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Comparison of the Energy Recovery and Usage of Compost from Green Waste under Aspects of Primary Resources

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Abstract
The German Biomass Regulation (§2 and §3) allows the use of bio and green waste for energy recovery, including electricity generation. This implies governmental support for energy recovery of this waste. The sponsored amount – calculated through the calorific value – ranges between 85 and 160 €/t.

The aim of the governmental promotion is to substitute primary resources by using renewable primary products - particularly to generate a positive effect on the greenhouse gas situation with regard to power generation.

A positive influence on greenhouse gases emissions can also be achieved through the recovery and use of green waste – especially as compost and a turf-substitute – although this procedure currently is not supported in Germany.

A direct comparison of the two alternatives is not available in the current scientific literature.

The research project includes the creation of a database containing all relevant data about green waste and its products, amongst others soil conditioner, substitute for fertilizer, turf, fuel from biomass etc. especially under the aspect of carbon dioxide. In addition a comparative balancing of different technical plants is elaborated.

The research project, already examined by the Universität Stuttgart, in cooperation with Humus and soil cantor (HEKO), Neu-Eichenberg is sponsored by the EdDE (Entsorgungsverband der Deutschen Entsorgungswirtschaft).

1 Introduction
According to § 2 and § 3 of the Biomass Regulation (2001), the use of green waste (from yards and parks) for power generation is allowed. The electricity generated is subject to the regulations of EEG (regulation for renewable energy), which means a monetary support of 4 – 7 € Cent/kWh.

The aim of the governmental promotion is to substitute primary resources by using renewable primary products - particularly to generate a positive effect on

the greenhouse gas situation with regard to power generation.

Unlike energy recovery, material recovery of green waste currently is not supported in Germany.

Humic material in compost although assures a partial storage of carbon, achievable even more efficiently when compost substitutes turf (garden earths and substrate). Turf is in fact a primary resource connected to greenhouse gas emissions through the excavation from moors (moors are sinks of carbon dioxide).

More arguments for the employ of turf substitutes result from economic considerations and partially from business management considerations in soil industries as well. In this context we have to consider the annual need for turf: ca. 10 Mio m^3 p.a., generating an actual annual import up to about 3 Mio. m^3 per year (2003). The German turf reserves will last another 20 years.

Currently ca. 300,000 m^3 compost from green waste are used as turf substitutes. The medium term potential capacity is ca. 1.2-1.8 Mio. m^3 per year, the long term potential capacity is ca. 2.5-3.0 Mio. m^3 per year.

Although there is a need for data regarding energy recovery, it is estimated that ca. 0.5-2.0 Mio. t/a of green waste are treated to recover energy.

Evaluations of the two competing alternatives (energy or material use of green waste) are difficult due to the lack of basic data. Although existing studies and reports do not give a clear preference to one of the two alternatives, no governmental support of material usage is available, whereas the energy use of green waste is promoted (ca. 85-160 €/t green waste).

This current practice needs revision, especially considering the relevance of these benefits.

2 Objectives of the Research Project

Objectives of the research Project:

a) Identification of the advantages and disadvantages of the two mentioned recovery scenarios for green waste, esp. regarding primary resources and CO_2-balances.
b) Instructions/Recommendations for stakeholders in waste management and legislation.

Work - Units:

a) Data mining and analyses on calorific values of green waste (different types of materials, different seasons, different types of output from plants).
b) Data mining on power requirement of technical systems and substitution of primary resources in both recovery scenarios.
c) Calculation of greenhouse gas emissions, including secondary effects.
d) Comparison of the results from c) with other woody energy sources (esp. old timber, wood chip etc.).
e) Valuation of the investigated systems in c) and d), esp. in relation to primary resources and greenhouse gases.

f) Estimation of potential masses/quantities and elaboration of recommendations for future waste management concerning recovery systems for green waste.

3 Data Mining for Green Waste

Samples of different types of green waste and secondary fuel are analyzed in the Laboratory of the University of Stuttgart to create a database with chemical-physical characterization (calorific value, water content etc.), for different seasons and different types of plants.

4 Balances

Process balances will be arranged for the following process units:

Bio-/Green Waste, old timber, wood chips:

- Collection
- Transport
- Treatment 1
- Composting
- Treatment 2
- Transport
- Use

Turf:

- Coverage, excavation, supply
- Raw material transport
- Treatment including packaging
- Transport product (wholesale)
- Transport product (consumer)

Evaluation criteria and borders of balances

The evaluation criteria of the investigated processes are mass flows, energy- and CO_2-balances. The respective borders of the balances result from the concept of „completed recovery“.

5 Conclusion

Both scenarios for the recovery of green waste lead to a reduction of greenhouse gas emissions, although with varying efficiency. Significant savings result from energy recovery as well as from material recovery (similar dimension). Therefore a similar or even equal political treatment – e.g., basing on saved greenhouse gases - is reasonable. The investigation project will also deliver a database and the parameters to provide a basis for future political decisions. First results will be presented in spring 07.

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