# The legend of the woody biomass reserve in Europe

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Content



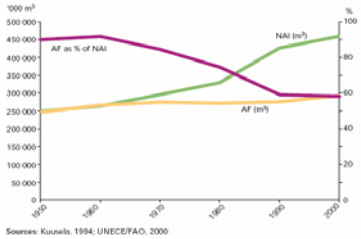




**The difference between "net annual increment" and „actual felling" is normally seen as biomass potential.**

**This lumps completely different things together!**

Net annual increment (NAI) and annual felling (AF) of the growing stock of forest for the EU — Figure 2.4.4.




Sources: Kuusela, 1994; UNECE/FAO, 2006

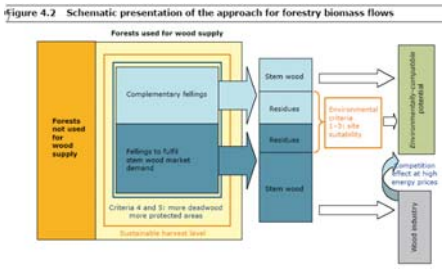




**The EEA concept of complementary fellings is based on the comparison of inventory data with actual fellings.**

**This leads to a huge overestimation of woody biomass reserve!**

Figure 4.2 Schematic presentation of the approach for forestry biomass flows




Source: EEA Report / No 7/2006 How much bioenergy can Europe produce without harming the environment? p.36





**For a better understanding:**

## Definition of "complementary fellings"

- ".., the gap between the level of fellings and the increment in growing stock provides an opportunity to use forestry biomass that currently remains unexploited as a source of renewable energy. This opportunity is identified as complementary fellings."
  (EEA Report, No 7/2006 How much bioenergy can Europe produce withour harming the environment, p 31)

- This does not include the following biomass reserves:
  - reserves as a result of over-mature forests
  - reserves form forest rest wood (branches, needles)
  - reserves from unused fellings

**The EU covers 160 M ha forest growing about 574 M m³ NAI.**

## The legend

- EU forest based industries use only 55% (315 M m³)
- Logically, EU forest resources can be more intensively used E.G. a felling rate at 85% of NAI would yield an extra 173 M m³
- The recent EEA study estimated that an extra 23 M toe (126 M m³) could be used without ecological impact.





## Why is the woody biomass reserve in Europe a legend?

There is a huge difference in definition between inventory data and actual fellings:

- EU inventory data are calculated over bark
- inventory data include harvest losses
- inventory data includes unused fellings
- actual fellings do not include unregistered fellings





| **inventory** (in M m³) | DE 2002 | EU 1997 |
|---|---|---|
| net anual increment in M. m³ | 97,9 | 574 |

Based on data of the German forest inventory the net annual increment in the EU is differentiated into parts.

This is only a first approximation, but gives a much better estimation on available biomass than the simple comparison of NAI and actual felling.

Source of EU growth and felling: DG ENTR/I/3/JW RES WG 2/2006, Summary of the biomass meeting of 26/09/2006, p.8





EU calculations made on shares in Germany

| **inventories** | DE 2002 | DE % | EU 1997 |
|---|---|---|---|
| NAI in M. m³ (VFm) | 97,9 | 100,0 | 574 |
| additional biomass to NAI – further technical potential | | | |
| wood under 7 cm diameter | 18,0 | 18,4 | 106 |
| needles | 5,6 | 5,7 | 33 |





EU calculations made on shares in Germany

| | DE 2002 | DE % | EU 1997 (?) |
|---|---|---|---|
| net anual increment in M. m³ (VFm) | 97,9 | 100 | 574 |
| **bark and losses** | **20,5** | **20,9** | **120** |
| felling volume (EFm) | 77,5 | 79,1 | 454 |
| unused stemwood *) | 10,8 | 11,0 | 63 |
| **usable felling potential** | **66,7** | **68,1** | **391** |

**Why are bark and losses no biomass potential?**





## Why are bark and losses no biomass potential?

**Bark**

- is almost completely delivered to wood industry, even though timber is measured under bark.
- Thus, actual fellings are calculated under bark, but bark is taken out from forest – inventory numbers must be „debarked“, when compared with fellings.

## Why are bark and losses no biomass potential?

**Losses:**

- cutting kerf
- felling wedge

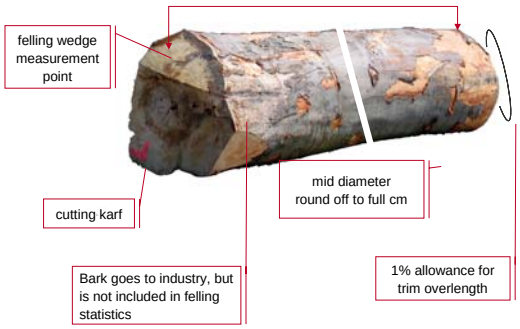
most important:

- measurement reductions on diameter and length (allowance for trim, overlength)

Thus actual fellings are calculated „reduced“ (underestimated), more timber is taken then sold – inventory numbers must be „demeasured“, when compared with fellings












**Fellings not registerd in Germany (preliminary results)**

| | 1987 | | 2005 | | Average 1987 - 2005 | |
|---|---|---|---|---|---|---|
| | M m³ | % | M m³ | % | M m³ | % |
| **registered fellings** | 28,7 | 82,9 | 56,9 | 76,7 | 41,0 | 83,9 |
| **Not registered** | 5,9 | 17,1 | 17,3 | 23,3 | 7,9 | 16,1 |





EU calculations made on shares in Germany, 16 % unregistered is the average unregistered fellings between 1987 and 2005

wood potential for forest industries in M. m³

| wood potential in M m³ | DE 2002 | EU 1997 |
|---|---|---|
| usable for industry | 66,7 | 391 |
| fellings | 42,5 | 315 |
| unregistered fellings (16% EU) | 13,7 *) | 50 |
| **Reserve for so called complementary fellings** | **10,5** | **26** |

**This is a technical reserve!**
**It is not taken into consideration that quite a lot of forest owners arn't doing any fellings!**
**The reserve for complementary fellings is a legend !!!**

*) yearly number vary; DE 2002 24,4 %; avarege 1987 to 2005 16,1%; EU was calculated with 16%.





German wood resource balance **2004** in M m³

| resources | | consumption | |
|---|---|---|---|
| sawlogs | 33.6 | 33.6 | sawmill industry |
| pulpwood | 21.0 | 19.4 | panel industry |
| forest residues | 7.1 | 8.5 | pulp industry |
| sawmill by-products | 11.8 | 2.7 | other mat. utilisation |
| bark | 2.4 | 11.3 | big BPHP > 1 MW |
| other ind. residues | 4.1 | 3.6 | small BPHP < 1 MW |
| post-cons. wood | 11.0 | 12.3 | private households |
| urban wood | 0.3 | | |
| total | 91.4 | 91.4 | total |

Available resources (market volume) for material and thermal utilization

Consumption for material and energy purposes

**short rotation plants → additional sectors ← btl – biomass fuels**





German wood resource balance **2002** to **2005** in M m³

| supply | | | | demand | | | |
|---|---|---|---|---|---|---|---|
| | 2002 | 2005 | Δ | Δ | 2005 | 2002 | |
| sawlogs | 30,3 | 62,4 | 14,9 | 6,9 | 37,2 | 30,3 | sawmill industry |
| pulpwood | 17,2 | | | 3,3 | 20,5 | 17,2 | panel industry |
| forest residues | 7,6 | 9,9 | 2,3 | 3,4 | 9,8 | 6,4 | pulp industry |
| sawmill by-products | 10,4 | 13,0 | 2,6 | -0,2 | 2,7 | 2,9 | other mat. utilisation |
| bark | 2,2 | 2,6 | 0,4 | 5,7 | 15,5 | 9,8 | big BPHP > 1 MW |
| other ind. residues | 4,1 | 4,1 | - | 0,2 | 3,6 | 3,4 | small BPHP < 1 MW |
| post-cons. wood | 10,0 | 11,0 | 1,0 | 4,2 | 20,7 | 12,3 | private households |
| urban wood | 0,6 | 2,8 | 2,2 | | -4,2 | | househ not bal. |
| total | 82,4 | 105,8 | 23,4 | 23,4 | 105,8 | 82,4 | total |

Available resources (market volume) for material and thermal utilization

Consumption for material and energy purposes

**Material uses increased even more than energy uses!**

**2005: preliminary data; wood residues & post consumer wood have not been determined yet. The demand of panel boards is lightly overestimated**

*Summary of wrong assumptions in the* ***EEA-report 7 / 2006***

**NAI and official fellings cannot be compared directly!**

- Wood industry consumption is not stable. In recent years it has been grown in Germany even more than energy consumption!
- Bark is treated as available volume, losses are not taken into account and unregistered cuttings are not seen at all.
- It is very generous to take an **additional** 5% out of production, but it is an unworldly dream based on a complete misunderstanding of forest reality.



*Reserves*

**Where are the reserves of woody biomass?**

1. **Forest rest wood**
2. **Trees above rotation rate**
3. **Rotation rate itself**
4. **Energy plantations**
5. **Trees outside forests**
6. **Definition of sustainability in wood production**



*Reserves – 1. Forest rest wood*

**Estimation of 100% potential of energy wood – possibly 33% can be harvested and used.**

| Energy wood | DE | | EU |
|---|---|---|---|
| | M. m³ | % | M. m³ |
| unused stemwood | 10,8 | 31% | 63 |
| wood under 7 cm diam. | 18,0 | 52% | 105 |
| needles | 5,6 | 17% | 33 |
| **technical potential** | **34,4** | **100%** | **201** |

EU calculations made on shares in Germany



*Reserves – 1. Forest rest wood*

**Estimation of 100% potential of energy wood – possibly 33% can be harvested and used.**

| Energy wood | DE | | EU |
|---|---|---|---|
| | M. m³ | % | M. m³ |
| **technical potential** | **34,4** | **100%** | **201** |

**The realistic economic biomass reserve for energy wood is most likely much smaller than 100 M m³. It is located in assortments hardly used today because of the cost price ratio.**



*Reserves – 2. Trees above rotation rate*

**WEHAM – Scenarios (future harvesting potential in Germany)**

When all trees which have passed rotation rates in Germany are felled, then 500 M m³ could be used above actual felling or 25 M m³ for 20 years .

**Attention:**

**This is only a restricted reserve for some time, but offers a time window for other activities.**



*Reserves – 3. Rotation rate itself*

Calculation on available woody biomass is based on rotation ration rates.

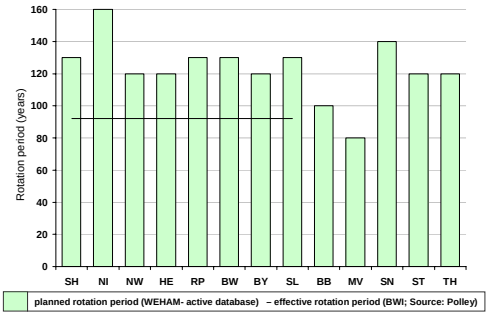
The following figure presents the assumed rotation rates by counties in Germany for spruce within the WEHAM-model for future allowable fellings.

The assumed ones are in average much higher (120 years) then the realized ones (under 100 years). Assuming the sustainable realized ones of the past the potential felling volume in the future would be higher.

Thus, we need a discussion on sustainable rotation rates based on targets.

*Reserves – 3. Rotation rate itself*

Realized (BWI; 1987-2002) and assumed (WEHAM; 2003-2017) rotation rates [Source: Dieter, M. Institut für Ökonomie, BFH, 2005 unpublished]






*Reserves – 4. Energy plantations*

**Energy plantations are an additional reserve – other topic, no comment**



*Reserves – 5. Trees outside forests*

**Trees outside forests like urban wood are an additional reserve – other topic no comment**



*Reserves – 5. Sustainability*

**Sustainability:**

- It is not sufficient to say: don't cut more wood than the amount regrowing!
- Forests exceeding their average rotation rate lead to decreasing grows over the years.
- To cut on the level of growth means in this case, to cut less every year.
- We need a much more differentiated comprehension of sustainability of our natural resource.



*Reserves – 5. Sustainability*

**Dynamic sustainability of forest natural resources**

| | |
|---|---|
| 1 | The annual growth rate is an indicator of forest land but not the only target for its utilization! |
| 2 | Sustainability of natural resources is guaranteed by<br>- preservation of forest area<br>- recultivation<br>- preservation of soil vitality |
| 3 | Rotation rates set a framework for utilization under different targets, but they are not solely based on growth rates. |



*Reserves – 5. Sustainability*

**Examples for rotation rates calculations:**

… rotation rates that transfer forests from old unproductive stands under time conditions into continuous use with higher production rates.

… rotation rates that optimize $CO_2$-binding (segregation).

… rotation rates that optimize wood production for material and energy uses.

... and much more.

Altogether this leads to a band of utilization options within which policy can make time depending decisions. However, the basic data must be valuable!

**Conclusions (1)**

Altogether the potential of woody biomass
in Europe for energy purposes
may add up to an additional
100 Mio. m³ per year or even more,
but this potential is not standing in forests,
waiting to be cut like we did before.

Most of it comes form sources not utilized so far
or require another comprehension of sustainability of
our natural forest resource.

There is a lot of work ahead to develop these
new resources as well as the new comprehension.





**Conclusions (2)**

- Unused forest resources in a traditional way
  (complemetary cuttings) may be a bit higher
  than this first calculation has shown (approx. 25 Mio. m²)
  but are much smaller than in the EEA-report calculated.

- Much better decision oriented knowledge
  on the available resource has to be developed.
  It means more then counting trees, it means
  understanding the structure and unsability
  of the forest resource!





**Conclusions (3)**

**Further reserves can be found in**

- \+ Forest rest wood
- \+ Trees above rotation rate
- \+ Rotation rate itself
- \+ Energy plantations
- \+ Trees outside forests
- \+ Definition of sustainability in wood production

***How do the drawn conclusions impact on policy?***



***The legend of the woody biomass reserve in Europe***