import (PJ)**	**Source**	**Export (PJ)**	**Destination**
Sawdust	1.99	n/a	3.12	n/a
Chips	3.6	n/a	2.1	n/a
Firewood	1.2	Estonia, Latvia, Lithuania, Russia	0.26	Norway
Pellets	4.6	Finland, Estonia, Russia	3.5	n/a
Tall oil	1.3 – 4.3	Finland, Canada, USA, Norway, UK	2.7	Norway, Austria, Finland
Different kind of refuse	3.9	n/a	-	-
Olive seed	0.1	Spain	-	-
Peat	3.6 – 4.3	Estonia, Latvia, Finland, Russia, Belarus	0.94	Denmark, Norway, NL
Norway	**Import (PJ)**	**Source**	**Export (PJ)**	**Destination**
Sawdust	0.52	n/a	0.12	n/a
Chips	7.10	n/a	0.45	n/a
Firewood	1.22	Estonia, Latvia, Sweden	0.01	n/a
Wood waste	0.516	n/a	0.21	n/a
Pellets	0.004	n/a	0.10	n/a
Briquettes	0.01	n/a	0.02	n/a
Total	**41 - 45**		**23.5**	

Note: n/a stands for not available information;

Source: Alakangas, E.,, Heikkinen, A.,, Lensu, T., and Vesterinen, P., (2007) Biomass Fuel Trade in Europe. Summary Report VTT-R-03508-07. EUBIONET II, VTT.

4 Trade in Biomass for Transportation

Denmark has a small but growing production of biodiesel based on domestically grown rapeseed. The totality of the production has been exported since 2001, where the production and export increased from 25,000 tonnes in 2001 to 71,000 tonnes in 2005.

Finland imports a small amount of bio-ethanol since 2002, but has also started to import an increasing amount of palm oil from certified palm oil plantations from Indonesia for home grown bioethanol production (See Econ Pöyry 2008).

Sweden imported in 2004 125,000 tonnes of ethanol and 1,000 tonnes of biodiesel for transportation purposes. Own production amounted to 7,000 tonnes of biodiesel and 80,000 t of bioethanol in 2004, primarily based on cereals and wine alcohol, the latter imported from France.

Table 4.1 below shows the import and export of biofuels for transportation in the Nordic countries in 2004.

Table 4.1 Import and Export of Biofuels for Transportation, Global, 2004

County	**Biofuel**	**Import (t)**	**Export (t)**
Denmark	Biodiesel	-	65,000
Finland	Ethanol	6,752	-
Sweden	Biodiesel	1,000	
	Ethanol	125,000	
Total		132,752	65,000

Source: IEA, Eurostat, UNECE (2006) Energy questionnaire, Renewables and Wastes for Denmark, Finland, Norway and Sweden.

Note: according to the Energy questionnaire, Norway did not produce or import Biodiesel or bio-ethanol in 2004.

5 Main Issues related to Imports of Biomass to the Nordic Countries

With the increased demand for internationally traded biomass for energy purposes, primarily from the industrialised countries, issues arise at the national and international level, that need careful planning. The most predominant issues include:

- increased competition for land with between traditional agriculture and forestry;
- competition between traditional and energetic use of biomass from industry;
- climatic net effects of producing, transforming and transporting biofuels compared to fossil fuels;
- food security in third world countries; and
- environmental challenges such as biodiversity, soil erosion and water quality.

5.1 Competition for Land

In developing countries, the amount of available land currently not under agricultural production is significantly lower than in the industrialised countries, according to UNCTAD/DITCOM (2006). Based on these findings, an increased production of bioenergy does not necessarily need to compete directly with agricultural areas and hence food production.

Environmental organisations and NGOs often do not share this opinion. 250 environmental organisations have sent an open letter to the EU (open Letter, 2007) stating that the EU bioenergy targets may also lead to the use of species with a poor greenhouse gas balance, increased deforestation, loss of biodiversity and degraded local conflicts on the use of land. Also five African NGOs warned the government of the UK against the possible negative effects of the bioenergy targets in the UK, stating that as no additional agricultural land is vacant in Africa, new large-scale areas for bioenergy production will need to be taken from wild forests and savannah or compete directly with agricultural land.

(www.biofuelwatch.no).

Challenges exist in choosing the most suitable areas, type of management, support the infrastructure, analyse the effects on local businesses, domestic demand and possibilities for export.

Different biomass resources provide different yields and hence different quantities of biofuels. For instance, the production of biodiesel demands larger areas under biodiesel production than bio-ethanol. Table 5.1 below gives an overview of the differences in yield measured in litres ethanol or biodiesel per hectare under

production. In Europe, the most efficient produce is sugar beet yielding 5,500 l ethanol per ha, while wheat produces less than the half, 2,500 l ethanol. Yields from Brazil from sugar cane lie at 6,500 l per hectare. The production of ethanol provides up to 7 times more biofuels per hectare than biodiesel. Rape seed oil provides the highest yield for biodiesel production in the EU.

Table 5.1 Yields per region and product (litres per ha)

	USA	*EU*	*Brazil*	*India*
Ethanol from:				
Corn	3,100			
Wheat		2,500		
Sugar beet		5,500		
Sugar cane			6,500	5,300
Biodiesel from:				
Sun seed		1,000		
Soy bean	500	700		
Barley		1,100		
Rape seed oil		1,200		

Source: IEA (2004)

In Europe, the IEA estimated the amount of land necessary in order to be self reliant in meeting the target of 5.75 per cent in 2010 and 10 per cent of total fuel consumption for transport in 2020. Assumptions for estimating the amount of land needed include a 28 per cent increase in demand for transport fuels in Europe between 2000 and 2020, a 1 per cent yearly increase in productivity, improvement of conversion yields for ethanol and biodiesel and finally the inclusion of set aside land. Results indicate that, 20 per cent of agricultural land would be needed by 2010 and 38 per cent by 2020.

5.2 Food Security

An increasing global demand for bioenergy can directly and indirectly lead to increasing prices on input factors in the food production and for basic food commodities, upon which especially poor net purchasers of food are dependent, and a subsequent scarcity of food. Social unrest and cases of hunger have been observed in Mexico as the price on corn increased significantly indirectly caused by the demand from the US in the production of bio-ethanol.

A large share of the crops used for the first generation bioenergy production demand a high quality of soil, availability of water and intensive use of pesticides and herbicides. Due to this situation, UN Energy (2007) considers that the production of food and bioenergy are from global perspective competitors.

Globally, food prices for sugar, corn, rapeseed oil, palm oil and soy beans have increased due to the increasing demand for bioenergy. This development may also lead to a price increase in other basic food commodities such as cereals. Also the price of meat is reported to increase, such as in China, where the increasing ethanol production using corn has increased the price of corn, an important fodder

in the pork production. As a consequence, the price of pork has increased across China (CHINAdaily, 2007).

The successful development of second generation biofuel technology may alleviate the pressure on food prices, as there is less direct competition with food production and land use.

5.3 Environmental Risks

One of the main challenges in the production of biofuels is the potential negative effects on agricultural areas and the effects that this production in turn can have on the natural environment (UN Energy, 2007).

The effects depend largely on the type of area chosen for biofuel production and the type of management set in place. For instance, the use of local tree species and grasses may reduce the need for chemical fertilisers and pesticides, reduce the need for water and provide habitats for birds and animals. Soil quality could be restored or improved compared to the use of non-perennial species. The use of rotational practices and multi-cropping can also help reduce soil erosion.

On the other hand, large scale mono-cultures, use of genetically modified species, deforestation to create land for biofuel production and application of irrigation techniques in areas with low fresh water availability are often unsustainable cases of biofuel production, with accompanying loss of biodiversity, soil erosion, nutrient leachate, competition for scarce water resources and pollution of water courses.

The development of second generation biofuels where the use of agricultural and forestry residues can be used offer prospects of more sustainable and less conflictual production of bioenergy as it will in relative terms reduce the demand for land for energy production. However, also in the use of second generation technology, careful planning is advised to avoid the negative effects of genetically modified species, and the excessive removal of biomass from land, otherwise needed to conserve and build up soil quality and keep the ecosystem in balance.

The increasing demand for bioenergy globally will increase the need for an active environmental policy and regulation at the local and regional level, especially in developing countries. International standards and certification systems represent central instruments to ensure a sustainable bioenergy production irregardless of the area of production.

6 Summary

Global trade in bioenergy is estimated to increase from the current 1,000 PJ to between 80,000 PJ and 150,000 PJ at a global level. The current trade in biomass with and among the Nordic countries accounts for imports of ca. 45 PJ and exports represent ca. 23 PJ. If the estimated development at the global level were to be proportional to the current trade in the Nordic countries, trade in bioenergy could be 80 to 150 times higher than today.

Trade in biomass for transportation is significant and heavily dependent upon the domestic framework conditions. Denmark exports practically the totality of its biodiesel production; Norway imports the raw materials for the production of biodiesel and with the current plans for future capacity, it may be likely that part of the biodiesel production will be exported. In Sweden, the large majority of biofuels for transport is imported.

Main issues relating to an increasing import of biomass and bioenergy at a global level relate to the fragile position of emerging economies in terms of adequate environmental, social and land tenure rights. At the same time, the growing importance of biomass offer development opportunities for farmers in the developing world. NGOs and international development agencies, however, warn against large-scale, intensively managed biomass production sites. Risks in terms of food security, loss of biodiversity, deforestation, water- and soil quality need careful attention. International trade agreements and certification systems are important tools in this respect.

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