

WP 4.2.4

Study on Biomass Trade in Germany



Published by:

Federal Ministry for the Environment,
Nature Conservation and Nuclear Safety

Author: Sybille Tempel, FFU

October 2010

Publisher:

Federal Ministry for the Environment,
Nature Conservation and Nuclear Safety
D-11055 Berlin

www.bmu.de

Author:

Environmental Policy Research Centre
Freie Universität Berlin
Sybille Tempel, M.A.
D-14195 Berlin

www.fu-berlin.de/ffu

The views expressed in this report are those of the author
and do not necessarily reflect the opinions of BMU

Oktober 2010

Table of Content

Introduction	4
1 Current State of Renewable Energy Use in Germany	5
1.1 Main mandatory regulation of production and use of biomass	7
2 Biomass potential for energy in Germany	8
3 Bioenergy production and consumption in Germany	8
4 The Bioenergy Market in Germany	13
4.1 Pellets	14
4.2 Wood chips	17
4.3 Firewood (split logs)	18
4.4 Wood briquettes	19
4.5 Sawdust	19
4.6 Biofuels for Transport	20
4.7 Biomethane	25
5 International Bioenergy Trade Flows	25
5.1 Imports and Exports of Firewood, Pellets and Wood Briquettes	26
5.2 Imports and Exports of Biofuels for Transport	28
5.3 Imports and Exports of Biomethane	28
6 Conclusion	29
7 References	30

Tables

Table 1 Contribution of renewable energy sources to energy supply in Germany 2009	6
Table 2 Estimated energy potential from forestry and agriculture in Germany	8
Table 3 Overview on bioenergy production in the years 2006 to 2009	9
Table 4 Bioenergy production and consumption in Germany in 2008	9
Table 5 Biogas plants in Germany in 2009 and prognosis for 2010	10
Table 6 Development of primary transport fuel consumption 2007 to 2009	11
Table 7 The German bioenergy market in figures 2009	13
Table 8 Price development of wood pellets in 2009 and 2010	17
Table 9 Firewood prices inclusive delivery until 10 km	19
Table 10 Minimum share of biofuels (energetic) in total transport fuel consumption	21
Table 11 Actual prices for biodiesel at filling stations in August 2010 (week 30)	22
Table 12 Prices for mineral diesel at filling stations in August 2010 (week 30)	22
Table 13 Bioethanol consumption in Germany in 2009 in 1000 tonnes	23
Table 14 German exports and imports of pellets in Europe and select. other countries	26

Figures

Figure 1 Structure of final energy supply from RES in Germany 2009 in percent	7
Figure 2 Biofuel and fossil fuel consumption in Germany in 2009	11
Figure 3 Pellet production and domestic demand in Germany 2009	14
Figure 4 Total amount of pellet heating installations in Germany 2009	15
Figure 5 Distribution of pellet heating applications in Germany	15
Figure 6 Fuel prices for heat in June 2010	16
Figure 7 Price development of wood chips, pellets, heating oil and natural gas	18
Figure 8 Development of biofuels for transport in Germany from 2005 to 2009	20
Figure 9 Monthly consumption of ETBE (bioethanol) in Germany 2007 to 2009 in t/a	23
Figure 10 Price developments of oilseeds, vegetable oil and oil groats	24

Introduction

The deployment of biomass for heating and cooling as well as for electricity is increasing rapidly in Germany. Energy from sustainable biomass production is, together with wind energy, a key resource for secure and independent energy supply, for saving fossil fuel reserves, for mitigating the effects of climate change and fostering value creation and employment.

Bioenergy, i.e. solid biomass, biogas, sewage and landfill gas, and also liquid biomass and organic waste, meets at present almost five percent of Germany's primary energy demand. This share will have to be increased considerably to achieve the national target of 18 percent share of renewable energy sources in final energy consumption by 2020, a necessary contribution to the EU target of 20 percent by that date required by the EU RES Directive 2009/28/EC.

The *National Biomass Action Plan for Germany*, issued in April 2009, mentions estimations that doubling the share of bioenergy in Germany's energy supply by 2020 may be possible. The development potential of energy plants is expected to be increased from presently 1.7 million hectares to 4 million hectares¹. However, meeting the energy demand solely from domestic biomass is unrealistic for competitive reasons. It will be inevitable to use domestic biomass resources in a cascading way, putting material use and food and fodder production in first place and leaving not usable fractions to energy production.

Furthermore, a sustainable forest and agriculture management requires to attach more importance to by-products and residues from both sectors for generation of heat, cold and power. Germany is committed to use its natural resources sustainably and conserve biodiversity, as it is stipulated in the Sustainability Strategy (2002) and the Biodiversity Strategy (2007).

Thus, imports of unrefined and refined biomass will be needed to meet the demand. Actually, imports and as well exports are already presently usual, and they will definitely gain increasing importance in the years to come. In the *National Renewable Energy Action Plan* a primary biomass demand of around 1.400 PJ by 2020 is assumed, while the domestic biomass contribution supposedly will be limited to 1.000 PJ. The difference of 400 PJ may be covered partly by imports from other countries, partly by yield increase and intensified use of residues and wastes².

The development of trade depends on various impacts, ranging from cost advantages over shipping capacities and routes to policy targets, e.g. for increasing renewable sources or reducing climate threatening emissions. It will be of vital interest for bioenergy trade on intraregional, transnational and international scale to reduce barriers connected with tariff regulation, technical standards, sustainability criteria, underdeveloped logistics and other possible issues.

Market developments in the forest, agriculture and paper & pulp sectors, and "new" biomass trading options like electricity, bio-methane, and "new" commodities such as coke, bio-char, biochemicals, as well as phytosanitary issues regarding wood chips, require increasing attention.

The study gives an overview on the situation in Germany concerning biomass potential, bioenergy production and consumption, the domestic market, and international trade.

¹ Agency for Renewable Resources (FNR), Press Release of from 06.07.2010 (www.fnr.de).

² Nationaler Aktionsplan für erneuerbare Energie gemäß der Richtlinie 2009/28/EG zur Förderung der Nutzung von Energie aus erneuerbaren Quellen (NREAP). August 2010, p. 96.

1 Current State of Renewable Energy Use in Germany

At present, the total final energy consumption in Germany consists of 89 percent fossil fuels (hard coal, lignite, mineral oil, natural gas) and nuclear energy, and 10.1 percent renewable energy sources (biomass 7.0, wind energy 1.6, hydropower 0.8, other renewables like solar and geothermic power 0.7 percent).

According to data provided by the Federal Ministry for Environment, Nature Conservation and Nuclear Safety (BMU) and the Arbeitsgruppe Erneuerbare Energien (AGEE Stat), renewable energy supply increased in 2009 to 238 billion kWh (236 billion kWh in 2008). As aforementioned, the share of renewable energy sources (RES) in final energy consumption was 10.1 percent (2008: 9.3 percent). Thus 109 million tonnes greenhouse gas emissions and 107 million tonnes CO₂ equivalents could be avoided and the national economy discharged with 7.9 billion Euro from external costs for environmental and health damages. Simultaneously imports of fossil fuels amounting to 6.4 billion Euro were avoided and the domestic value creation was consolidated.

A considerable increase of the share of RES in gross final energy consumption was observed in the heat sector: 8.4 percent compared to 7.4 percent in 2008, corresponding to an increase in heat production of 110 billion kWh. The contribution of biomass (almost 101 billion kWh) amounted to 91 percent, due primarily to an increased use of wood and as well of biogas for heat production, the latter amounting to 10 billion kWh (8,1 billion kWh in 2008).

The share of RES in gross final electricity consumption grew to 16.1 percent (15.2 percent in 2008), the installed capacity of all renewables, i.e. energy from wind, solar, hydro, biomass and geothermal sources, at about 5400 MW. The biogenous energy carriers biomass, biogas, landfill gas and sewage gas as well as the biogenous share of waste delivered 30.5 billion kWh, i.e. a nine percent increase in electricity generation (27.8 billion kWh in 2008). The share of these energy carriers in electricity consumption climbed up to 5.2. percent (compared to 4.5 percent in 2008).

In transport sector, however, the deployment of RES has declined again slightly: Only a share of 5.5 percent of biofuels was achieved, compared to 5.9 percent in 2008 and 7.3 percent in 2007. This downward trend is expected to be stopped by the quota of 6.25 percent issued in 2009 and the tax relief for pure vegetable oil prolonged until 2012.

The total turnover of all renewable energy amounted to 33.4 billion Euro (30.7 in 2008), of which 17.7 billion Euro were invested in renewable energy plants (14.8 billion Euro in 2008). Employment increased from 278.000 people working in the renewable energy sector in 2008 to 300.500 people in 2009. Biomass makes with 36 percent (109.000 working places) the greatest contribution to gross employment, followed by wind with 29 percent, solar power with 27 percent and geothermal and hydro with 3 percent each. These figures show clearly that renewable energy is becoming an important economic factor in Germany¹.

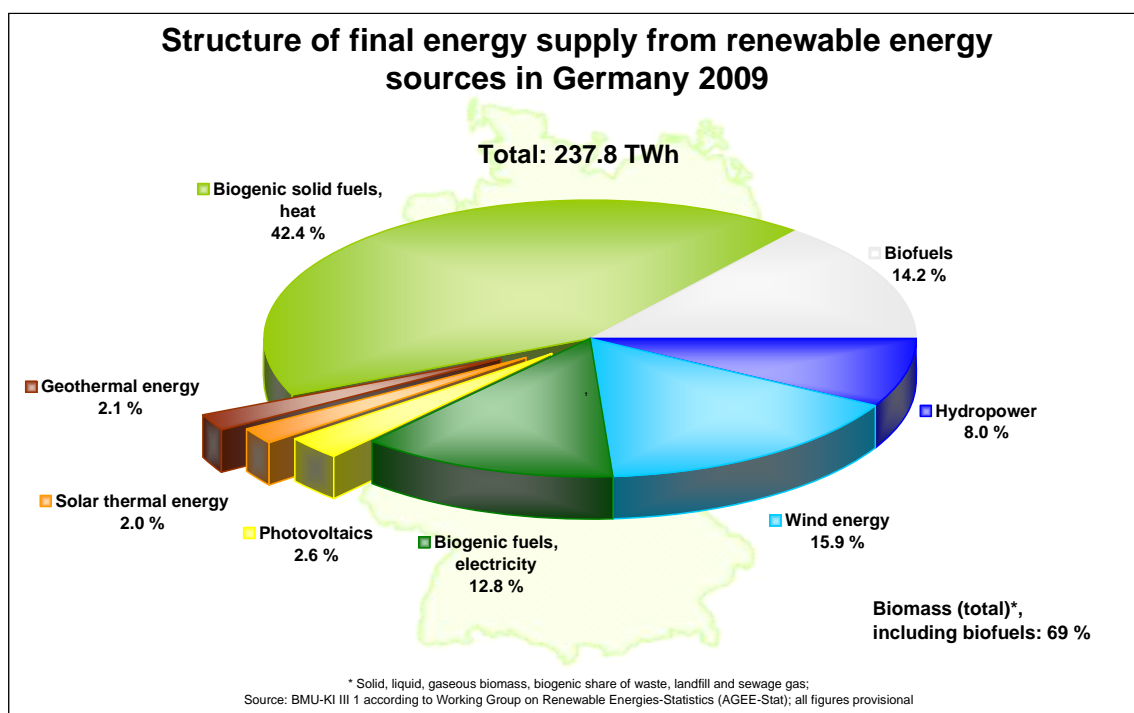
¹ BMU/AGEEStat (2010): Entwicklung der Erneuerbaren Energie in Deutschland im Jahr 2009. BEE Bundesverband Erneuerbare Energien e.V. (2010). Press Release from 18.02.2010. Figures are rounded and preliminary, parts are estimated.

Table 1 Contribution of renewable energy sources to energy supply in Germany 2009

Electricity		
Hydropower		19.0
Wind energy		37.8
Biomass (total)		28.6
therefrom:		
solid biomass, including biogenic waste	[TWh]	17.1
biogas	=	10.0
liquid biomass	(1 billion kWh)	1.5
Landfill and sewage gas		2.0
Photovoltaics		6.2
Geothermal energy		0.019
Total electricity		93.5
Heat		
Biomass (total)		100.8
therefrom:		
solid biomass, including biogenic waste		82.9
liquid biomass	[TWh]	7.7
biogenic gaseous fuel	=	10.2
Solar thermal energy	(1 billion kWh)	4.8
Deep geothermal energy		0.3
Near surface geothermal energy		4.7
Total heat		110.5
Biogenic fuels		
Biodiesel (approx. 2.5 mill. t)		26.0
Vegetable oil (approx. 0.1 mill. t)	[TWh]	1.0
Bioethanol (approx. 0.9 mill. t)	=	6.7
Biogenic fuels (total)	(1 billion kWh)	33.8
Total final energy from renewable energy sources		237.8

Source: Federal Ministry for Environment, Nature Conservation and Nuclear Safety (BMU) - KI III 1 according to Working Group on Renewable Energies-Statistics (AGEE-Stat); all figures provisional, deviations in the totals are due to rounding. State as from March 2010.

Figure 1 Structure of final energy supply from RES in Germany 2009 in percent



Source: BMU – KI III 1, Version: March 2010

1.1 Main mandatory regulation of production and use of biomass

EU legislation

- Directive 2009/28/EC on the promotion of the use of energy from renewable sources
- Directive 2009/30/EC on environmental quality standards for fuel (Fuel Quality Directive)
- Directive 2006/32/EC on energy end-use efficiency and energy services

German national legislation

- Renewable Energy Sources Act (Erneuerbare Energien Gesetz – EEG), last amendment January 2009
- Renewable Energy Heat Act (Erneuerbare Wärme Gesetz – EEWärmeG) January 2009
- Energy Taxation Act (Energiesteuergesetz - EnergieStG), last amendment 2009
- Gas Grid Access Ordinance (Gasnetz Zugangs Verordnung – GasNZV) and Gas Grid Payment Ordinance for feed-in of biomethane into the natural gas grid
- Biofuels Quota Act (Biokraftstoffquotengesetz (BioKraftQuG)
- Ordinance on Sustainable Electricity Generation from Liquid Biomass (Nachhaltigkeitsverordnung Biomassestrom – BioSt-NachV)
- Biofuel Sustainability Ordinance (Biokraftstoff-Nachhaltigkeitsverordnung – BiokraftNachV)
- Federal Immission Control Act (Bundesimmissionsschutzgesetz - BImSchG), last amendment 2010
- Market Incentive Programme (MAP) under the Renewable Energy Heat Act for support of RES in buildings.

2 Biomass potential for energy in Germany

In Germany, the available biomass potential from forests is rather increasing, as the annual increment of 100 million m³ extends considerably the removal. The last Federal Forestry Inventory conducted in 2002 has identified wood reserves of 3.4 billion m³, currently the largest amount in Europe. Nevertheless, not the whole increment of growth can be deployed for industrial or energy use. A certain amount of wood residues have to be left because the nutrient balance has to be maintained according to sustainable forest management.

In agriculture, some 1.75 million hectares arable land were used to grow energy crops in 2008, in the years to come high yield levels and further increasing harvests are expected. Since population is slightly decreasing, experts predict a good potential of resources.

Table 2 Estimated energy potential from forestry and agriculture in Germany

Estimated energy potential in PJ	
Forestry	300-400
Agriculture	450-1.150
Greenland	100
Residues (e.g. manure, straw)	550
Total	1.400-2.200

Source: Nationaler Biomasseaktionsplan für Deutschland (2009), Annex, p.10.

Mobilisation of new biomass potential, e.g. fast growing energy plants like poplar, willow, miscanthus (Short Rotation Coppice – SRC) and agroforest systems promise a considerable potential when grown on suitable land without concurring with food and fodder production. Several research projects on these commodities are presently being conducted in different federal states. With the amendment of the Federal Forest Law (BWaldG) in June 2010, areas with short rotation coppice and other agro-forest land do no longer underlie forest law but have the status of agricultural land¹.

A remarkable potential can be gained from by-products in wood industry as well as from residues and wastes of biogenous origin. Residues from forests like crowns, branches, foliages, stumps etc. (approximately 70 PJ), residues from agriculture like straw bales, rice husks, cuts from landscape management and waste from bio-waste containers (approximately 35 PJ), sewage sludge, sewage gas and landfill gas (approximately 40 PJ), liquid and solid manure (approximately 90 PJ) and grain straw (approximately 275 PJ), together with others add up to an energy amount of approximately 550 PJ as indicated in table 2².

3 Bioenergy production and consumption in Germany

Solid and gaseous biomass is predominantly used in commercial plants for generation of electricity and combined heat and power, to a lesser extent for generating solely heat in rather small-scale plants. Under the *Renewable Energy Sources Act* (last amendment

¹ **BUND** (2010): Kurzumtriebsplantagen für die Energieholzgewinnung – Chancen und Risiken. Juli 2010.

² Nationaler Biomasseaktionsplan für Deutschland (2009). Annex, p. 9.

January 2009) the number of electricity generating biomass plants has increased to 220¹, including the co-generation plants producing heat and power; the number of biomass heat plants of more than 500 kWh amounted to 1.200 in 2009².

Table 3 Overview on bioenergy production in the years 2006 to 2009

In billion kWh	2006	2007	2008	2009
Heat Generation	88,8	95,0	101,9	113,9
Biofuels Production	40,3	45,1	36,7	33,8
Electricity Generation	19,3	23,7	27,2	30,1

Source: BEE website 07.07.2010

(www.bee-ev.de/Erneuerbare-Energien/Erneuerbare-Energien.php)

Table 4 Bioenergy production and consumption in Germany in 2008

Total installed electric capacity	3.996 MW
Produced amount of electricity (incl. biogenous waste)	27.2 billion kWh
Share in energy consumption	4.4 %
- Avoided CO ₂ emissions	20.7 million t
Produced amount of heat	101.9 billion kWh
Share in heat consumption	7.1 %
- Avoided CO ₂ emissions	29.1 million t
Use of biofuels for transport	3.7 million t
thereof	
- Biodiesel	2.7 million t
- Bioethanol	0.6 million t
- Vegetable oil	0.4 million t
Share in transport fuel consumption	5.9 %
Avoided CO ₂ emissions	8.3 millio t
Jobs	around 95.800

Source: Agentur für Erneuerbare Energien (2009): Potenzialatlas Deutschland. Sonderausgabe Bioenergie. Dezember 2009.

The *Renewable Energy Heat Act* (as well from January 2009) strongly promotes biomass for heat in buildings, so does the *Market Incentive Programme* which supports heating systems and devices in buildings with grants at favourable conditions (from 2009 to 2012 an amount of 500 million Euro). For individual heating purposes mostly pellets, wood-

¹ Bundesverband BioEnergie e.V. BBE (2010): Der Bioenergiemarkt in Zahlen 2009. Juli 2010 (www.bioenergie.de/index.php)

² *ibid.*

chips and firewood are used. Presently 125.000 pellet furnaces¹ are in use, and the number of firewood combustion applications are estimated 10.8 million units in Germany².

Biogas is mainly used to produce electricity, to a minor amount for both electricity and heat, and, to a still very small amount, as transport fuel. The highest increase of biogas plants occurred in agriculture where rather small-to medium-size plants on farms use residues and wastes from the surrounding farm land. Municipalities often operate larger biogas facilities, utilising organic waste from industry and households, and achieve a higher installed capacity. In 2009 some 4000 biogas plants were in operation³, the German Biogas Association listed even 4.984 plants with an installed capacity of 1.893 MW for the same year⁴.

Table 5 Biogas plants in Germany in 2009 and prognosis for 2010

	2009	Prognosis 2010
Number of plants	4.984	5.800
Installed electric capacity in MW	1.893	2.300
Households supplied with electricity in millions	3.5	4.3
Turnover in Germany in billions €	2.6	2.3
Employment places	16.000	17.000

Source: Fachverband Biogas e.V. 2010: Biogas-Branchenzahlen auf einen Blick. Website

Gaseous biomass is primarily used in stationary heat and power applications but can be deployed as well for mobility in transport sector. Only, the promising potential of natural gas and biomethane (upgraded from biogas) is being used still at a marginal amount: At present, the targets of the market share of natural gas and biomethane as a motor fuel have not yet been achieved, thus at the end of 2009 the share of natural gas as fuel in transport was only 0.3 percent in total consumption; only 85.000 of a total of around 50 million vehicles use natural gas as fuel (80 percent cars, 20 percent trucks)⁵. By September 2010, 40 plants for biomethane production were in operation, the prognosis for the end of 2010 is 70 plants⁶. The plant operators expect of the amendment of the Renewable Energy Sources Act (EEG) in 2012 improved conditions for biomethane production.

With a blend of 20 percent biomethane with natural gas, CO₂ emissions can be reduced by 39 percent. If pure biomethane is deployed, even 97 percent of CO₂ emissions can be avoided⁷.

¹ Ibid.

² IEA Bioenergy Task 40: Country Report Germany (2009), p. 27

³ BBE 2010, see above.

⁴ Fachverband Biogas e.V. (2009): Biogas Branchenzahlen 2009. Website www.biogas.org

⁵ Dena (2010): Erdgas und Biomethan im künftigen Kraftstoffmix. Handlungsbedarf und Lösungsansätze für eine beschleunigte Verwendung im Verkehr. Deutsche Energieagentur (dena), p. 8.

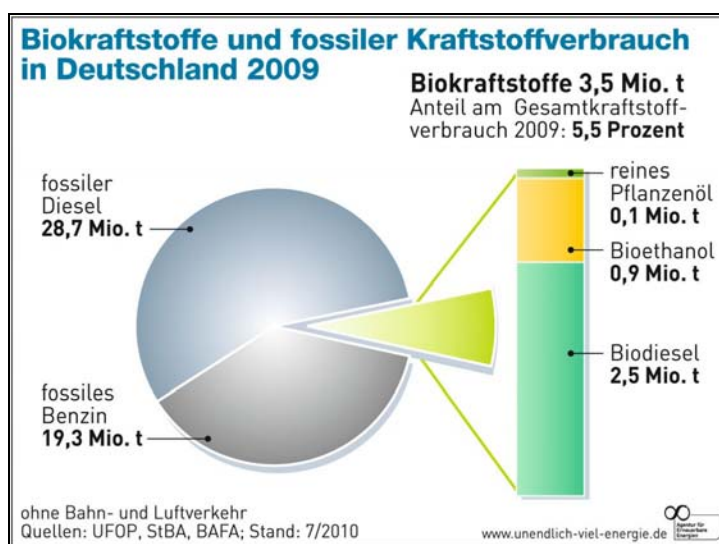
⁶ Deutsche Energieagentur (dena) 2010: Biogaspartner. Marktentwicklung in Deutschland.

⁷ Ibid., p. 4.

Hydrogen for energy and transport fuel production is at present still in experimental phase.

Liquid biofuels are predominantly used in the transport sector, their share in primary fuel consumption amounted to 5.5 percent in 2009.

Figure 2 Biofuel and fossil fuel consumption in Germany in 2009



Without train and air transportation

Source: UFOP, Statistisches Bundesamt (StBA), Bundesamt für Wirtschaft und Ausfuhrkontrolle (BAFA), July 2010

In Germany biodiesel is gained from oil plants like rapeseed and sunflowers and as well from waste oil and waste grease; vegetable oil consists on the same plants, whereas bioethanol comes from sugarbeet, grains and straw.

The so-called "second generation" biomass-to liquid fuels (BtL) are produced from wood, straw and whole plant biomass. They can be blended or used purely replacing diesel and petrol. Only, their market maturity is expected not before the year 2020.

Table 6 Development of primary transport fuel consumption 2007 to 2009

In million tonnes	2007	2008	2009
Fossil diesel	28.1	28.3	28.9
Fossil petrol	21.2	19.9	19.3
Biodiesel			
- blend with fossil diesel (B5 or B7)	1.4	1.6	2.3
- pure biodiesel (B 100) for truck fleets	1.7	1.1	0.2
Vegetable oil			
- pure vegetable oil (agricultural vehicles)	0.7	0.4	0.1
Bioethanol			
- blend with fossil petrol (E 5)	0.5	0.6	0.9
- bioethanol with share 70-90 % ethanol (E 85)	0.006	0.008	0.009

Without consumption in air and rail transport; state April 2010

Source: Agentur für Erneuerbare Energien e.V. (AEE).

Since 2004, fossil diesel is blended with 5 percent biodiesel (B 5). From February 2009 on, under the amended *Biofuel Quota Act* seven volume percent of biodiesel must be blended to one litre fossil diesel (B 7). This Act obliges all providers of fossil fuels to replace a certain amount of fossil fuels by a minimum share of biofuels. Thus in 2008, 4.4 percent (energetic) of the total amount of traditional diesel had to be replaced by biodiesel, corresponding to 1.6 million tonnes biodiesel.

Production of bioethanol increased in 2009 to 591.000 tonnes which corresponds to 29 percent compared to 2008, the consumption expanded even to 44 percent. One third of German bioethanol was produced from sugar beets, 65 percent from maize or rye. Residues from food industry with less than three percent are negligible.

The quota for bioethanol blends in 2008 was only 2 percent, corresponding to 0.6 million tonnes bioethanol, in 2009 it increased as E5 (five percent blended) to 0.9 million tonnes. From January 2011 on, a share of 10 percent bioethanol (E10) may be blended with fossil fuel¹. Pure bioethanol E85 (blended with 15 percent petrol for material reasons) can be used only by the small number of FlexiFuel Vehicles presently in use, thus total production of bioethanol amounted only to 9.000 tonnes in 2009².

Besides the biofuels for transport, liquid biofuels like vegetable oil and biodiesel are also used in co-generation plants for generating heat and electricity. Facilities with rather small capacity (< 10 kW_{el}) are mainly used in residential buildings by private persons for heat and hot water, medium sized plants supply heat to blocks of flats, greenhouses or companies. Municipal energy utilities often operate plants based on liquid biomass with higher installed capacity.

Sustainability criteria of EU Directive 2009/28/EC concerning electricity and liquid biofuels from biomass have been first implemented in Germany: The *Ordinance on Sustainable Electricity Generation from Liquid Biomass* (Nachhaltigkeitsverordnung Biomassestrom – BioSt-NachV) and the *Biofuel Sustainability Ordinance* (Biokraftstoff-Nachhaltigkeitsverordnung – BiokraftNachV), both in force since 2009 and binding from January 2011 on, guarantee the sustainable use of bioliquids. Analogous ordinances for sustainable production and use of solid and gaseous biomass are presently being elaborated by the responsible Ministries to follow the respective (non-binding) recommendations of the EU Commission.

The sustainability criteria formulated in EU Directive 2009/28/EC apply not only to production in EU Member States but also to imports from other countries. Thus their production of biomass for biofuels and vegetable oil may not be carried out on land with high carbon stock and high biodiversity, such as nature protection land, primary forests, forests, wetland, and grassland. Furthermore biofuels and vegetable oil have to achieve savings of at least 35 percent GHG emissions compared to fossil fuels. Verification of the sustainability of the whole production chain of German biofuels and bioliquids is provided by two different certification schemes and the respective certification bodies: The German Federal Office for Agriculture and Food issued on 20 July 2010 the final recognition of the *International Sustainability and Carbon Certification* (ISCC) as well as of the *RED-cert* system. Both certification systems can be applied to all of the steps involved in the process starting with production and collection of input materials through to processing in oil mills and the production of biofuel and bioliquids.

The same verification procedures are required for imports of biofuels and bioliquids from other countries. They have to be verified through a recognised verification body before

¹ Press Release from Verband der Deutschen Kraftstoffindustrie e.V. (VDB) from 15.07.2010

² Bundesverband der deutschen Bioethanolwirtschaft BDB^e 2009: WWW:BDDE:DE7Statistik 2009.html.

being transported to European countries. ISCC and TÜV SÜD issue already certificates to suppliers in Brazil and neighbouring countries as well as in Indonesia¹.

4 The Bioenergy Market in Germany

The domestic biomass trade volumes in total are not documented. Some special figures can be found, e.g. the amount of 8 million tonnes of matured timber utilised annually for energy purposes (i.e. discarded furniture, doors, demolition wood etc.), however, these are based on estimations².

Table 7 The German bioenergy market in figures 2009

> 1.200 biomass heat plants more than 500 kW _{th}
125.000 pellet boilers
40 pellet production plants (2.3 million tonnes capacity)
> 220 biomass heat and power plants (> 11.7 TWh electricity production in 2008)
4.000 biogas plants (10.0 TWh electricity production in 2008)
45 biodiesel plants (4.9 million tonnes production capacity)
Around 150 oil mills
9 bioethanol plants (0.88 million tonnes production capacity)
11.4 billion Euro turnover in this sector
109.000 Jobs
58.4 million tonnes avoided Co ₂ emissions (out of 110 million Co ₂ savings through all renewables)

Source: Bundesverband BioEnergie e.V. (2010): Der Bioenergiemarkt in Zahlen 2009. Juli 2010 ([www.bioenergie.de /index.php](http://www.bioenergie.de/index.php)).

Biomass fired plants for heat and power usually buy forest and agriculture residues from individual suppliers (public and private forest owners, municipalities offering cuttings from landscape management and others) located in the surrounding area. Data on these amounts are not collected. All in all, there are presently no clear bioenergy trade statistics available. Regarded refined biomass products like pellets and wood chips as well as biofuels for transport, the situation is more favourable.

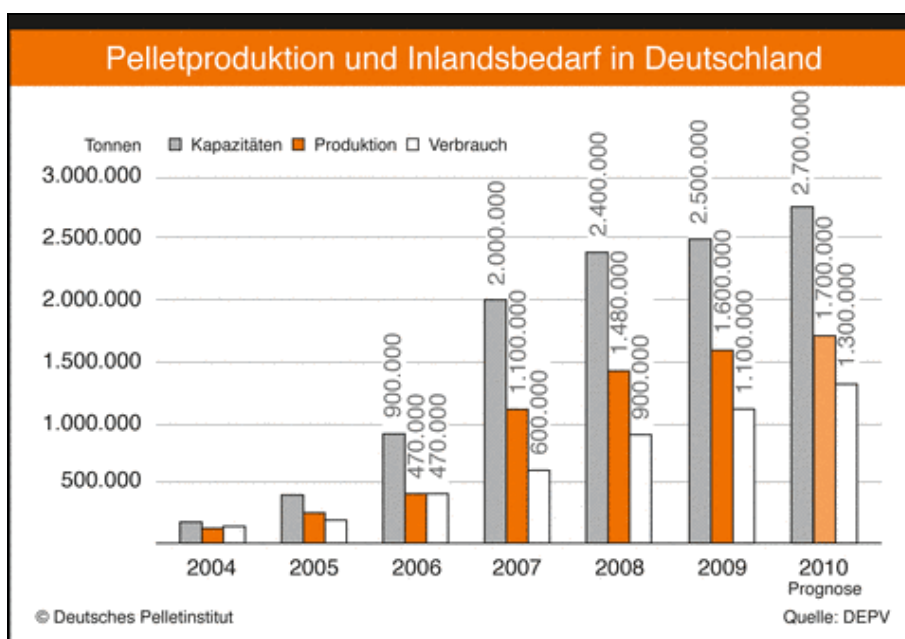
¹ ISCC website. www.iscc.org

² Umweltjournal from 24 March 2010. www.umweltjournal.de

4.1 Pellets

Wood pellet production in Germany was started in 1996/1997, and it increased steadily since that time. At present, Germany is one of the largest pellet markets worldwide and the largest in Europe in terms of produced and consumed volumes and installed production capacities. In terms of per capita volumes though, Austria is undoubtedly in first place.

Figure 3 Pellet production and domestic demand in Germany 2009



Grey column: capacity, orange: production, white: consumption
Source: German Pellet Institute (DEPI)

After the massive expansion of production capacities in 2007, the industry stabilised in 2008. Almost 1.6 million tonnes of pellets were produced, 1.1 million tonnes were consumed on domestic market, 28 % of production were exported¹.

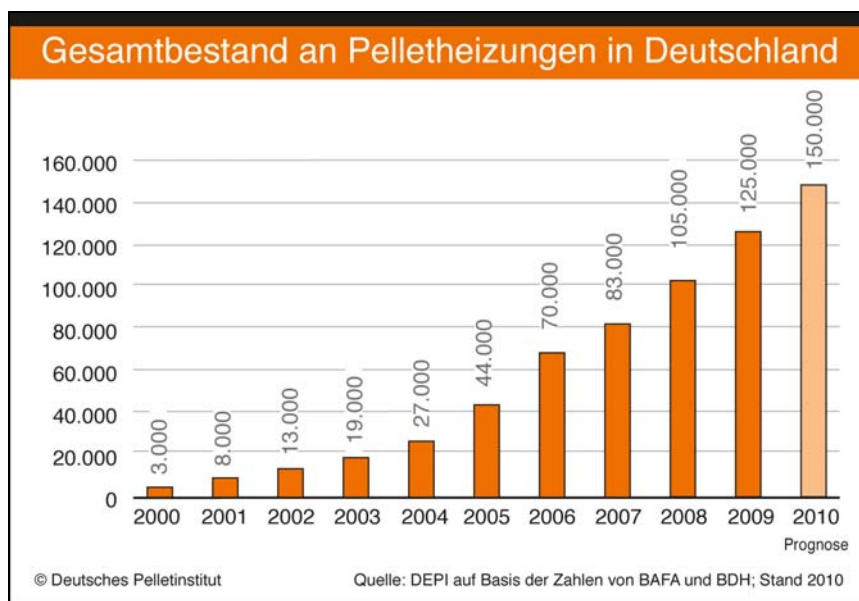
In 2009, pellet production was mainly based on sawn wood with a share of 70 percent,, around 30 percent were produced from round wood not suitable for sawing. Material from short rotation coppice has not played an important role in pellet production so far.

Pellet trade is continuously increasing. The Deutscher Energieholz- und Pelletverband e.V. (DEPV) lists 70 companies producing pressed wood products and 300 distributing firms offering them to big traders, to the specialised pellet trade and to small energy dealers expanding their traditional offer of heating oil with pellets². The largest manufacturer of wood pellets in Europe is at present the German Pellets GmbH, founded in 2005 in Wismar and operating now eight plants in the north, east, south and southwest of Germany.

¹ DEPI 2010: Marktreport Heizen mit Pellets.

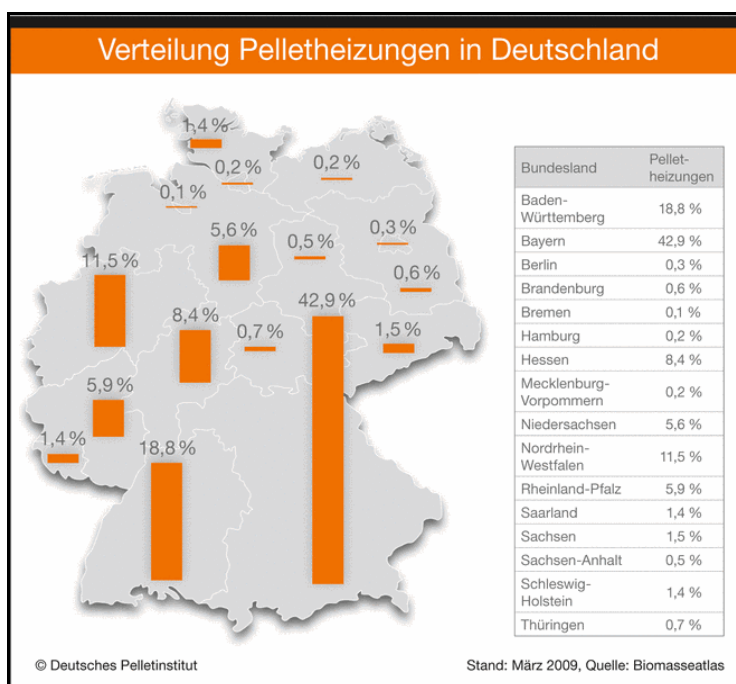
² ibid.

Figure 4 Total amount of pellet heating installations in Germany 2009



Source: Deutsches Pellet Institut (DEPI)

Figure 5 Distribution of pellet heating applications in Germany



Source: Deutsches Pelletinstitut (DPI) 2009

As figure 5 shows, 125.000 pellet heating installations were in operation in 2009, for the year 2010 the DEPV expects an increase to 150.000. Around 60 percent are operated in Bavaria and Baden-Württemberg, the demand in northern and eastern Germany seems to be also increasing. Around 8.000 employment places contributed to strengthen regional economic structures in 2009, the turnover of wood pellets market amounted up to 1.2 billion Euro in the same year.

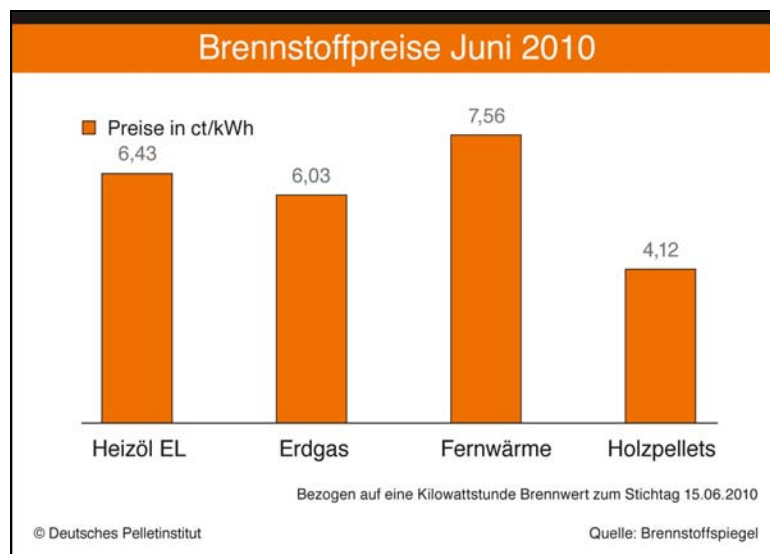
The German quality standards for pellets DIN 51731 and the substantially stricter DIN-plus (more than 90 percent of the total pellet production are certified DINplus pellets¹) will be replaced by the Enplus sign newly developed by Deutsches Pellet Institut (DEPI), Deutsches Biomasseforschungszentrum (DBFZ) and the Austrian Pellet Association Pro Pellets Austria. Within 2010 the new European norm for wood pellets EN 14961-2 shall be implemented in Germany. With this new norm not only production but also trading of pellets will be regarded².

Due to the significantly increasing role of pellets and to the fact that Europe is currently the largest market for pellets, national pellet associations from Austria, Finland; France, Germany, Hungary, Italy, Portugal, Spain, Sweden and Switzerland have established on 1 July 2010 the European Pellets Council as a common European platform. The Council will be organised by the European Biomass Association AEBIOM, Christian Rakos from proPellet Austria was elected as the first president. The European Pellet Council will promote pellets from a niche product to a major energy commodity³.

Price development of wood pellets in Germany

At present, prices for wood pellets in Germany are quite favourable for customers, compared to oil, gas and district heating:

Figure 6 Fuel prices for heat in June 2010



heating oil natural gas district heating wood pellets,
 based on 1 kWh calorific value, reference day 15 June 2010

Source: DEPI 2010

¹ Pellets Atlas (2009): Pellet market country report Germany, p. 12.

² DEPV (2010): Pelletproduktion 2009 in Deutschland auf 1,6 Mio. Tonnen angestiegen. 11.01.10. [www.depv.de/nc/startseite/startmeldungen/article/pelletproduktion 2009](http://www.depv.de/nc/startseite/startmeldungen/article/pelletproduktion%202009).

³ AEBIOM Newsletter July 2010. www.aebiom.org.

DEPV anticipates, despite of a slight reduction of growth in the last year, a positive development of the market. With constant framework conditions and an oil price development in line with the market, continuous growth rates up to 20 percent are to be expected. Thus for the year 2020 an amount of one million pellet furnaces may be achieved¹. The prognosis for 2020 expects a heat amount of 36.7 TWh corresponding to a share of 5 percent in heat market by 2020.

Table 8 Price development of wood pellets in 2009 and 2010

Month/year, in €/t	2009	2010
January	229.87	225.73
February	236.23	227.28
March	234.68	230.45
April	218.68	223.20
May	204.86	218.75
June	203.79	216.04
July	212.54	218.67
August	218.84	
September	221.20	
October	225.88	
November	223.50	
December	224.20	

Source: DEPV/Solar Promotion GmbH, August 2010

The figures in table 8 are based on purchase of 6 tonnes, radius of 100 to 200 km, inclusive all ancillary expenses, inclusive VAT.

While fossil energy carriers partly underlie strong price fluctuation, pellet prices develop in domestic market independent from speculative influences.

4.2 Wood chips

Wood chips are mainly used in commercial plants up to 1 MW for production of heat, only 1 percent of wood fuel used in private households are wood chips. From consumption of around 20 million solid cubic metres, only 200.000 are deployed in form of wood chips by residential consumers. In biomass plants more than 1 MW mostly used wood and wood residues from industry is fired. As there are no DIN standards for wood chips existing in Germany, they are traded either without any standard or according to the classification of Austrian standard ÖNORM M7133. Essential parameters are size (G 30 or G 50) and water content (35 percent). In the future, European standards developed by the European Committee for Standardisation CEN will become mandatory for all Member States².

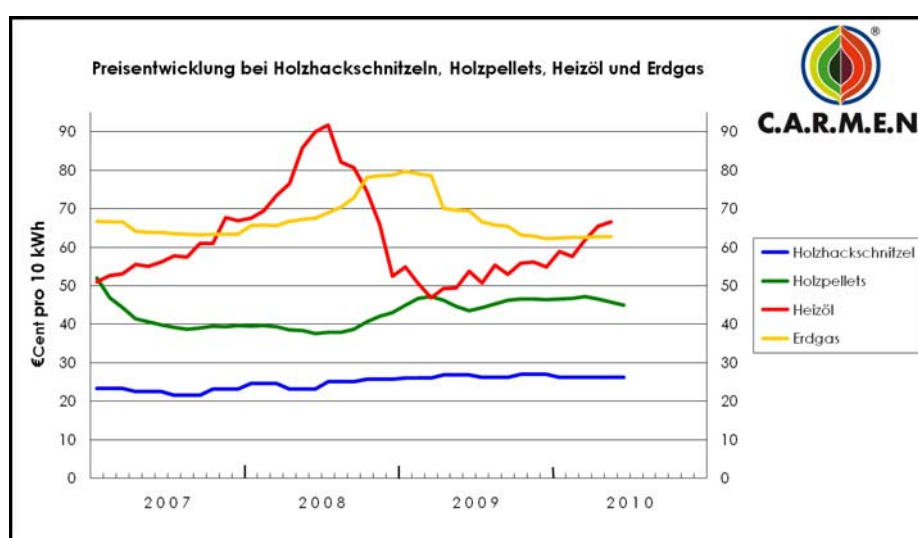
¹ DEPI (2010): Marktreport Heizen mit Pellets. www.depi.de

² Fachagentur Nachwachsende Rohstoffe FNR (2010): Hackschnitzel. www.bio-energie.de/heizen-mit-holz/hackschnitzel/

Price development for wood chips

Other than for wood pellets, statistical data for wood chips is only sparsely available. The agrarian network C.A.R.M.E.N e.V. regularly publishes the prices for a purchase quantity of 80 bulk cubic metres of wood chips delivered within a radius of 50 km and with a water content of 35 percent. This data is based on price information of a certain number of suppliers of wood chips. Prices all over Germany differ significantly, depending on quality like the type of wood, or the region in Germany, e.g. a densely wooded area like in the South or a rather agrarian structured region with less wood sources like in the North of Germany¹.

Figure 7 Price development of wood chips, pellets, heating oil and natural gas



Blue: wood chips, green: pellets, red: heating oil, yellow: natural gas
 Source: C.A.R.M.E.N e.V.

South: Baden-Württemberg, Bayern, Hessen, Rheinland-Pfalz, Saarland

North: Berlin, Brandenburg, Bremen, Hamburg, Mecklenburg-Vorpommern, Niedersachsen, Nordrhein-Westfalen, Sachsen, Sachsen-Anhalt, Schleswig-Holstein, Thüringen².

4.3 Firewood (split logs)

There is no official statistics on split logs usage in place. The Technologie- und Förderzentrum in Bavaria publishes bi-annually a fuel wood price index regarding split logs. The inquiry is based on information of 28 suppliers like forest owners, forest enterprises, forest farming groups and municipalities.

Table 9 (next page) shows the prices for firewood for end consumers determined in the survey of January 2010.

(All prices inclusive VAT. Stacked cubic metre split, length of split logs 1 m, 33 cm split logs ready for use in furnaces³).

¹ IEA bioenergy Task 40: Country Report Germany (without year, supposedly 2009), p. 39.

² C.A.R.M.E.N e.V. (2010). www.carmen-ev.de/dt/energie/bezugsquellen/hackschnippreise.html

³ Technologie- und Förderzentrum TFZ (2010). www.tfz.bayern.de/festbrennstoffe/17385.

Prices for firewood

Table 9 Firewood prices inclusive delivery until 10 km

	Mean value €/st cub metre*	Min. €/st cub metre*	Max. €/st cub metre*	Number of values	Mean value ct/kWh	Min. ct/kWh	Max. ct/kWh
Assortments							
Bulk stock hard wood split	67.1	47.0	90.7	14	4.3	3.0	5.8
Bulk stock soft wood split	50.8	31.0	80.7	14	4.5	2.7	7.1
33 cm hard wood split	75.9	45.1	106.6	27	4.9	2.9	6.8
33 cm soft wood split	59.6	43.0	89.4	23	5.3	3.8	7.9

* stacked cubic metre

Source: Technologie- und Förderzentrum TFZ Straubing, Bayern

4.4 Wood briquettes

There is no general overview available on which amounts of wood briquettes are being traded in Germany. Usually the pellet producers deliver also wood briquettes. Market data and prices can only be obtained by gathering figures directly from some individual producers (others refuse to publish their business figures) or eventually from the numerous energy agencies active in the Federal States. Since 2003 the market for wood briquettes grew by 50 percent, in 2007 around 150.000 tonnes briquettes were used for energy supply. Compared to the other solid fuels, this is a rather small amount, nevertheless, this market is estimated to have a high future growth potential¹.

Wood briquettes are sold in the same quality as pellets, according to the standards DIN 51731 and DINplus. The upcoming European standards EN 14961-2 will become binding for wood briquettes, too. Prices for wood briquettes vary according to different sorts with different fuel values. They are delivered mainly in pallets. Buyers can use several platforms (germanbrix, oekobrix, brennholz.de, etc.) for price comparison or order at the Energieholzbörse (energy wood bourse).

4.5 Sawdust

There are no figures available on the consumed amount of sawdust for energetic purposes in Germany. But it is evident that during the past years the price has risen constantly as the wood processing industry provided more sawdust to the pellet manufacturers to meet the increasing demand. According to estimates by the DBFZ, in 2000 roughly 2 percent of the total amount of sawdust was utilised in the energy sector, by 2007 it had achieved already a share of 40 percent with an upward trend². At present, no clear price signals for sawmill residues in Germany can be observed³.

¹ IEA Bioenergy Task 40: Country Report Germany, p. 41.

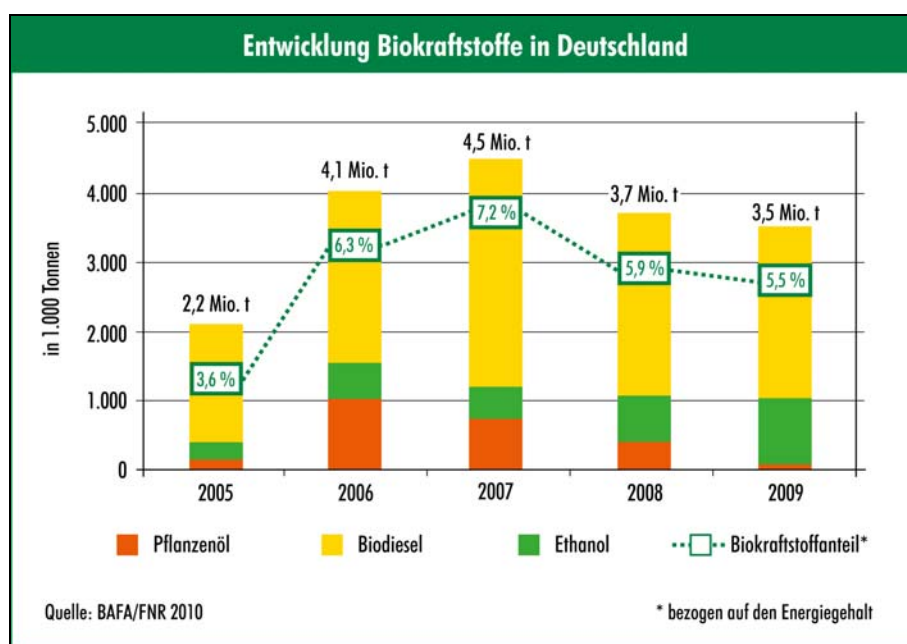
² IEA Bioenergy Task 40: Country Report Germany, p. 43.

³ EUWID Pulp and Paper No. 26 of 28 June 2010. Market.

4.6 Biofuels for Transport

In 2009, the consumption of transport fuels amounted to 51.5 million tonnes in Germany. Biofuels contributed with 3.5 million tonnes to this amount which corresponds to 5.5 percent. Among these, the share of biodiesel amounted to 2.5 million tonnes, of bioethanol to 0.9 million tonnes, and of pure vegetable oil to 0.1 million tonnes.

Figure 8 Development of biofuels for transport in Germany from 2005 to 2009



Source: BAFA, FNR2010

* based on energy content

As figure 8 shows, biodiesel is by far the largest and most important biofuel in Germany. It can be used in pure form (B100), mainly in busses, trucks and older cars, and as blend with conventional diesel (B5 and B7). Pure vegetable oil is used in agricultural vehicles, bioethanol is blended with petrol (E5, E10), in pure form as E85 it is used in cars with flex-fuel motors suitable for both traditional fuel and bioethanol; for these cars presently a new market is developing.

The share of biofuels in total amount of transport fuels has declined in the last years, the sales decreased from 7.2 percent in 2007 to 5.5 percent in 2009. This was partly due to declining oil prices, but as well to taxation of pure fuel (from 15 ct/l to 18 ct/l in 2009) and biodiesel (until 2006 both fuels were exempted from taxation), and the reduction of the biofuel quota¹.

The *Biofuel Quota Act* from 2006 had set the target for 2010 to 6.75 percent and to 8 percent in 2015. Due to ongoing discussions on conflicts of use between food/fodder and energy, the Government issued in 2009 the *Amendment Act on the Promotion of Biofuels* (Biokraftstoffänderungsgesetz- BiokraftÄndG) reducing the target slightly. From 2010 on a biofuel quota of 6.25 percent is mandatory (previously 6.75 percent); in 2015 the quota system will be replaced by calculations of net reductions of greenhouse gases (GHG): Biofuels must by that time provoke at least 35 percent GHG reduction compared to fossil fuels, in 2017 reductions of 50 percent and from 2018 on 60 percent, for being

¹ VDB 2010: Zukunft tanken.

counted against the 10 percent EU reduction target for 2020. This caused severe overcapacities in manufacturing facilities.

Table 10 Minimum share of biofuels (energetic) in total transport fuel consumption

Year	Before amendment	After amendment	Net GHG emission reduction
2009	6.25 %	5.25 %	
2010	6.75 %	6.25 %	
2015	8 %	circa 5.1 %	- 3 %
2020	15-17 %	circa 12 %	- 10 %

Source: AEE (2010): Biokraftstoffe. Marktentwicklung, Klima- und Umweltbilanz und Nutzungskonkurrenzen. August 2010

Particularly the breakdown of the sales of pure biodiesel (B100) and simultaneously the import of less expensive biodiesel based on soy oil from the U.S. and South America using export subsidies, caused a decrease of the number of biodiesel plants and filling stations: At the beginning of 2010, around 50 percent of biodiesel manufacturing facilities had stopped production or were insolvent, the number of filling stations offering pure biodiesel decreased from 1.900 in 2007 to only 200 in 2010¹.

Several Biofuel Associations stipulated in a Memorandum to increase again the biofuel quota already in 2011 to 7 percent, and continue in annual steps to 10 percent in 2020². However, due to increasing efficiency of technologies used, transport fuel demand in Germany will decrease perceptibly in the coming years, primarily regarding petrol. So in 2003 an amount of 25.900 tonnes of petrol had been needed, estimations for 2025 anticipate only 13.600 tonnes.

The only big industrial biofuels producer in Europe is the German VERBIO Vereinigte Bio-Energie AG with a capacity of 450.000 tonnes biodiesel and 300.000 tonnes bioethanol annually, as well as pharmaglycerine as a co-product for cosmetic industry. By process optimisation and technological innovation a production circle has been achieved – the mash from bioethanol production is partly prepared for feed for cows and pigs and partly used in biogas plants, and the produced biogas delivers then the energy for the production process again. This leads to an almost complete energetic utilisation of the deployed raw material and allows at the same time savings of 80 percent of CO₂ emissions. In 2009 the VERBIO Group achieved a turnover of 501.7 million Euro with 411 employees. Nevertheless, on reason of the economic crisis in the last year, biodiesel exports to Eastern Europe decreased considerably (see chapter on export of biofuels, p. 24). Bioethanol production of 180.762 tonnes in 2009 compared to 138.478 tonnes in 2008 were almost completely used in domestic blending market. The share of VERBIO in E85 sales in Germany amounts to 50 percent³.

¹ AEE (2010): Biokraftstoffe. Marktentwicklung, Klima- und Umweltbilanz und Nutzungskonkurrenzen. *Renews Spezial*, Ausgabe 38, August 2010, p. 8.

² BDB^e, UFOP, VDB 2010: Memorandum der Verbände der deutschen Biokraftstoffwirtschaft BDB^e, UFOP und VDB zur Beimischung von Biokraftstoffen. 30 März 2010.

³ VERBIO (Vereinigte BioEnergie AG). http://www.co2-handel.de/article341_13936.html. 06. August 2010

Prices for transport biofuels

Biodiesel

As already stated, biodiesel achieved with an amount of 2.5 million tonnes in 2009 by far the greatest market potential in biofuel transport sector. Actual prices for road transport are shown in the following table:

Table 11 Actual prices for biodiesel at filling stations in August 2010 (week 30)

Prices for biodiesel at filling stations In cent/litre, inclusive energy tax (18.6 cent/litre) and VAT (19 %)				
	Week 30	Previous week	July 2010	Change in ct
North	107.50	106.30	107.74	1.20
East	109.70	109.33	109.51	0.37
West	108.72	110.69	109.38	-1.97
South	108.85	108.81	108.80	0.04
Price spread	91.9-116.9	90.9-116.9		

Source: AMI GmbH 2010. Website UFOP. www.ufop.de

Compared to fossil diesel, biodiesel is around 10 cent less expensive.

Table 12 Prices for mineral diesel at filling stations in August 2010 (week 30)

Prices for mineral diesel at filling stations In cent/litre, inclusive mineral oil tax (47.04 cent/litre) and VAT (19 %)				
	Week 30	Previous week	July 2010	Change in ct
North	117.70	116.90	118.26	0.8
East	119.11	118.28	119.73	0.8
West	120.30	119.32	120.22	0.9
South	119.47	117.84	119.91	1.6
Price spread	113.9-125.9	112.9-127.9		

Source: AMI GmbH 2010. Website UFOP. www.ufop.de

Several biofuel associations claim a minimum difference between mineral diesel and bio-diesel of at least 10 percent to be granted.

Bioethanol

The production of bioethanol started in Germany only in 2005. By 2009 it amounted to 591.000 tonnes, an increase of 29 percent compared to the previous year. One third was produced from sugar beets, 65 percent from grain like wheat, maize or rye. Other raw material like residues from food industry are with a share of three percent still marginal. Bioethanol utilisation increased even stronger than production, it amounted to 903.000 tonnes in 2009, an increase of 44 percent compared to the previous year. 693.000 tonnes have been blended at an amount of five percent with petrol (E5) according to standard EN DIN 228. From January 2011 on, 10 percent bioethanol will be blended with petrol (E10). Experts anticipate for the blending market in 2010 further increase, particularly when E10 will be introduced not only in German market but as well in the whole of

Europe. A number of countries just start blending biofuels with traditional fuels as is required by EU RES Directive 2009¹.

Table 13 Bioethanol consumption in Germany in 2009 in 1000 tonnes

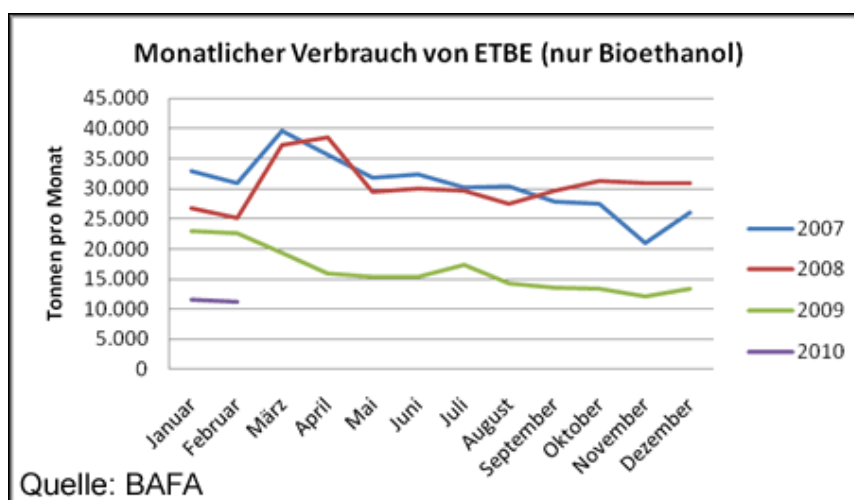
2009	2009 aggregated	Change to 2008
Petrol in total	20.232	-1.6 %
Thereof: Bioethanol for ETBE	202	-45 %
Thereof: Bioethanol for blends	693	+176 %
Bioethanol in E 85	9.0	+6 %
Bioethanol in total	903	+44 %

Source: BDB^e Statistik 2009

On rather low level stayed the use of pure bioethanol E85 (this is a blend with 15 percent petrol) in the last year. The market for E85 is presently in initial stage, as only FlexiFuel Vehicles (FFV) dispose of the necessary technology; their number is anticipated to increase in the time coming though. The price for E85 is usually 20 percent less than that for traditional super mineral fuel, according to the *Energy Taxation Act* from 2006 the share of bioethanol in blends is exempted from mineral oil tax until 2015.

For production of the petrol additive ETBE (ethyl-tert-butyl-ether) 202.000 tonnes bioethanol have been used (see table 11)².

Figure 9 Monthly consumption of ETBE (bioethanol) in Germany 2007 to 2009 in t/a



Quelle: BAFA

Source: Bundesaufsichtsamt für Wirtschaft und Ausführungkontrolle

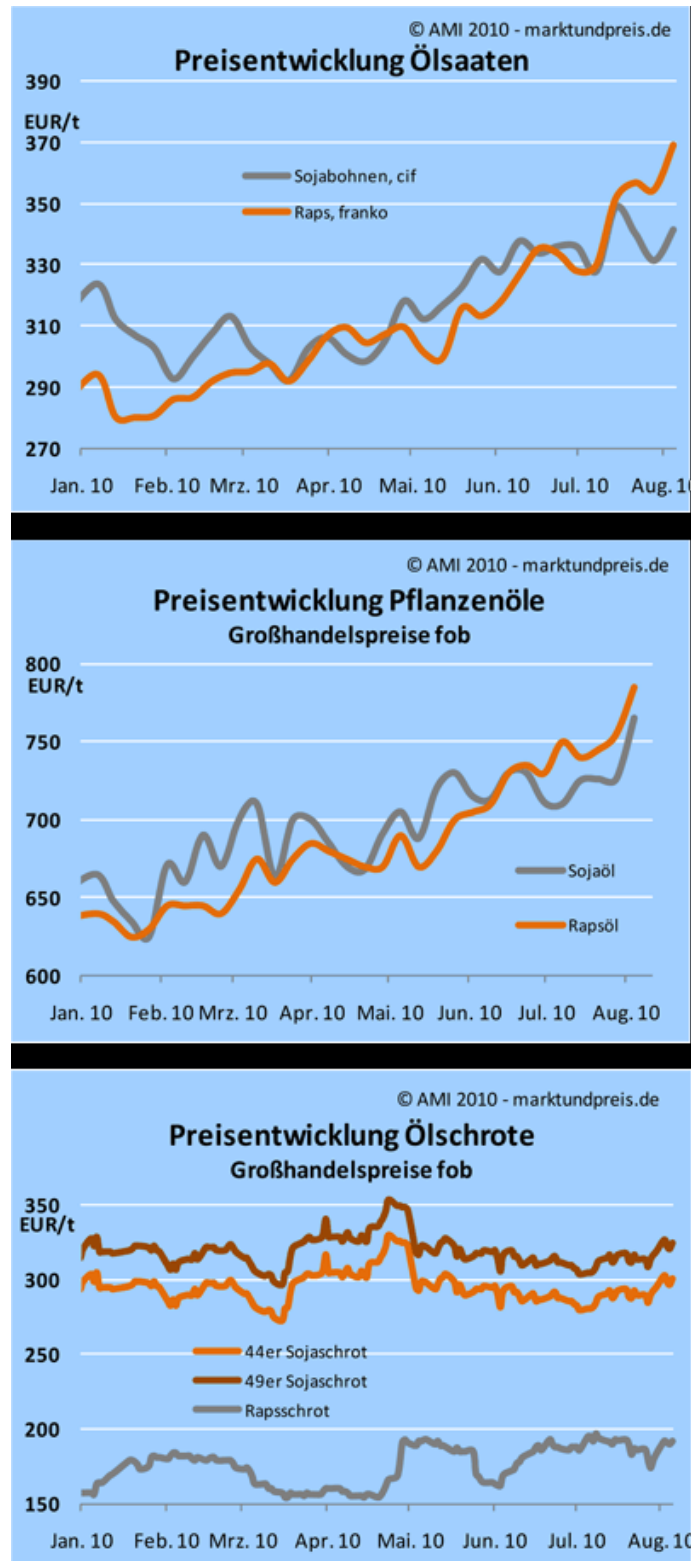
Prices differ strongly in different regions. At present more than 300 filling stations sell bioethanol E5. Actual prices vary between 0,847 €/l and 1,080 €/l, the average price in August 2010 was 0,939 €/l³. For pure vegetable oil at the 400 filling stations no statistical data on prices is available. Information on price developments in wholesale for oil-seeds, vegetable oil and oil groats is given by the following figure 10.

¹ BDB^e 2010: Statistik 2009. www.bdbe.de/Statistik_2009.html

² *ibid.*

³ Ethanol-tanken.com. <http://www.ethanol-tanken.com/index.php>. 05. August 2010.

Figure 10 Price developments of oilseeds, vegetable oil and oil groats



Source: UFOP website. 05. August 2010.

Synthetic biofuels (BtL or 2nd generation fuels, biodiesel and bioethanol from lignocellulose) are still in testing phase and presumably not available on the market before 2020.

4.7 Biomethane

The trade with biomethane is a newly developing market in Germany. Presently, 40 biomethane plants are in operation feeding into the natural gas grid, by the end of 2010 an increase to 70 plants is expected. They will feed-in around 50.000 Nm³ per hour into the grid.

The German Energy Agency (dena) presented on 22 September 2010 the *Biogas Register Germany* in Berlin. This register secures an efficient and reliable documentation of biomethane creating an intersectoral standard for proof of origin and characteristics of upgraded biogas to be fed into the natural gas grid. Producers, retailers, consumers and authorised inspectors can apply for registration, the amounts of biogas produced and sold will be documented. This is expected to give a push to German-wide biogas trading¹.

The German government supports the demand for biomethane by several promotion instruments like Renewable Energy Sources Act, Federal Emission Control Act, Renewable Energy Heat Law. Only, some associations claim to strengthen support instruments, particularly the Renewable Energy Heat Law (EEWärmeG) to accelerate the development of a heat market for biomethane, otherwise the German targets of 6 billion Nm³ biomethane feed-in annually by 2020 and 10 billion Nm³ by 2030 will not be achieved².

5 International Bioenergy Trade Flows

In Germany 90 percent of utilised bioenergy are of domestic origin, only 10 percent are imported from other countries, at present apparently in first line from neighbouring countries. This seems to be true also for exports. But it can be observed that more and more a global market for biomass is developing. So for example, Canada exports residues from wood industry in form of pellets on ships to Belgium, the Netherlands, and Sweden³.

Biomass can be imported as raw material or as a refined bioenergy carrier. Particularly biomass and bioenergy with high energy density and already well established logistic concepts possess the best technical preconditions for transport. This pertains presently to

- Solid bioenergy carriers and raw material with high bulk density like e.g. pellets and wood chips, grain and seeds
- Liquid bioenergy carriers like biodiesel, bioethanol, vegetable oil
- Biomethane (biogas upgraded to natural gas)⁴.

In Germany, exports of pellets exceed imports. In 2007 they amounted to around 50 percent of production, imports amounted to about 30 percent of domestic consumption. Biodiesel exports, however, are on a similar level to imports⁵.

¹ Dena 2010: Biogasregister Deutschland geht an den Start. Einheitliches Dokumentationssystem stärkt Markt für Biogas im Erdgasnetz. Press release 22.09.2010.

² Dena 2010: Biomethan im KWK- und Wärmemarkt. Projekt Biogaspartner. July 2010, p.5.

³ TU Vienna 2009: Lukas Kranzl in Press Release from 16.02.2009.
www.tuwien.ac.at/aktuelles/news_detail/article/5466/

⁴ NREAP Germany. German version, p.99.

⁵ IEA Bioenergy Task 40: Country Report Germany. July 2009, p.45.

5.1 Imports and Exports of Firewood, Pellets and Wood Briquettes

According to data from the German Biomass Research Centre in 2007 the **import** of raw wood as firewood amounted to 4.417.000 m³. The greatest amount of wood imports came from:

- Sweden (1.027.000 m³ coniferous wood)
- Czech Republic (624.000 m³ coniferous wood)
- Belgium (327.000 m³ coniferous wood, 9.000 m³ hard raw wood)
- Denmark (287.000 m³ coniferous wood, 25.000 m³ hard raw wood)
- France (237.000 m³ coniferous wood, 80.000 m³ hard raw wood)¹.

In the last years, in Germany more wooden raw material for energetic use was exported than imported.

A survey conducted by CARMEN e.V. within the PelletsAtlas project questioning 79 traders and retailers revealed that 3 percent of the total purchase volume were imported from Austria and another 0.5 percent from the Czech Republic (presumably in 2008). It is assumed that small amounts are also imported from other Central Eastern countries (Slovakia, Hungary, Poland), where production is increasing rapidly, and additionally from Sweden. Concerning wood briquettes, 50 percent of Ukrainian exports are imported by Germany, compared to 8 percent of Ukrainian pellet exports going to Germany².

The international trade with DINPlus pellets does not seem to be of great importance. Some small and medium scale producers located near borders and their retailer networks sell pellets in rather small amounts cross-border according to the respective demand in the countries. Large amounts of pellets are expected to be pressured into the European market from overseas, particularly from Canada.

In 2009, the total imports of wood pellets to Germany amounted to 53.535,6 t³.

Table 14 German exports and imports of pellets in Europe and selected other countries

2009	Export / t	Export / value	Import / t	Import / value
Austria	73869,7	12169	13141,6	2128
Belgium	60441,8	7558	346,5	52
Bulgaria	371,4	91	-	-
Czech Republic	5293,7	357	12526,8	1384
Denmark	98293,8	16244	883,4	299
Estonia	345,5	64	70,4	14
Finland	1492,5	171	-	-
France	39956,0	4562	493,4	72
Greece	690,9	67	-	-
Hungary	385,9	101	-	-
Ireland	369,9	49	-	-
Italy	67236,0	13019	119,7	26

¹ Institut für Energetik und Umwelt 2007: Schlüsseldaten Klimagasemissionen. Leipzig.

² Zheliezna, Tetiana /2010): Presentation at 4Biomass Trade Workshop in Vienna. 05.10.2010

³ DESTATIS 2010 (preliminary figures)

Latvia	423,3	37	-	-
Lithuania	1229,6	148	432,4	119
Luxembourg	1375,3	276	322,0	14
Malta	104,9	22	-	-
Netherlands	51883,6	6154	2335,2	407
Poland	23984,6	2926	4639,2	659
Portugal	1375,9	76	-	-
Romania	904,5	84	163,8	23
Slovakia	6,0	2	12,0	1
Slovenia	1917,3	281	-	-
Spain	167037,4	25683	-	-
Sweden	91176,3	13969	-	-
United Kingdom	7953,7	953	-	-

German exports and imports in most important Non-EU countries

Russ. Federation	192,8	85	7379,6	808
Switzerland	22616,7	4594	1548,8	222
Ukraine	749,6	17	3756,4	442

DESTATIS Genesis-Online. Oktober 2010.

In 2009, total **exports** of wood pellets from Germany amounted to 727,965,2 tonnes¹. Germany is becoming a large exporter of pellets, in Europe it is the market leader in pellet production. As already previously mentioned, the production in 2008 amounted to 1.46 million tonnes and consumption to 900.000 tonnes. The difference, an amount of 560.000 tonnes of industrial pellets, were exported, mainly to Scandinavia, Belgium and the Netherlands, Austria, Italy and Switzerland. Not all stakeholders have been questioned, thus it is assumed that real exports, especially in international trade, have been much higher. One of the largest wholesale retailers in Europe, the German enterprise GEE Energy, exports refined biomass products in these countries, and on the other side imports products from overseas. It operates logistic centres in Germany, Austria, Italy and Denmark².

In summary, the most important trade flow of pellets in Germany is the export of industrial pellets which are mainly transported by ships; most of the large-scale producers have direct access to river or sea harbours³.

Large pellet markets (more than 500.000 tonnes) are found in Austria, Belgium, Denmark, Germany, Italy, the Netherlands, Russia and Sweden. Among these, Germany and Austria are widely self-sufficient, other markets like the Netherlands, Belgium and Denmark depend on the import of wood pellets⁴.

All in all, pellet import and export flows are certainly underestimated.

¹ DESTATIS 2010 (preliminary figure)

² GEE Energy 2010. <http://www.gee-energy.com/GEE/de/services/grosshandel/index.php>

³ PelletsAtlas, p. 13.

⁴ Junginger, Martin, et al.: Opportunities and Barriers for international bioenergy trade. IEA Bioenergy Task 40: Sustainable Bioenergy Trade, May 2010, p. 10.

5.2 Imports and Exports of Biofuels for Transport

In Germany, biofuels for transport primarily are produced from domestic biomass, i.e. vegetable oil from rapeseed for biodiesel, and grain and sugar beets for bioethanol.

Imports of biomass for production of transport fuel are still marginal compared to imports for animal feed. In the past years, biofuels and biomass for their production have been imported from other Member States, e.g. France and Spain, and from United States, Argentine, Brazil; some amounts came from some Eastern European countries. Thus e.g. imports of rapeseed from Ukraine to Germany for biodiesel production amounted in 2008/2009 to 131.000 tonnes¹. From 2.5 million tonnes of biodiesel consumed in Germany in 2009, only 5.2 percent came from imported palm oil². This is also due to the fact that palm oil at low temperatures solidifies and thus is not suitable for use in Central and North Europe. Furthermore, the technical standards for biodiesel cannot be achieved with palm oil, therefore only few percentage points of it can be blended with biodiesel³.

The **export** of biodiesel has declined in the last two years. The aforementioned German biofuel producer VERBIO reports that in 2008 an amount of 37.4 percent of its biodiesel production were exported to Eastern Europe, whereas in 2009 only an amount 11.8 percent had been achieved. In contrast, due to an increased demand, the production of bioethanol was expanded considerably in the previous year (2009: 180.762 tonnes, compared to 2008: 138.478 tonnes), but nearly the total amount of bioethanol production was used for blending, so that no bioethanol was exported.

5.3 Imports and Exports of Biomethane

As aforementioned, the market for biomethane and biogas is in initial phase in Germany. Experts from Biogas Associations point to the just started biogas register which will document data on production and sales as well as on technical standards. According to the National Renewable Energy Action Plan Germany, the import of biomethane may gain a considerable importance by 2020. Presently no prognosis can be made as to how favourable conditions can be created under which imports could be expected. Neither the physically available import potential nor the demand for imports by 2020 can be estimated; great importance may obtain the biofuels sector⁴.

The export quota of **biogas technology** amounts to 30 percent, the export volume at around 150 million Euro⁵.

In the German NREAP it is assumed that the national target of 18 percent renewable energy in final energy consumption by 2020 will be achieved by own national resources. Estimations expect even an amount of 19.6 percent⁶, so that no imports would be needed.

¹ Deutsche Beratergruppe für die Ukraine: Klimaschutz und Agrarhandel: Implikationen der neuen EU-Nachhaltigkeitsrichtlinie für die Ukraine. Ausgabe 22, Juni 2010.

² Estimations from VDB and Greenpeace.

³ AEE (2010): Biokraftstoffe. Marktentwicklung, Klima- und Umweltbilanz und Nutzungskonkurrenzen. *Renews Spezial*, Ausgabe 38, August 2010, p. 13.

⁴ NREAP Germany, July 2010, p. 97.

⁵ Agentur für Erneuerbare Energien 2010: Fakten. Die wichtigste Daten zu den Erneuerbaren energien. Schnell und kompakt. Stand 6/2010.

⁶ NREAP Germany 2010, p. 104.

6 Conclusion

Due to the fact that data on trade flows of domestic raw biomass for energy as well as for processed biomass like pellets, wood chips, briquettes etc. are not centrally registered but only in parts for certain suppliers or specific regions recorded, it is difficult to specify the actual traded amounts of these biomass fractions. A significant amount is sold to local and regional private and industrial customers without being documented, this concerns particularly used wood and residues from forests and agriculture. Only some of the big enterprises producing refined biomass, document their production and sales figures as well as their exports; this quantity is only a part of the whole traded amount. There is definitely a need for clear global bioenergy trade statistics. The same applies to imports and exports of biofuels. Biodiesel, bioethanol, palm oil, as well as domestic oilseeds processed to biodiesel, are not documented as self-contained data, thus it is not possible to completely determine tradeflows of these goods.

There are some barriers for bioenergy trade: On domestic market there is an unfair competition of solid biomass with fossil fuels (external costs are not included in price, and they are still subsidised in some cases, e.g. hard coal). Of course, this refers not only to biomass but to all renewables. On global markets, the United States subsidise their export of biodiesel and Argentina promotes its biodiesel exports fiscally. Import and export tariffs influence markets and competition negatively, so Russia e.g. has decreed increased export tariffs for roundwood recently. Concerning pellet markets, a global classification system is lacking.

German transnational trading activities seem to concentrate rather on European area, as the main trading partners are Austria, the Baltic States and Scandinavia, Italy, the BeNeLux and several Central and Eastern European countries (comp. table 14). Particularly the latter could intensify their expansion of biomass potential, unrefined and refined, to boost the intra-regional trade in Central Europe. This would allow relatively short transportation routes and quick supply, and thus strengthen the efforts for more sustainability in supra-regional and international trade. Long-distance transports of pellets from Canada or palm oil from Indonesia are certainly more cost-intensive and environmentally harmful than those within and around Central Europe.

The sustainability regulation for liquid biomass and biofuels for transport in Germany and Europe will contribute not only to serious climate protection successes but might simultaneously give a push to the introduction of globally valid ecological standards in world biofuels trade. "Three key issues should be addressed in any biodiversity risk-mitigation strategy: conservation of areas of significant biodiversity value; mitigation of negative effects related to indirect land-use change; and promotion of agricultural practices with few negative impacts on biodiversity"¹. It would be consequent to introduce sustainability standards also for solid biomass in the near future. They should become mandatory for all utilisation pathways of biomass, otherwise the non-sustainable production of food and feed will be shifted to other areas. The EU Commission is presently discussing the opportunities and barriers of extending sustainability regulation on solid biomass.

In the long term, it will be crucial to not limit sustainability regulation to European area, but extend it on global trade activities. This will require a change of World Trade Organisation (WTO) rules towards a just and socially acceptable trade development including developing and emerging countries. The efforts for a sustainable utilisation of the global bioenergy potential may even promote an understanding of the necessity of worldwide land use planning.

¹ Hennenberg, K.; Fritsche, U. R.; Wiegmann, K. (2010): The Power of Bioenergy-Related Standards to Protect Biodiversity. <http://www.oeko.de/oekodoc/975/2009-074-en.pdf>

7 References

- AEBIOM Newsletter July 2010. www.aebiom.org
- AEE Agentur für Erneuerbare Energien 2010: Biokraftstoffe. Marktentwicklung, Klima- und Umweltbilanz und Nutzungskonkurrenzen. *Renews Spezial*, Ausgabe 38. August 2010. www.unendlich-viel-energie.de/
- BBE (Bundesverband BioEnergie e.V.) 2010: Der Bioenergiemarkt in Zahlen 2009. www.bioenergie.de
- BDB^e Bundesverband der deutschen Bioethanolwirtschaft 2009: Press Release from 15.07.2010. www.bdbe.de/statistik2009/html
- BDB^e Statistik 2009. www.bdbe.de/statistik2009/html
- BDB^e/UFOP/VDB 2010: Memorandum der Verbände der deutschen Biokraftstoffwirtschaft BDB^e/UFOP/VDB zur Beimischung von Biokraftstoffen. 20.03.2010
- BMU/AGEE-Stat 2010 (Bundesministerium für Umwelt, Naturschutz und Reaktorsicherheit (BMU – Federal Ministry for the Environment, Nature Protection and Nuclear Safety) / Arbeitsgruppe Erneuerbare Energien-Statistik (Working Group Renewable Energy Statistics))
- BUND (2010): Kurzumtriebsplantagen für die Energieholzgewinnung – Chancen und Risiken. Juli 2010.
- C.A.R.M.E.N e.V. 2010. www.carmen-ev.de/dt/energie/bezugsquellen/
- Dena 2010: Erdgas und Biomethan im künftigen Kraftstoffmix. Handlungsbedarf und Lösungsansätze für eine beschleunigte Verwendung im Verkehr. www.dena.de
- DEPI Deutsches Pellet Institut 2010: Marktreport Heizen mit Pellets. www.dpi.de
- DPEV Deutscher Energieholz- und Pelletverband e.V. 2010. www.depv.de
- Deutsche Beratergruppe für die Ukraine 2010: Klimaschutz und Agrarhandel: Implikationen der neuen EU-Nachhaltigkeitsrichtlinien für die Ukraine. Ausgabe 22, June 2010
- Ethanol-tanken.com. 2010. <http://www.ethanol-tanken.com/index.php>. 05.08.2010
- EUWID 2010: Pulp and Paper No. 26. 2606. 2010. www.euwid.eu
- FNR Fachagentur Nachwachsende Rohstoffe 2010: Press Release from 06.07.2010. www.fnr.de
- Fachverband Biogas e.V. 2009: Biogas Branchenzahlen 2009. www.biogas.org
- GEE Energy GmbH & Co. KG 2010. <http://www.gee-energy.com/GEE/de/services/grosshandel/index.php>
- Hennenberg, K.; Fritsche, U. R.; Wiegmann, K. (2010): The Power of Bioenergy-Related Standards to Protect Biodiversity. <http://www.oeko.de/oekodoc/975/2009-074-en.pdf>
- Holzbörse Bayern. <http://www.biomasseboerse.bs-bayern.de/html/angebote.php>
- IEA Bioenergy Task 40: Country Report Germany 2009. International Energy Agency
- Institut für Energetik und Umwelt 2007: Schlüsseldaten Klimagasemissionen. Leipzig.
- Junginger, Martin, et al. 2010: Opportunities and barriers for international bioenergy trade. IEA Bioenergy Trade Task 40: Sustainable Bioenergy Trade, May 2010
- NREAP Germany 2010: Bundesrepublik Deutschland. Nationaler Aktionsplan für erneuerbare Energie gemäß der Richtlinie 2009/28/EG zur Förderung der Nutzung von Energie aus erneuerbaren Quellen. August 2010
- Pellet Atlas 2009: Pellet market country report Germany. IEE Europe. www.pelletatlas.info/pelletatlas
- TFZ Technologie- und Förderzentrum 2010. www.tfz.bayern.de/festbrennstoffe/17385
- UFOP Union zu Förderung von Ölpflanzen e.V. 2010. www.ufop.de

Umweltjournal 24.03.2010. www.umweltjournal.de

VDB Verband der Deutschen Kraftstoffindustrie e.V. 2009: Press Release from
15.07.2010. www.vdb.de

VERBIO Vereinigte BioEnergie AG 2010. [http://www.co2-
handel.de/article341_13936.html](http://www.co2-handel.de/article341_13936.html). 06.08.2010

Zheliezna, Tetiana 2010: Biomass trade flows from Ukraine to Central European coun-
tries. Presentation at 4Biomass Trade Workshop in Vienna. 0510.2010.
www.4biomass.eu