

# **IEA Bioenergy Tasks 30/31**

Country report for the Netherlands

Biomass Production for Energy from Sustainable Forestry

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# 1 Introduction

The IEA Bioenergy Agreement aims to accelerate the use of environmentally sound and cost-competitive bioenergy on a sustainable basis, and therefore achieve a substantial contribution to future energy demands.

The objectives of task 30 / 31 are: To share, analyse, synthesize, disseminate and promote scientific knowledge and technical information leading to the economically and environmentally sustainable production of biomass for energy from respectively short rotation crops and integrated forestry systems.

This country report provides information on the biomass production from sustainable forestry in the Netherlands. In chapter 2, *Policy on bioenergy in the Netherlands*, some information is summarized on bioenergy production in the Netherlands, developments in the policy of the Dutch government on sustainable energy and a bio-based economy, and criteria for sustainability of biomass for energy. In chapter 3, *Statistics*, information is provided on forest and nature in the Netherlands and biomass production. Finally in chapter 4, *Further developments*, some additional facts and developments are presented.

## 2 Policy on bioenergy in the Netherlands

The total use of energy in the Netherlands amounts to 3,300 PJ per year. A major part of that energy is produced from fossil fuels. Less than 2% of the energy (59 PJ per year) is produced from biomass, much of which is imported (Table 1). There are no statistics available for the proportion of energy from Dutch forests or nature.

Table 1. Bioenergy production in The Netherlands in 2006

Conversion system	Replaced Fossil Energy	
	Tera Joules	Percentage
Waste combustion	12,180	20.6%
Biomass combustion in power plants (mainly co-firing)	27,189	46.0%
Industrial heat	2,037	3.4%
Residential heat	5,464	9.2%
Other combustion	4,839	8.2%
Bio fuels	1,978	3.3%
Biogas	5,453	9.2%
Total:	59,140 = 59.1 PJ	100%

In the Netherlands most bioenergy is produced by waste incineration and by co-firing in large electricity plants. Statistics on the origin of biomass used for energy production are sketchy. Most biomass used for co-firing is imported. The direct contribution of Dutch forests and other woody vegetations in the production of biomass for energy is estimated at a maximum of 100,000 tons of wood annually. On top of this, up to 100,000 tons per year of wood for residential heating is estimated to originate from Dutch forests.

In 2007 the Dutch government formulated ambitious targets on sustainability. In September 2007 the Ministry of Housing, Spatial Planning and the Environment (VROM) presented the programme for new energy and climate entitled 'Clean and Efficient' (Werkprogramma Schoon en Zuinig). The programme includes three important aims for the period till 2020:

- Reducing CO<sub>2</sub> emissions by 30%
- Yearly reduction of energy consumption (2% each year)
- Sustainable energy to have a 20% share of total energy consumption.

In October 2007 Minister Verburg (Minister of Agriculture, Nature and Food Quality; LNV) and Minister Cramer (VROM) stated in their policy paper "The keten sluiten" ("Closing the chain") that The Netherlands should become a bio-based economy. In the bio-based economy companies (both national and international) produce non-food products from green waste products. The application of biomass can reduce the emission of greenhouse gases. Besides, the dependency of fossil fuels can be reduced as well. Use of biomass can lead to new economic opportunities. Knowledge of the technical possibilities of a bio-based economy is still immature. Scientific research on a good balance between the production of food, chemicals and bioenergy is required.

The Ministry of LNV will contribute to the aims mentioned above. The programme 'Clean and Efficient' includes CO<sub>2</sub> reduction in agricultural sectors (including Forestry, Nature and Urban Green). Besides, it is stated that the sectors under the responsibility of the Ministry of

LNV will contribute to the production of sustainable energy. The Ministry of LNV has stated that biomass can strongly contribute to the production of sustainable energy, and an aim of 200 PJ from biomass has been set for the year 2020. To realize this aim, all sectors must contribute to the supply of biomass. Biomass from forest and nature management should have an important role in the supply of biomass.

The total land surface of the Netherlands amounts to 3.8 million hectares. Agriculture is the main form of land use (2.3 million hectares) and may contribute largely to the production of biomass for energy production. The total current area of nature and forests is 0.5 million hectares, but plans are to increase that area to 0.7 million hectares by the year 2020.

The Dutch national government aims to maximise the contribution of biomass for energy from forest, nature, landscape, urban green and the wood and paper industry, within the constraint of conservation of biodiversity and an optimal positive effect on the balance of greenhouse gases.

### **Sustainability criteria**

Concerns about the sustainability of imported biomass (i.e. palm oil) ignited a public debate in the past few years about the sustainability of biomass for the production of energy. As a result a commission was installed under Mrs Cramer (the current Minister of Environment) consisting mainly of representatives from NGOs, Government and industry which defined sustainability criteria for biomass and bioenergy. In 2006 the Cramer Commission published its principles for criteria development:

1. The greenhouse gas balance from the production chain and application of the biomass must be positive.
2. Biomass production must not be at the expense of important carbon sinks in the vegetation and in the soil.
3. The production of biomass for energy must not endanger the food supply and local biomass applications (energy supply, medicines, building materials).
4. Biomass production must not affect protected or vulnerable biodiversity and will, where possible, have to strengthen biodiversity.
5. In the production and processing of biomass the soil and soil quality are retained or improved.
6. In the production and processing of biomass ground and surface water must not be depleted and the water quality must be maintained or improved.
7. In the production and processing of biomass the air quality must be maintained or improved.
8. The production of biomass must contribute towards local prosperity.
9. The production of biomass must contribute to the social wellbeing of the employees and the local population.

The consequent application of these criteria should avoid the unsustainable use of biomass from forests and natural areas for the production of energy. Still, various sorts of biomass should be available from forest and nature.

In the coming years sustainability demands will be incorporated into rules and regulations governing bioenergy. Together with the UK, Germany, Belgium and the European Commission sustainability criteria will be developed further.

### 3 Statistics

#### *Forest and nature in the Netherlands*

As the Netherlands is a small densely-populated country, most forests have other functions besides wood production. This is expressed in the management system which generally emphasizes natural quality and recreational value. Furthermore, forest areas and forestry enterprises are small, which increases the relative costs for management and harvest. Forest management is not very profitable in the Netherlands. Wood production contributes only a small part to the benefits from forest management, while subsidies take a large part in the total benefits. The year 2006 has been a more profitable year for forest managers, due to higher wood prices.

The total current area of forest and terrestrial nature amounts to 483,000 hectares. A large proportion, 360,000 hectares, of that area is covered with forests. The Dutch government aims to increase the area of forests and nature to 658,000 hectares in the year 2020, mainly by increasing the area of grasslands.

The estimates in this report of total harvestable<sup>1</sup> biomass from the Dutch nature for energy production is based on the targeted area of terrestrial nature cover types for the year 2020. Table 2 gives an overview of these nature types. Most of these areas have already been realised. In particular, the area of grassland needs to be extended in order to realise the targets.

Table 2. Area of nature types (aims for the year 2020)

Nature type	Area (ha)
Forest - current	360,000
Forest - planned (2020)	9,000
Green landscape elements <sup>#</sup>	9,560
Production reedland	6,000
Grassland (2020)	207,600
Heath land (2020)	66,200
Water	<i>pm</i>
Total	658,360

<sup>#</sup>: Only those managed by nature conservation organisations

#### *Annual increment of biomass (2020)*

The total annual production of biomass in natural areas in The Netherlands is estimated at 3 million tons dry matter per year. Approximately 1.9 to 2.3 million tons of that amount can annually be harvested within the constraint of conservation of biodiversity. Forests contribute largely to this production of biomass, with an annual increment of 1.7 million tons dry matter (wood) per year. The annual production of grassland consists of approximately 1 million tons dry matter grass. Other nature types produce only a relatively small amount of biomass. The amount of biomass from landscape elements managed by public authorities and privately owned landscape elements is still under investigation.

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<sup>1</sup> Biomass that can be harvested without negative impacts to nature, recreational and other values (usually within common management practice)

### ***Current use of biomass from forest and nature management***

At present the current harvest of woody biomass from forest and green landscape elements is less than half the increment: approximately 0.6 million tons per year. The remainder of the annual increment is either added to the standing stock of wood, is left at the site as logging residues (forests) or pruning wood residues (green landscape elements), or is taken to a composting installation (green landscape elements) (see Table 3). An uncertain amount of 0.1 million tons dry matter is used for firewood in households.

The annual production of grassland (approximately 1 million tons grass dry matter) is harvested almost entirely every year. The use of the grass from nature management depends on the terrain properties (accessibility for machines) and the feeding value of the grass. An estimated 0.7 million tons dry matter is used as forage in agriculture (based on the current usage) and an estimated 0.35 million tons dry matter is taken to composting installations.

*Table 3. Annual increment of woody biomass and the current yearly harvest of wood*

Nature type	Area (ha)	Increment (m <sup>3</sup> /a)	Increment (ton/a)	Current harvest (ton/a)
Forest with production function	315,000	2,362,500	1,228,500	624,000
Nature forest	45,000	337,500	175,500	-
Forest - planned (2020)	9,000	67,500	35,100	-
Logging residues		553,500	287,820	-
Green landscape elements <sup>#</sup>	9,560	76,480	39,770	<i>pm</i>
Total	378,560	3,397,480	1,766,690	624,000

<sup>#</sup>: Managed by nature conservation organisations

### ***Options for biomass as an energy source***

In total an annual amount of 1.9 million tons dry matter biomass can be harvested in nature by 2020, based on current management practices (Table 5). An estimated 0.7 million tons of that amount can be used for energy production. The remainder is used in traditional applications as these applications are expected to be more competitive. Wood from forests contributes 0.2 million tons dry matter to that amount. Of course, the biomass quantities that will eventually be used for energy, depend on the market situation, subsidies and technical development in the next decade.

The quantities of harvestable biomass can be raised by increasing the level of wood harvest to 80% of the increment of stemwood and the accompanying logging residues. Availability of wood for energy production is limited since most of the extra wood can be used for more valuable applications. At least an estimated 10% of the total amount of logging residues can be harvested, which is fully applicable for energy production. Harvesting logging residues is uncommon in the Dutch forests. The proportion of harvestable logging residues is limited by the small logging scale and the multi-functionality of Dutch forests. Extra information on the techniques and the effects of harvesting logging residues may support forest managers on the decision-making on this measure. The harvest of wood for energy production can further be increased by harvesting young trees from cleanings and traditionally unmerchantable thinnings (Table 4). The energy content of the biomass for energy production is 11.7 PJ per year, or 13.5 PJ at the increased wood harvest level (Table 5).

Table 4. Potential harvest of wood for bioenergy, at the current and increased level of stemwood harvest (2020)

Nature type	Current harvest level		increased harvest level (80% of increment)	
	potential harvest	usable for energy	potential harvest	usable for energy
	(ton/a)	(ton/a)	(ton/a)	(ton/a)
Forest - regular harvest	624,000	178,880 <sup>##</sup>	982,800	281,736 <sup>##</sup>
Forest - harvest from cleanings and unmerchantable thinnings	26,000	26,000	26,000	26,000
Forest - logging residues	12,480	12,480	19,656	19,656
Green landscape elements <sup>#</sup>	31,816	31,816	31,816	31,816
Total	694,296	249,176	1,060,272	359,208

<sup>#</sup>: Only those managed by nature conservation organisations

<sup>##</sup>: the biomass quantities that will eventually be used for energy, depending on the market situation, subsidies and technical development in the next decade.

Table 5 Potential harvest of biomass for energy, at the current and increased level of stemwood harvest (2020)

Nature cover type	Increment 10 <sup>3</sup> odt	Current level of stemwood harvest				increased level of stemwood harvest (80% of increment)			
		harvestable 10 <sup>3</sup> ton	usable for energy		harvestable 10 <sup>3</sup> ton	usable for energy			
			10 <sup>3</sup> ton			10 <sup>3</sup> ton			
				PJ			PJ		
Forest	1,727	662	217	3.7	1,028	327	5,6 <sup>##</sup>		
Green landscape elements <sup>#</sup>	40	32	32	0.5					
Production reedland	54	54	36	0.6	unchanged				
Grassland	1,080	1,080	345	5.9					
Heath land	142	56	56	1.0					
Total	3,043	1,884	687	11.7	2,250	797	13,5		

<sup>#</sup>: Only those managed by nature conservation organisations

<sup>##</sup>: the biomass quantities that will eventually be used for energy, depend on the market situation, subsidies and technical development in the next decade.



## 4 Further developments

Recently a coalition of stakeholders in wood production and processing (Platform Hout in Nederland, 2007) published a report which proposed to double the total forested area in The Netherlands by 2030 to produce biomass for energy and other products. It is proposed that both new forests (375,000 ha), short rotation coppice (170,000 ha) and roadside trees (50,000 ha) should be established. Clearly renewable energy ambitions and associated biomass demand will be having an influence on the forest sector in The Netherlands.

Research programs are being executed that support the biomass policies of the Netherlands which focus on developing a bio-based economy based on sustainably produced feedstocks sourced locally and especially imported from the EU or overseas. Much attention is therefore given to sustainable production of (agri)feedstocks. Emphasis is put on development of high value products from biomass. Technology development is aimed at development of biorefinery concepts, second generation transportation fuels (cellulosic ethanol, hydrogen, butanol, etc) and chemicals.

At the end of 2007 two reports were produced by Alterra. One report was on the potential for the production of biomass for energy in forest and nature. Some statistics from this study are presented in this country report. The second report presents the potential of production for energy from the landscape (trees and wooded banks in and around the agricultural landscape).

In November 2007 the Overleggroep Houtoogst en Houtvoorziening (Meeting group on Wood production) organized a seminar on biomass production for energy in forests at the Norske Skog Paper Plant in Renkum. Information was exchanged, and also some good practices from Denmark and Ireland were presented.

More and more initiatives are being taken that make use of locally produced biomass. An example is a project in Beesterzwaag in the north of the country. Here woodchips produced from natural areas, hedgerows and wooded banks are used for heat production for heating a swimming pool in a rehabilitation centre. Some 700 tons (dry matter) of wood chips replace some 320,000 m<sup>3</sup> of natural gas per year. The initiative is driven by the increased cost of natural gas and the possibility of reducing costs for maintenance of hedgerows and other natural areas by adding value to locally produced biomass.

The Netherlands has developed a strong research and consultancy industry in the field of bioenergy which includes ECN (Energy Research Centre of the Netherlands), Utrecht University and Wageningen University.

## 5 Related internet sites

<http://www.wur.nl/UK/>

<http://www.senternovem.nl/english/index.asp>

<http://www.ecn.nl/en/>

<http://www.uu.nl/>

<http://www.avih.nl/>

<http://www.probos.net/>