COMPARISON OF THE ENERGY RECOVERY AND USAGE OF COMPOST FROM GREEN WASTE: WHAT IS THE IMPACT ON PRIMARY RESOURCES?

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SUMMARY: 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 material recovery and use of green waste – especially as compost and a turf-substitute – although this procedure is currently 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 financed 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 generated electricity 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 is currently not supported in Germany.

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Humic material in compost, though, 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 earth industries as well. In this context we have to consider the annual need of turf: ca. 10 Mio m³ p.a., generating an actual annual import up to ca. 3 Mio. m³ p. a. (2003). The German turf reserves will last another 20 years.

Currently ca. 300.000 m³ compost from green waste are used as turf substitutes. The medium term potential capacity is ca. 1,2-1,8 Mio. m³ p.a., the long term potential capacity is ca. 2,5-3 Mio. m³ p.a.

Although there is a want for data regarding energy recovery, it is estimated that ca. 0,5-2 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 not possible 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 Investigation Project:

a) Verifying relative preferences of the two mentioned recovery scenarios for green waste, esp. regarding primary resources and CO2-balances Bilanz and to develop

b) Instructions / Recommendations for stake holders in waste management and legislation.

Working Packages:

a) Data mining and analyses concerning calorific values of green waste (different types of materials, different seasons, different types of output from plants).

b) Data mining concerning power requirement of technical systems and substitution of primary ressources through both recovery scenarios (energy and material recovery).

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 1, Treatment 1, Composting, Treatment 2, Transport 2, Utilisation
- Peat:
  Coverage, excavation, supply, raw material transport, treatment including packaging, transport of products (wholesale), transport of products (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".

Figure 1 shows the main processes which have to be considered related to the recovery of green waste. A part of the material is more suitable for an energy recovery whereas another part should be used for composting. A third fraction of green waste is suitable for both recovery scenarios.

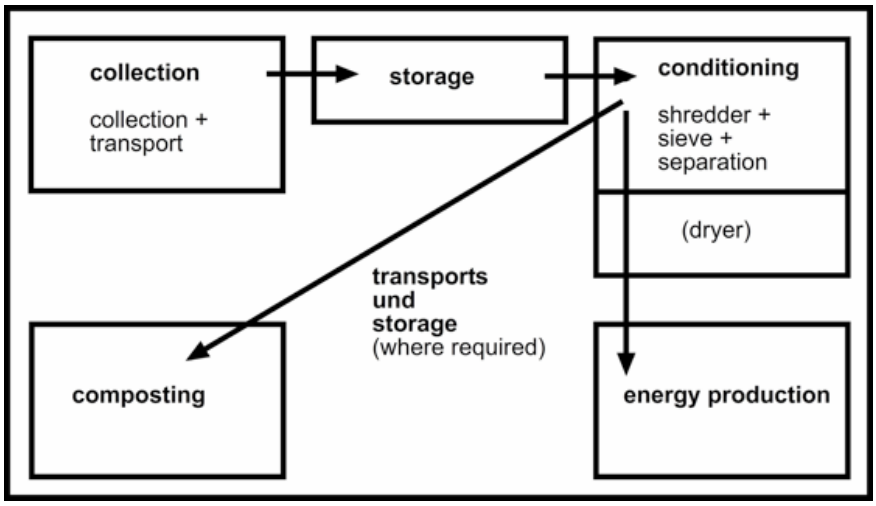

Figure 1 Recovery of green waste: relevant processes

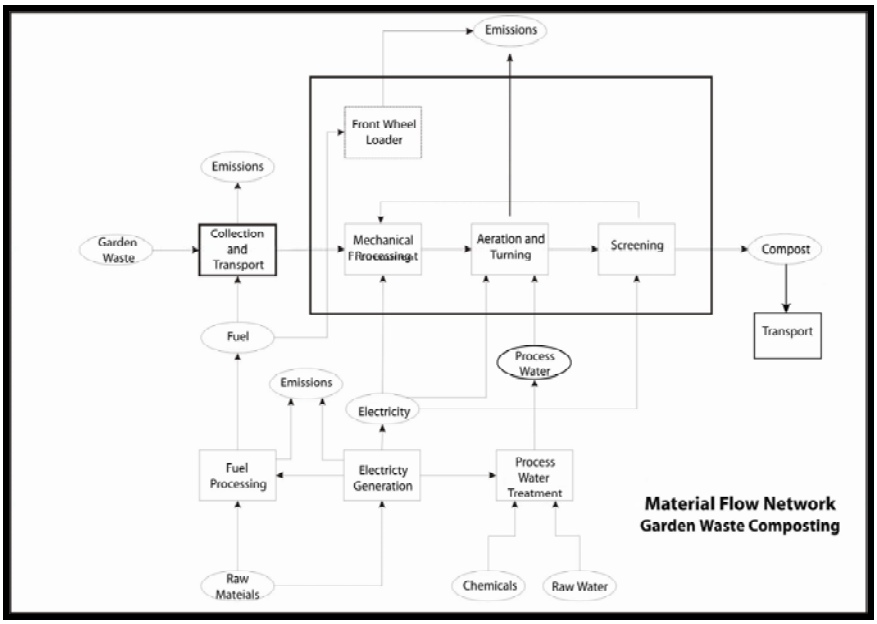

Figure 2 Garden waste composting: material flows

5. FIRST RESULTS

The following figures show examples of results from CO_2-calculations related to different scenarios of green waste recovery. Two time frames are considered: 2 years and 50 years. After 50 years the biomass used for the recovery is renewed (growing of plants). Figure 3 illustrates a positive balance for the energy recovery of raw green waste from spring. The energy recovery for conditioned green waste (screening) is much more efficient (figure 4) and has a similar dimension as the scenario shown in figure 5, where the CO_2-balance for the substitution of german peat by substrates from green waste compost is calculated.

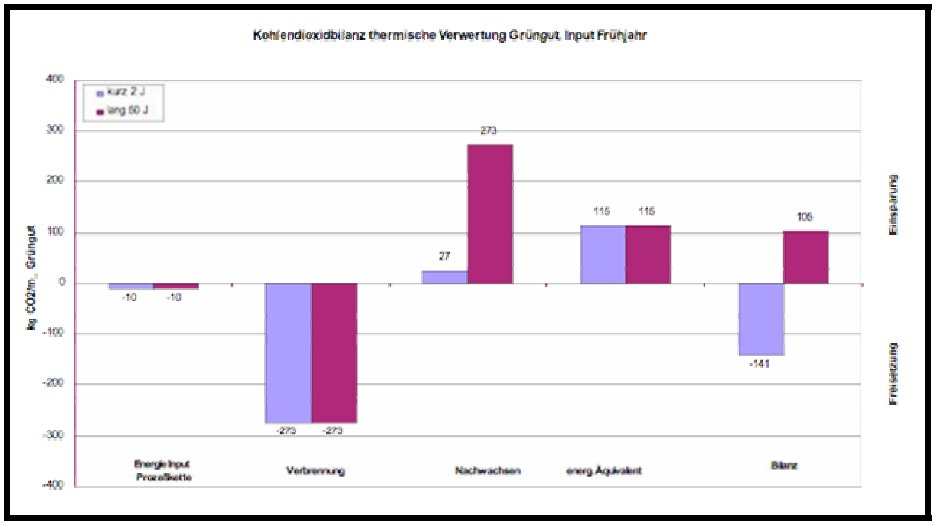

Figure 3 CO_2-balance: energy recovery from green waste (raw, spring)

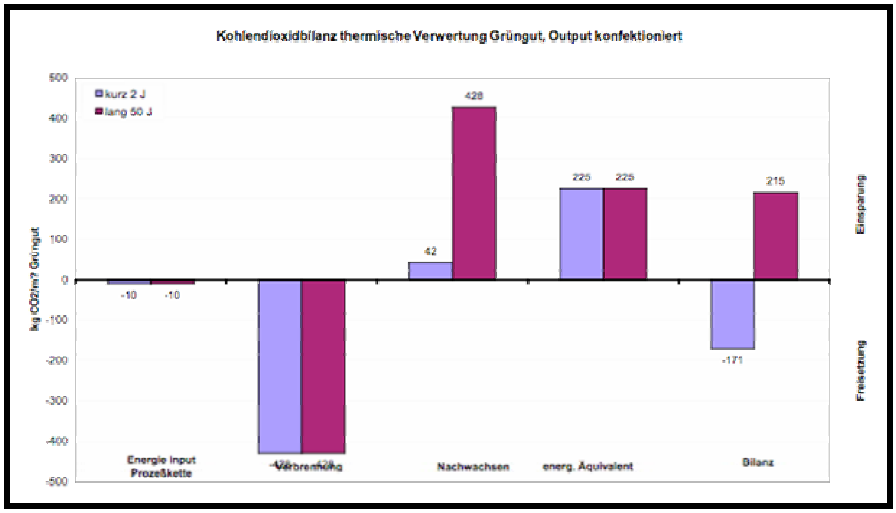

Figure 4 CO_2-balance: energy recovery from green waste (conditioned)

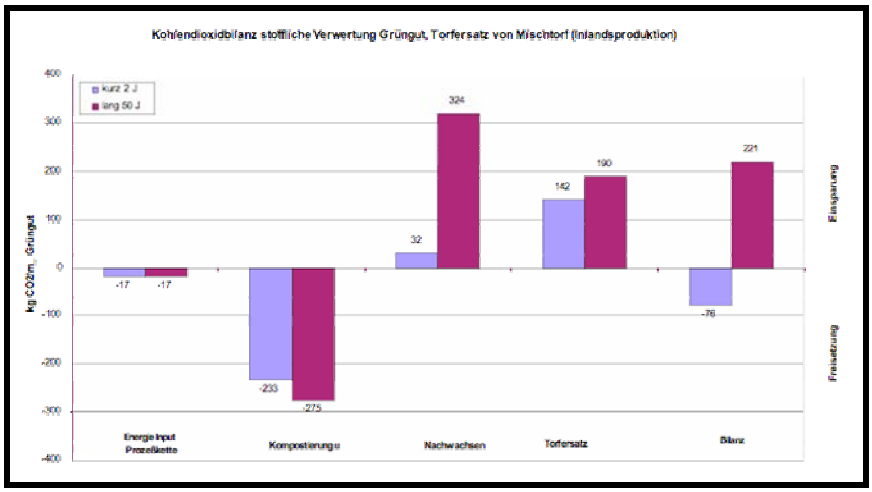

Figure 5 CO_2-balance: material recovery from green waste (substitution of german peat)

6. 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. Final results will be presented within the oral presentation.

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