

Subject:

**Reports on woody bioenergy from forest residues and hedgerow maintenance in the project region Rotenburg (Wümme), Germany
- Summaries in English -**

1. Fuelwood from currently not utilised resources (results from technical trials).

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The aim of this work package is to define new resources for a sustainable use of wooden biomass for energetic purposes which do not compete with food or material utilisation and to increase the energy independency of the pilot region.

The first task is focused on harvest of fuelwood from landscape care which was in the past mostly harvested with regard to care and not with the intention of energetic use.

The main problems are at first the lack of data in literature, so that an own investigation had to be started, second problem is the classification of the potential in a theoretical, technical or cost-efficient way and third problem is that up to now the harvesting process of this assortment has not yet been evaluated and optimised systematically under economical aspects.

The main focus of this task was put on the harvesting-process-chain and the possibilities for its optimization. Therefore the data collection of the continuous reading method was used. The different parts as harvesting, bundling, forwarding and chipping were evaluated and show very clear results. The most important result is to avoid duplication of work by better organisation of the harvesting steps and better adaption of the harvesting technologies to the specific requirements.

The second task is focused on gaining fuelwood from forest residues in the way of increasing the utilisation factor without having a negative impact on the sustainability. To assure a smooth process it is necessary to inform the machine operator before starting. So from the beginning both assortments can be handled separately. As well as in the first task the continuous reading method was used for evaluating the harvesting, forwarding and chipping. Due to the fact of a better opening up fully established process chains and well experienced machine operators the results show a much higher efficiency than in the first task.

Beyond these results which stand for the absolute technical perception it is mandatory to spread the relevant information as well as to integrate all partners and the publicity in a very sensitive way. To reach the aim it is necessary to create a seminar dealing with the abilities and the basic conditions to

inform these target groups e. g. landowners, municipalities, entrepreneurs, nature conservancy and keep them stick to the project.

Apart from that the whole tasks show that it is very important to change our view of waste in the way of being a secondary resource and to communicate this to the public.

2. Wood chips out of land scaping residues and a pine thinning (report on laboratory analyses)

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In the Bioenergy Promotion model region Rotenburg/W. field experiments for the harvest of wood chips out of land scaping residues and a pine thinning were realized.

The wood chips, gained out of the land scaping residues had the consecutive numbers from 10153 till 10155 and the wood chips out of the pine thinning the consecutive numbers from 10914 till 10916 for the analysis in the laboratory.

The samples were analysed for the moisture and ash content, the heating value and the particle size distribution according to the CEN 14961.

The moisture content of both wood chips samples (land scaping residues and pine thinning) is in the expected range from 45-60% (HARTMANN, 2001) for green wood.

The ash content of both samples is very low. The material out of land scaping residues normally has higher ash contents due to the fact that the wood has an adverse wood/bark-relation. A huge bark fraction or a huge fraction of green needles in the wood chips (compare with photos) leads to higher ash content.

For the heating value, the analysed data expect the data out of the references. Only a low moisture content leads to higher heating value because you don't need the energy to dry the wood chips before burning them. The context between heating value and moisture content can be viewed in the attached graphic on the last page.

The particle size distribution of both wood chips samples cannot be compared, because for the later analysed pine wood chips, there was added an new class according to the EN 14961. It stands out that the fraction of fine material (particles till the size of 16 mm) is very high in both wood chips samples. This can be optimized with adjustments in the chipping process.

At least the analysed data is according to other references (CREMER 2007, NEFF 2007). For a better handling and storage of the wood chips, the particle size distribution should be ruder, according to the results of SCHOLZ, 2007.

3. Scenarios on woody bioenergy potential from logging residues in private and municipal forests

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The county of Rotenburg (W.) is one out of 15 model regions of the Bioenergy Promotion project. The County administration with its Bioenergy Network strive for encouraging local investments in wood-based bioenergy, as, besides private fuelwood users, the number of local customers like enterprises and public buildings is currently very limited.

For this purpose, the regional potential of logging residues in private and municipal forests was estimated, based on forest inventories. A number of parameters, however, are still uncertain, as

- The additional biomass from tops and branches, calculated from the yield data for sawlogs and pulpwood.
 - The output from extensively managed forests on mires and heathland areas
 - The share of wood in dimensions, which principally would be suitable for material processing, but are substandard in terms of quality
 - The share of sites, where bioenergy extraction is not recommendable due to nutrient losses.
- Therefore, scenarios were calculated in order to estimate the lower and upper level of energy wood availability, enabling more precise assessment, when relevant parameters would become more reliable. The lowest biomass volume estimated amounts up to appr 3,500 to dry matter/y, whereas more optimistic versions would offer almost 9,000 to dry matter/y.

Additional aspects to be considered will be

- Interdependencies with the market situation for pulpwood and sawlogs
- Uncertainties about the actual nutrient situation and the option for woodash recycling
- Management behaviour of different ownership groups including availability of energy wood from state forests
- Availability of resources from maintenance operations, for which no inventory data are available
- Additional resources from maintenance of hedgerows in the landscape
- Management of commercially un-used forests

The County administration had elaborated a list with 214 public buildings, for which the accumulated demand for heat energy in 2006 was 48 GWh. Depending on the scenario, the demand could be satisfied from logging residues in private forests between 36% and 95%. Adding the estimated output from hedgerow maintenance along municipal and county streets and roads, the respective figures would mount up to 109% and 166%.

It would be extremely desirable, if large-scale investments into heat or CHP-plants would be implemented on short notice, since, due to the good market situation for industrial wood grades, an extraordinary high share of logging residues is currently available.

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4. Estimation on availability of woody biomass from hedgerow maintenance along county and municipal streets and roads

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The Bioenergy Initiative of the Economic Development Unit of the Rotenburg (W.) County Administration closely co-operates with the INTERREG IVB BSR project BIOENERGY PROMOTION. Overall target is the assessment and further development of woody biomass resources, not competing with food or solid wood production. Though forest resources in the county are limited, hedgerows in the open landscape play a significant role for biodiversity, but need, specifically if located along public roads, frequent maintenance. This type of operation is costly, but energetic use of the cuttings may contribute in co-financing maintenance measures.

In order to estimate the potential as well as strengths and weaknesses in a pre-feasibility study, a sample of 300 plots was investigated along municipal and county roads and streets, describing for 200 m each

- the share of accompanying tree and shrub vegetation on the left and on the right side
- the structure of the vegetation: tree- or shrub dominated or mixed
- the estimated time span for the next maintenance operation in the coming decade (1st, 2nd, 3rd period)
- the general environment (urban or rural)
- the public owner and thus, the responsible party for maintenance (municipality or county)

Tree-dominated hedgerows are most frequent, specifically along county roads, whereas there are almost no shrub-dominated hedges. Appr. one third each of the hedges shows medium or low density. Half of the vegetation will need maintenance only after appr. 6 years, 10% in the coming 3 years. This fact is important against the background of a potential investor for a bioenergy plant, demanding continuous woodchip supply. Appr two thirds of the hedges are situated along rural roads, which would make maintenance and biomass harvesting easier than in settlements with dense housing structures and traffic.

Estimating the output of biomass, the investigation referred to other existing and current projects and research, where obtained biomass volumes were measured:

	loose m ³ /100 m in coming decade		
Density =>	1	2	3
tree-domin.	1	10	20
mixed	3	15	25
shrub-domin.	2	10	15

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The corresponding energy output is estimated by 6.500 to dry matter, mainly to be obtained from maintenance of municipal roads and streets.

Chemical analyses showed a low ash content of appr. 1,5% from dry matter biomass from hedgerows.

Additional aspects, which might modify the quantity and temporary availability of the material, are:

- General concepts and strategies, perceiving the operations as a harvesting rather than a controlling measure
- Optimal planning, as, according to German environmental legislation, the felling or pruning of trees and shrub outside forests is allowed only from October to February
- Optimisation of the equipment used, as locally available technology is mostly suitable only for shrub control, though harvesting technology is available in other regions and countries
- legal aspects, specifically, if hedgerows in private property shall be integrated in a further stage of the woody biomass strategy
- Economic aspects: Optimal planning and the need for bigger local energy consumers in order to minimize transport costs are crucial in the given situation.