

**MARKETS FOR RECOVERED WOOD IN EUROPE:
CASE STUDIES FOR THE NETHERLANDS AND GERMANY BASED ON THE
BIOXCHANGE PROJECT¹**

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Abstract

Within the BioXchange project, finished in 2005, a study was conducted by the University of Hamburg, INFRO and Probos which among others describes the market for post-consumer wood in Germany and The Netherlands¹.

For Germany the following main conclusions can be drawn from the study: the market volume of post-consumer wood in Germany in 2003 is about 6.5 mill. tons (air-dry), of which 912,000 tons originate from the wood-processing industry. 17% of this amount is quite clean A I quality. Almost 35% is treated post consumer wood, but not with halogenated organic compounds in the coating and no wood preservatives (A II). 31% contains halogenated organic compounds in the coating, but no preservatives (A III) and another 17% consists of post consumer wood treated with wood preservatives (A IV). The utilization for energy production has increased from 56% in 2001 to 72% in 2003. The exported volume has decreased in the last two years from 15% to 11%. The volume of material used for panel board production is about the same. The price for distributed post-consumer wood is higher the better the quality (here: lower contamination) is and vary between – 40 and + 21 Euro per ton. The prices are increasing with the size of the disposal unit.

The main conclusions, figures reflect the situation in 2004, for The Netherlands are: the total market volume of used wood in The Netherlands is 1.25 mill. tons annually (air dry). Most of it is slightly contaminated B-quality wood (58%), about one third is clean A-quality wood (36%) and a very limited amount is contaminated waste wood of C-quality (6%). In 2004 only 22% of the total volume of used wood is being utilised in The Netherlands, the rest (almost 1 mill. tons) is being exported. The board industry and energy utilities in Germany, Belgium, Sweden and Italy are the main outlets for the exported used wood from The Netherlands, each industrial sector taking approximately half the volume. The traditional board industry is willing to pay more for its raw material than the utilities. Apparently there is still a surplus of used wood offered to the renewable energy market. In the long run, however, the energy utilities will have to pay more market conform prices. Prices vary from 20 – 30 Euro per ton air dry for A-quality and 7 – 15 Euro for B-quality.

Keywords: recovered wood, post-consumer wood, used wood, waste wood, market, prices, trade, BioXchange

Introduction

This paper presents the results of studies carried out by the University of Hamburg, INFRO and Probos on the markets for post-consumer wood in Germany and the Netherlands. The aim of this study was to provide information on availability, quality, volumes, present destinations and end uses of biomass streams suitable for energy purposes. The overall objective for this specific Work Package was described as followed: "Collection of reliable data and the development of methods to document woody biomass potentials and supplies. Providing actual information on national and regional markets for forestry residues, used wood and industrial wood residues, on the availability and the current users of different biomass sources in the participating countries". Since forestry and industrial wood residues are not within the scope of COST Action E31 they are, where feasible, not taken into account in this paper. Detailed information can be found in part 1 of the final report².

Probos Foundation, the Dutch Institute for Forestry and Forest Products, has taken the initiative for this paper, but is thankful to the University of Hamburg, Department of Wood Science, Section of Economics of Forest Products, especially Dr. Mantau, for their contribution within the study.

Germany

Volume of post-consumer wood

The development of the wood-disposing industry can be described as quite dynamical within the last years. On the one hand, the ordinance on the management of waste wood started in 2003. On the other hand, based on the renewable energy sources act (Erneuerbare-Energien-Gesetz, EEG) and the ordinance on generation of electricity from biomass (Biomass Ordinance – BiomasseV), a lot of biomass power plants commissioned within the last years and increased their demand for wood, and especially, due to the lower prices, their demand for post-consumer-wood. This had an effect on the structures of the market, the disposal companies and the structures of trade within the disposal and raw material market.

In order to determine the annual amount of post-consumer wood, a questionnaire was sent out in which the companies were asked to state their annual collected amount. The number of locations as well as the collected quantities of material can be pointed out for 2001. The addition "gross" means that the internal trade (from disposer to disposer) is still contained. Consequently, it is the volume of trade of post-consumer wood within the disposal market.

Thus, the quantity is higher than the market volume, which is available for final use by different consumers. With respect to the limited database, the projection of 2003 has been made only for the quantity of post-consumer wood but not for the number of locations.

Table 1
Trade volume (amount gross), collected quantities 2001 and projection 2003 by company size categories

Company Size	Companies 2001		Volume traded 2001		Volume traded 2003		
	N	[%]	[mill. t]	[%]	[mill. t]	[m. t oven-dry*]	[%]
Up to 499 t	272	28.5	0.047	0.8	0.047	0.038	0.6
500-999 t	142	14.9	0.096	1.6	0.079	0.064	1.1
1,000-2,499 t	210	22.0	0.330	5.3	0.265	0.212	3.6
2,500-4,999 t	113	11.8	0.397	6.4	0.471	0.377	6.5
5,000-9,999 t	85	8.9	0.546	8.8	0.714	0.571	9.8
10,000-19,999 t	56	5.9	0.701	11.4	1.172	0.937	16.1
20,000-49,999 t	48	5.0	1.281	20.8	2.021	1.617	27.7
50,000 t and more	29	3.0	2.772	44.9	2.518	2.015	34.6
SUM	955	100.0	6.170	100.0	7.287	5.830	100.0

*Conversion factor tons air-dry to tons oven-dry: 0.8

Towards the end of the investigation in **2001** of the post-consumer market, 6.2 mill. tons of post-consumer wood had been accounted for, which were registered by the questioning of the disposal companies. Noticeable, the large amount of companies in the size-categories 1,000-4,999 tons post-consumer wood, making about one third of all companies. The businesses found in the middle size-categories (10,000-49,999 tons), that make about 11% of all companies, collect about one third of all of the post-consumer wood. In the size categories 50,000 annual tons and above (3% of the businesses) almost 50% of the market-relevant post-consumer wood is collected. In contrary to that are those companies that collect up to 1,000 tons per year. About 43% of the identified locations only collect 2.3% of the total quantity.

Mantau and Bilitewski (2005)³ have disclosed a total amount of waste wood and wood in waste of about 11.2 mill. tons (air-dry). This amount is derived from data of the statistical Federal Office and the administrative offices which were lifted up in the context of the waste statistics. These amounts of wood waste emerge in different areas of private businesses and public communes. According to the authors the “wood is collected separately in some cases, however, mainly it is a component of waste mixtures. A part of the wood is sorted and utilized or disposed afterwards. The pre-dominant part is removed or utilized directly without an inter-step of sorting” (Mantau and Bilitewski 2005). Primarily the wood in the mixing waste is distributed directly for disposal. About 5.6 mill. tons are disposed, either landfill or thermal. The utilization of waste wood happens mainly for material or energetic use. Furthermore, an import of about 0.9 mill. tons and an export of post-consumer wood of about 0.7 mill. tons were calculated. In Germany, about 6.5 mill. tons are utilized. This amount subsumes the waste wood which can be defined as post-consumer wood and the imported volume.

Origin

The following table displays an overview of the origins of post-consumer wood, which were relevant only for the random sample in 2003. The groups of origin are based on the German designation of the Waste List Order. The distribution of the different provenances has been projected up to the market volume of 6.5 mill. tons.

Table 2
Origin of post-consumer wood 2003

Origin	Post-consumer wood	
	[mill. t]	[%]
Commerce (package)	1.369	21.0
Construction waste	1.742	26.7
Wood-processing industry	0.912	14.0
Municipa waste	1.353	20.7
Import	0.632	9.7
Other	0.523	8.0
SUM	6.531	100.0

Other sources (17) are named as follows: private households (5), railway construction (2) and ten without further specification.

Categories

This question was relevant also only for the random sample in 2003. The following table shows the subdivision of post-consumer wood into the different categories of the waste wood ordinance. 218 of 221 answering businesses answered the question. Category A I is defined as waste wood in its natural state or only mechanically worked which, during use, was at most insignificantly contaminated with substances harmful to wood. A II is waste wood bonded, painted, coated, lacquered or otherwise treated waste wood with no halogenated organic compounds in the coating and no wood preservatives. A III contains halogenated organic

compounds in the coating, with no preservatives and A IV is waste wood treated with wood preservatives, which cannot be assigned to waste wood due to its contamination.

Table 3
Categories by waste wood ordinance

Category	Post-consumer	
	[mill. t]	[%]
A I	1.112	17.0
A II	2.265	34.7
A III	2.050	31.4
A IV	1.094	16.7
Waste wood cont. PCB	0.010	0.1
SUM	6.531	100.0

Table 3 shows that the market volume consists of A I / A II as well as A III / A IV respectively one half each. The categories A II and A III respectively have a share of about one third of the total volume. Waste wood containing PCBs has got a share of about 0.1%. It has to be mentioned that double counting's caused by internal trade have not been deducted.

Of the collected 6,2 mill. tons post-consumer wood in 2001 3% is used by the disposal companies themselves. The disposal companies sell the major part of almost 6 mill. tons to other companies. A segmentation of the types of utilization into business size categories shows a similar structure of utilization throughout all groups. Only the largest category with an annual collection of 100,000 tons and more sells the complete volume to other businesses.

Reselling the post-consumer wood can basically be divided into dealing with final consumers and dealing with other post-consumer wood conditioners. Table 4 shows that the reselling of the post-consumer wood is divided into two directions. The data refer to 2001. Furthermore, the table is subdivided into business-sizes. From this the differences in the sales structure between large and small companies become clear.

About 20% of the totally collected post-consumer wood in **2001** is sold from one business to other post-consumer wood disposal businesses. By this 1.2 mill. tons of the wood is resold within the disposal branch before it reaches its final utilization. The share of the resold post-consumer wood depends on the size of the business (amount of collected post-consumer wood). The share of the amounts sold to the final user starts with the small businesses at 26%. It grows continuously and lies at 54% of the annually collected quantities for the mid-sized businesses. For the large companies finally, they reach a share of 100%.

4.8 mill. tons of post-consumer wood is sold directly to the final user in **2001**. Together with the internally used quantity, this corresponds with the quantity of post-consumer wood registered (5.0 mill. tons). On the other hand the quantities merchandized within the branch cannot be included in the total quantity, since this would lead to double counts.

Table 4
Post-consumer wood utilization by company size category (2001)

Company size	Companies N	Resales [mill. t]	To final User		To other conditioners	
			[mill. t]	[%]	[mill. t]	[%]
Up to 499 t	272	0.046	0.012	25.7	0.034	74.3
500-999 t	142	0.093	0.035	37.6	0.058	62.4
1,000-2,499 t	210	0.326	0.124	38.0	0.202	62.0
2,500-4,999 t	13	0.378	0.188	49.7	0.190	50.3

5,000-9,999 t	85	0.532	0.288	54.2	0.244	45.8
10,000-19,999t	56	0.677	0.418	61.8	0.258	38.2
20,000-49,999 t	48	1.219	1.041	85.4	0.178	14.6
50,000-99,999 t	19	1.150	1.146	99.7	0.004	0.3
100,000 t and more	10	1.562	1.562	100.0	0.000	0.0
SUM	995	5.983	4.814	80.5	1.169	19.5

Channel of distribution

The distribution of post-consumer wood by the disposal industry can be subdivided in the part which remains for domestic utilization and in the exported volume. In **2001** 6 mill. tons have been distributed. About 85% is utilized for domestic purposes, 871,000 have been exported. In **2003** the share for domestic utilization increased. Nearly 90% of the distributed volume has been used in Germany. 11% has been distributed to foreign businesses.

Table 5
Distribution inland – export

Distribution to	2001		2003	
	[mill. t]	[%]	[mill. t]	[%]
Inland	5.112	85.4	6.291	89.3
Export	0.871	14.6	0.751	10.7
SUM	5.983	100.0	7.042	100.0

The share of the exported volume in 2003 corresponds with the data Mantau and Bilitewski (2005) have presented. They numbered an exported share of about 11% according to a volume of 718,000 tons.

Table 6 displays the domestic distribution of post-consumer wood in 2001 and 2003. In **2001** the predominant domestic share of the post-consumer wood is supplied to the energetic utilization (49%) and the domestic timber-derived product industry (26%). The share of post-consumer wood to be discarded lies at about 1%. Domestically an amount of 37,000 tons are discarded. Large amounts of the post-consumer wood for the “Others” substantial utilization is sold to composting facilities.

Table 6
Domestic distribution

Purchaser inland	2001		2003	
	[mill. t]	[%]	[mill. t]	[%]
Panel industry (substantial)	1.309	25.6	0.958	15.2
Composting/other (substantial)	0.090	1.8	0.053	0.8
Energetic utilization	2.506	49.0	4.345	69.1
Other p.-c. wood disposers	1.169	22.9	0.734	11.7
Commodity trade*	-	-	0.122	1.9
Disposal	0.037	0.7	0.012	0.2
Others	0.001	0.0	0.067	1.1
SUM	5.112	100.0	6.291	100.0

* Data cannot be displayed for 2001

In **2003** about 6.3 mill. tons have been distributed domestically. The table shows other conditioners as well as commodity traders or disposal. The amount distributed to other conditioners in an internal trade will be sold after further conditioning. Energetic utilization has the highest share with about 70%. 15% is distributed to the panel board industry for material utilization. Composting, disposal or other respectively have a share of about 1% or less. Other conditioners or commodity trade are taking 12% and 2% respectively. To which kind of user of post-consumer wood this volume is sold cannot be calculated on the basis, but most likely will it is sold to particle board producers.

In 2001 the export share lies at about 15%. With 696,000 tons, the largest share of the recorded export goes to the foreign timber-derived product industry. With this a total of 2 mill. tons post-consumer wood is taken by the timber-derived product industry. The share of the exported post-consumer wood that is energetically used lies at an amount of 174,000 tons (20%). With a total of 2.7 mill. tons more than 50% of the post-consumer wood is used energetically domestically and in foreign countries, of which the biggest share (2.5 mill. tons) is used domestically.

Table 7
Export

	2001		2003	
	[mill. T]	[%]	[mill. T]	[%]
Purchaser export				
Panel industry	0.696	79.9	0.536	71.4
Composting/other (substantial)*	-	-	0.000	0.0
Energetic utilization	0.174	20.0	0.193	25.7
Other p.-c. wood disposers*	-	-	0.022	2.9
Commodity trade*	-	-	0.000	0.0
Disposal	0.001	0.1	0.000	0.0
Others*	-	-	0.000	0.0
SUM	0.871	100.0	0.751	100.0

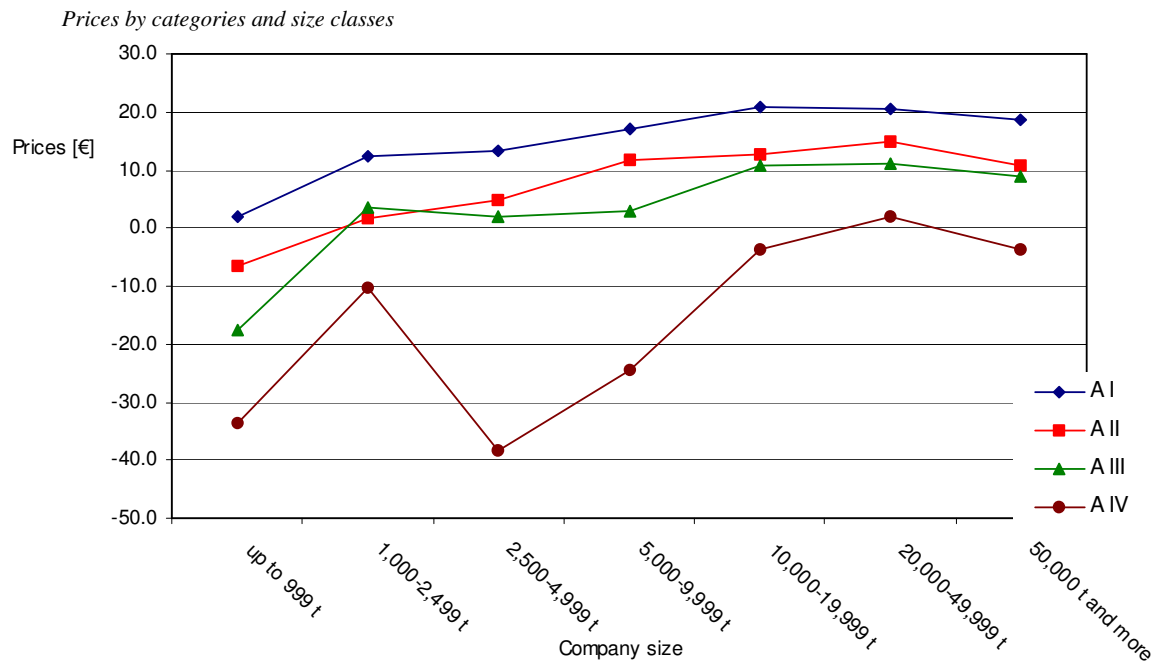
* Data cannot be displayed for 2001

In 2003 the export of post-consumer wood subsumes to 750,000 tons. Most of this is distributed to foreign panel board industries. For energetic consumption about 200,000 tons are exported. Other conditioners just take a small share of 3% of the exported volume.

Prices of post-consumer wood

Beside the structure of distribution and of the contractual situation the disposal industry has been questioned for prices of the post-consumer wood sold. In the following figure the results are displayed. It has been differentiated by company size classes and category (A I to A IV).

Figure 1



Two fundamental conclusions can be drawn. As expected, on the one hand the price for distributed post-consumer wood is higher the better the quality (here: lower contamination) is. The figure displays a strong correlation of quality and price. On the other hand, the prices are increasing with the size of the disposal unit. This might be due to a better sorting and conditioning of the bigger businesses.

The Netherlands

Volume of post-consumer wood

To obtain a realistic picture of the rather obscure market for used wood in The Netherlands the results of previous studies and literature sources have been analysed, in addition to questionnaires which have been sent out to the most important companies involved in waste wood handling. It was a deliberate choice to focus on companies involved in logistics, sorting and trading of used wood because they are active at the downstream end of the supply chain, which involves only a limited number of companies. They, on their turn, are being supplied by a very large number of small companies which collect the used wood at various sources. Focussing on the collectors was not considered a viable option, partly due to the large number of companies involved but also due to the non-transparency of the waste collecting sector. To limit the risk of double-counting the focus has been at the rear end of the supply chain instead.

Questionnaires have been sent to 23 companies in total, of which 18 (74%) have responded. These companies represent 90% of all waste handling in The Netherlands. Table 8 gives a distribution of their company size. When extrapolated to 100% of all used wood trading, the total volume will be some 1.39 mill. tons (air dry).

Table 8
Size distribution of companies involved in logistics, sorting and trading of used wood in The Netherlands, representing 90% of all used wood trading

Company size	Number of companies		Amount of used wood	
	N	%	kton	%
up to 4.999 t	3	17	9	1
5.000 - 10.000 t	2	11	20	2
11.000 - 20.000 t	2	11	40	3
21.000 - 50.000 t	6	33	226	18
51.000 - 130.000 t	2	11	205	16
Over 130.000 t	3	17	750	60
Total	18	100	1,250	100

Origin

Table 9 summarizes the estimated amounts of used wood produced by primary disposers in The Netherlands, on the basis of official statistics and other studies.

Table 9
Summary of the amounts of used wood produced by primary disposers in The Netherlands

Primary disposers	Amount (kton/a)
Private households	289
Industrial producers	578
Construction and demolition sector	370
office, shops and services sector	153
Total	1,390

Used wood from private households collected in municipal waste yards

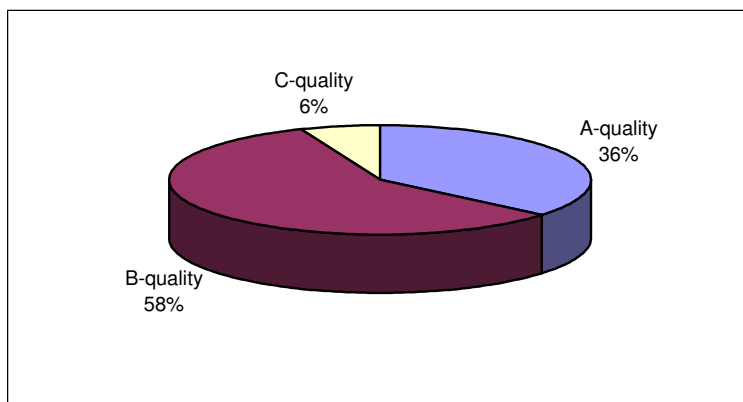
The amount of used wood (excluding prunings from gardens), which municipalities collect in their waste yards, has increased since the year 2000 from 225 kton to 289 kton in 2003. This corresponds with annual 'production' of approximately 19 kg of 'waste wood' per citizen, excluding prunings. Much of the wood fraction in coarse domestic waste consists of C-quality wood, such as garden wood contaminated with chemical preservatives.

Categories

In an earlier market assessment by Probos in 2003 the most important traders of used wood have been interviewed. The total volume of used wood which became available in 2003 in The Netherlands was estimated to amount 1.39 mill. tons. Figure 2 gives the division of used wood into A-, B- and C-quality classes in the 2003 assessment. A-quality is clean wood, B is slightly contaminated and C quality is wood contaminated with hazardous substances.

Figure 2

Division of A-, B- and C-quality wood in the total used wood stream in the Netherlands in 2003 (100% = 1,390,000 ton)



Channel of distribution

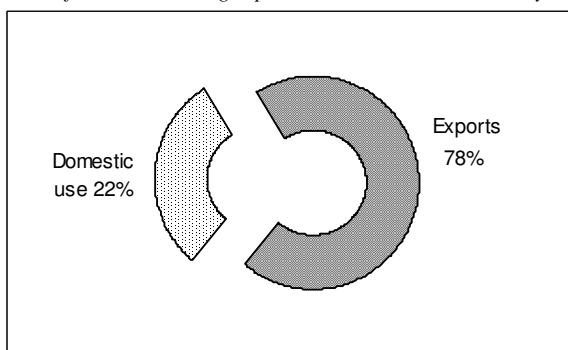
Table 10 and figure 3 indicate that very little used wood is being utilised in The Netherlands (22%). Only A-quality wood is utilised to a significant extent: about 130 kton has been used by the company Presswood Recycling for the production of pallet blocks and single use pallets of pressed wood. In addition, some 60 kton of used wood has been used for the production of energy pellets. Approximately 50 kton of B-quality wood has been used by Dutch utilities for the production of bioenergy. C-quality wood is hardly being burned anymore in Dutch waste incineration plants, but is being exported instead, as biofuels to utilities abroad, mainly to Germany.

Table 10
Availability of used wood in The Netherlands

Categories	Total, kton	Use in NL, kton	Exports, kton
A-quality	495	215	280
B-quality	705	50	655
C-quality	50	15	35
Total	1,250	280	970

Figure 3

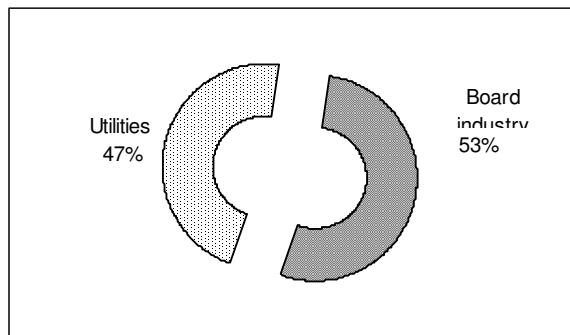
Share of used wood being exported and utilised domestically



In 2003 over three quarters of the total amount of used wood has been exported (totalling 970 kton). Over half the amount of A-quality wood (56%) was shipped abroad, whereas most of B- and C-quality wood has been exported with 93% and 70% of their total volumes respectively. Over 58% of the export of used wood goes to the board industry in Germany, Belgium and Italy. About 41% of the export volume goes to utilities in Germany and Sweden. Especially the German utilities have a large market share of 36% of total exports of used wood.

Country exported to	Board industry, kton	Energy companies, kton
Germany	168	353
Belgium	148	0
Sweden	0	48
Italy	250	0
Total	566	401

Figure 4
Share of the exported volume of used wood used by utilities and by the board industry (100% = 970,000 ton)



Prices

To get an indication of prices for used wood three companies have been interviewed. In addition the “Informationsbrief-Holz-Zellstoff-Papier” of Casimir Katz has been consulted to get an impression on comparative used wood prices for the German market. Data concern buyer’s prices for collected used wood and sellers prices for broken and shredded wood. All informers gave a scope of prices levels, which illustrate that non-quantifiable factors too affect wood prices, such as the quality and amounts of used wood being delivered at the timber yards. The traders were reluctant to give specific information on average prices. However, the price indications provided by the used wood traders corresponded with each other remarkably.

Buyers prices are based on professional supplier, which include small suppliers who deliver volumes as small as 800 to 1200 tons per year. Sellers prices are based on delivery prices at the gate of the board industry in Germany and Belgium and energy companies in Germany. They include the transports costs. Table 12 indicates that the board industry is willing to pay more for their raw material (A- and B-quality wood) than the utilities are prepared to pay. The utilities are facing a weak market position in the future supply of woody biomass. There is very little competition on low grade C-wood, but the amount of which is very limited. However, a study by SHR Timber Research suggest that the amount of C-quality wood will increase rapidly the coming years.

Product	End-use	Price in Euro per ton
A-quality wood	Board industry in Belgium and Northwest Germany	20 – 30 euro/ ton air dry
B-quality wood	Utilities in NW-Germany	7 – 15 euro/ ton air dry

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