

Universität Stuttgart

Prof. Dr.-Ing. Martin Kranert  
Institute for Sanitary Engineering, Water Quality and Solid Waste Management

**Comparison of the energy recovery and usage  
of compost from green waste:  
What is the impact on primary resources?**

CODIS 2008  
Solothurn (CH), 27 th – 29 th February 2008

Martin Kranert, Gerold Hafner (Univ. Stuttgart)  
Ralf Gottschall, Christian Bruns (HEKO)

1



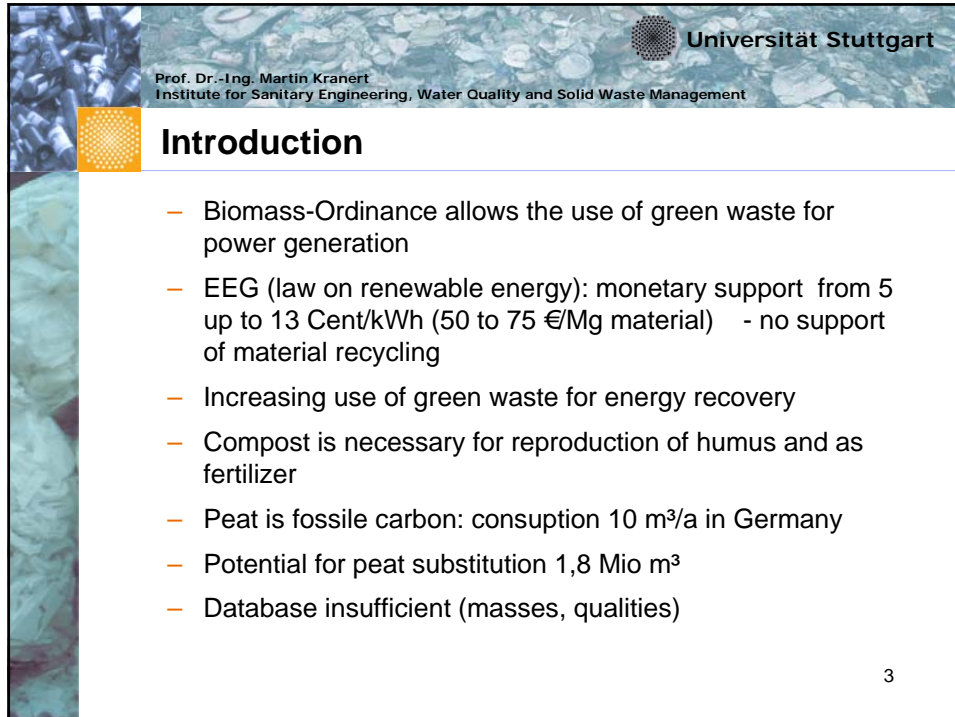
Universität Stuttgart

Prof. Dr.-Ing. Martin Kranert  
Institute for Sanitary Engineering, Water Quality and Solid Waste Management

**Outline**

- I. Introduction**
- II. Aim of the research project**
- III. Methodology**
- IV. Data of green waste**
- V. Process chains**
- VI. Results**
- VII. Conclusions**

2



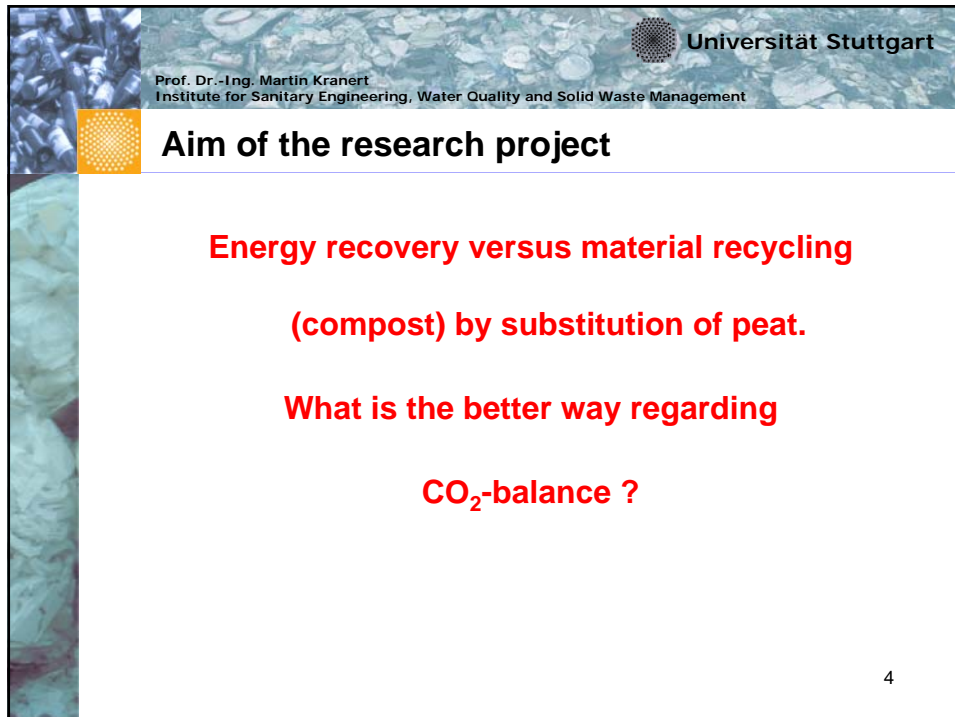
Universität Stuttgart

Prof. Dr.-Ing. Martin Kranert  
Institute for Sanitary Engineering, Water Quality and Solid Waste Management

## Introduction

- Biomass-Ordinance allows the use of green waste for power generation
- EEG (law on renewable energy): monetary support from 5 up to 13 Cent/kWh (50 to 75 €/Mg material) - no support of material recycling
- Increasing use of green waste for energy recovery
- Compost is necessary for reproduction of humus and as fertilizer
- Peat is fossile carbon: consupcion 10 m<sup>3</sup>/a in Germany
- Potential for peat substitution 1,8 Mio m<sup>3</sup>
- Database insufficient (masses, qualities)

3



Universität Stuttgart


Prof. Dr.-Ing. Martin Kranert  
Institute for Sanitary Engineering, Water Quality and Solid Waste Management

## Aim of the research project

**Energy recovery versus material recycling  
(compost) by substitution of peat.**

**What is the better way regarding  
CO<sub>2</sub>-balance ?**


4


**Universität Stuttgart**  
 Prof. Dr.-Ing. Martin Kranert  
 Institute for Sanitary Engineering, Water Quality and Solid Waste Management

## Methodology

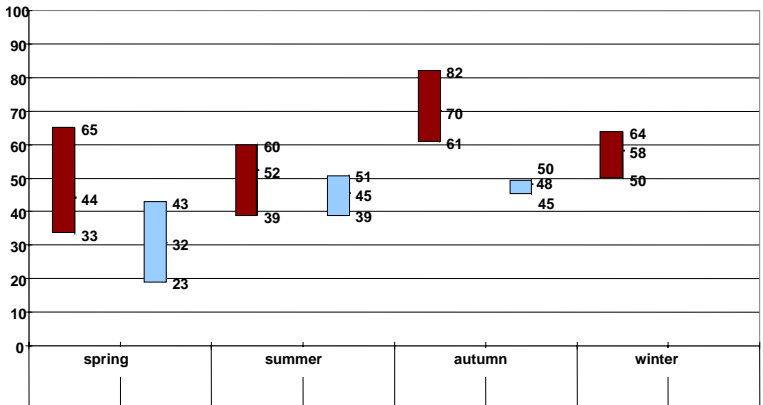
1. Data mining and analyses of green waste
2. Data mining / calculations of energy demand
3. Definition of process chains
4. Calculation of CO<sub>2</sub>-emissions – including secondary effects
5. Comparison of balances: energy recovery of green waste and wood (waste wood + wood chips)
6. Evaluation of the systems
7. Estimation of potential capacity
8. Recommendations for future waste management concepts

5


**Universität Stuttgart**  
 Prof. Dr.-Ing. Martin Kranert  
 Institute for Sanitary Engineering, Water Quality and Solid Waste Management

## Water Content

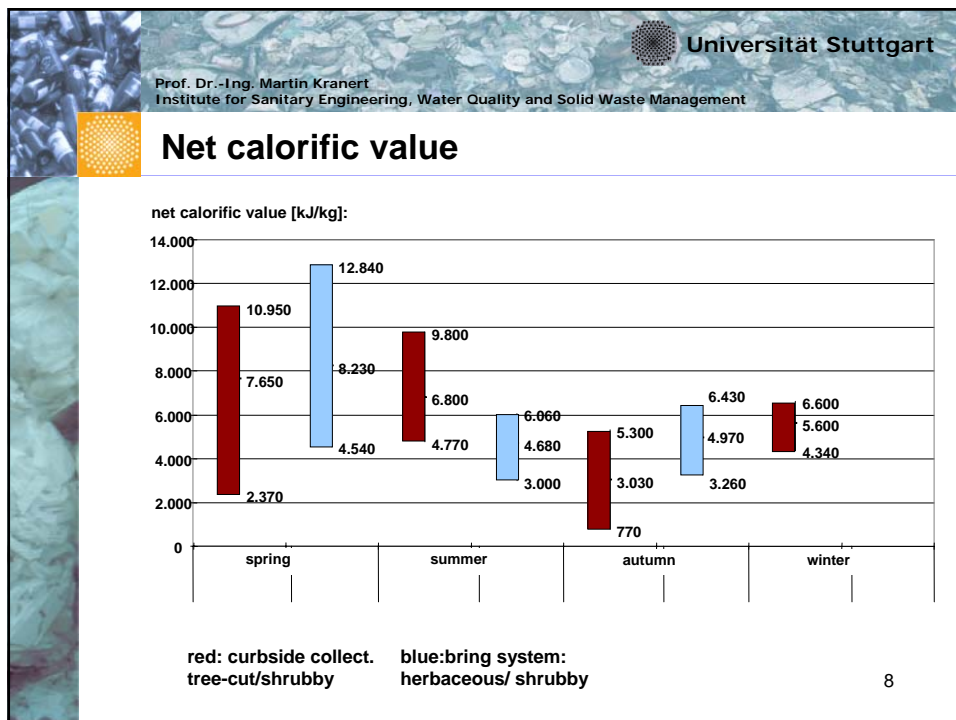
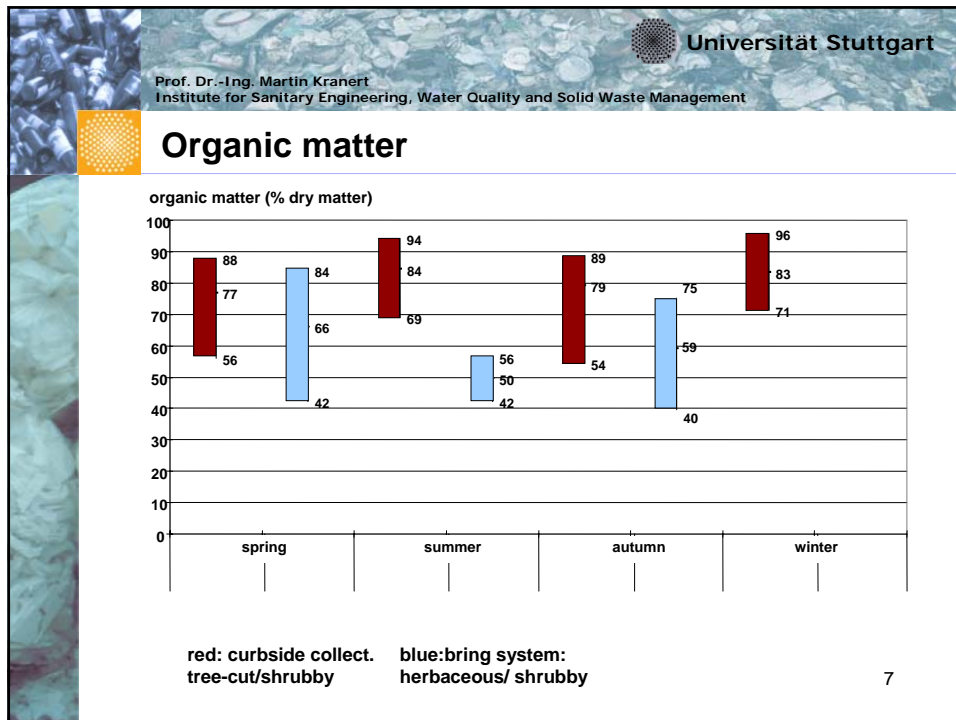
H<sub>2</sub>O (% water content)

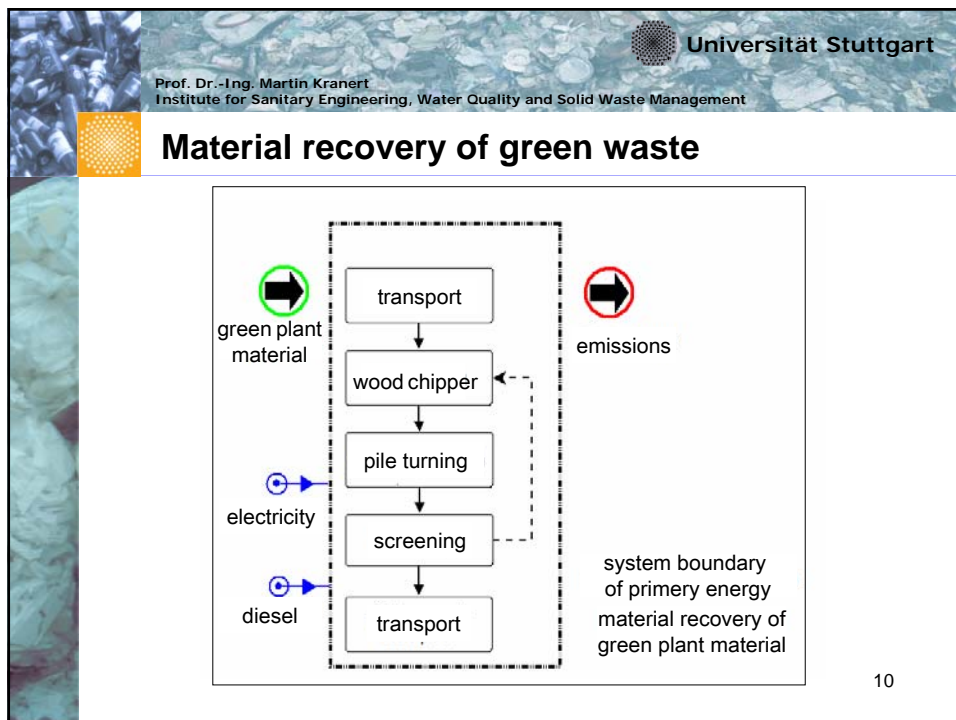
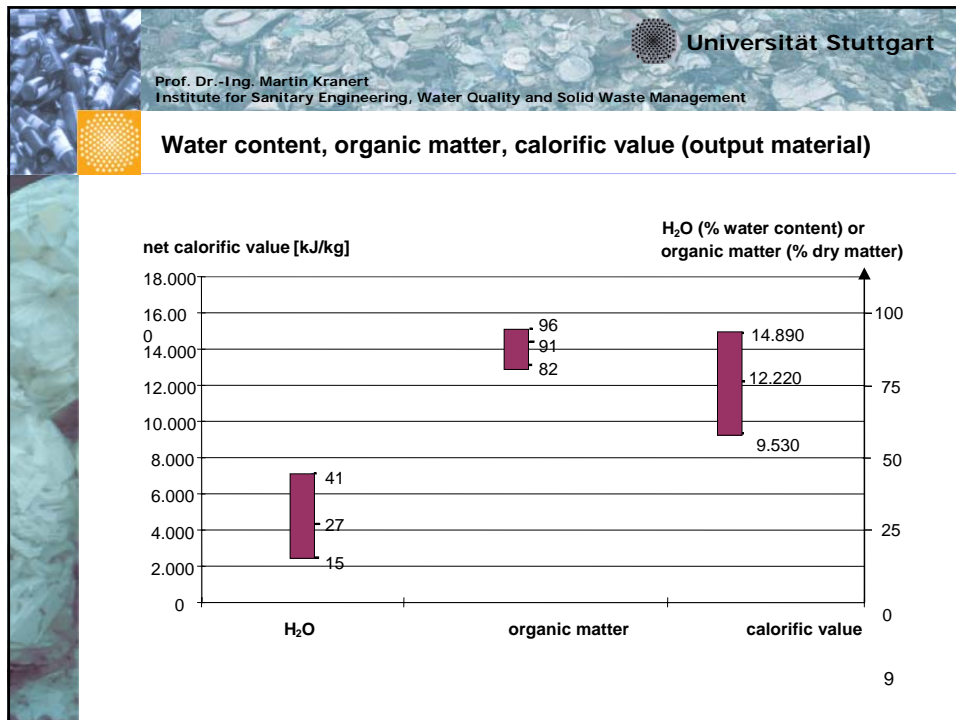


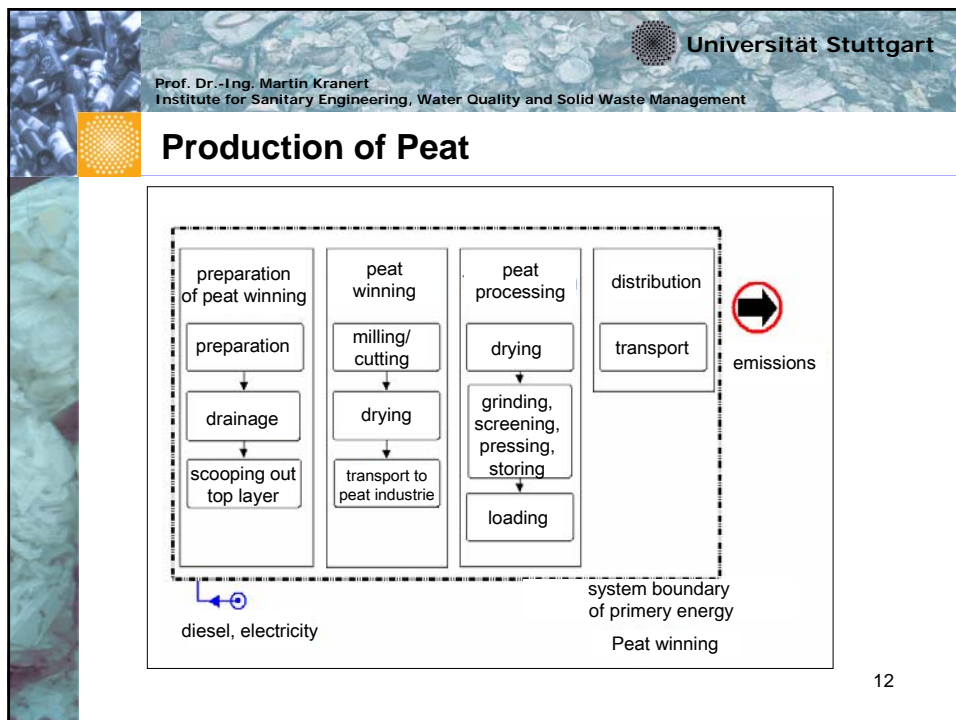
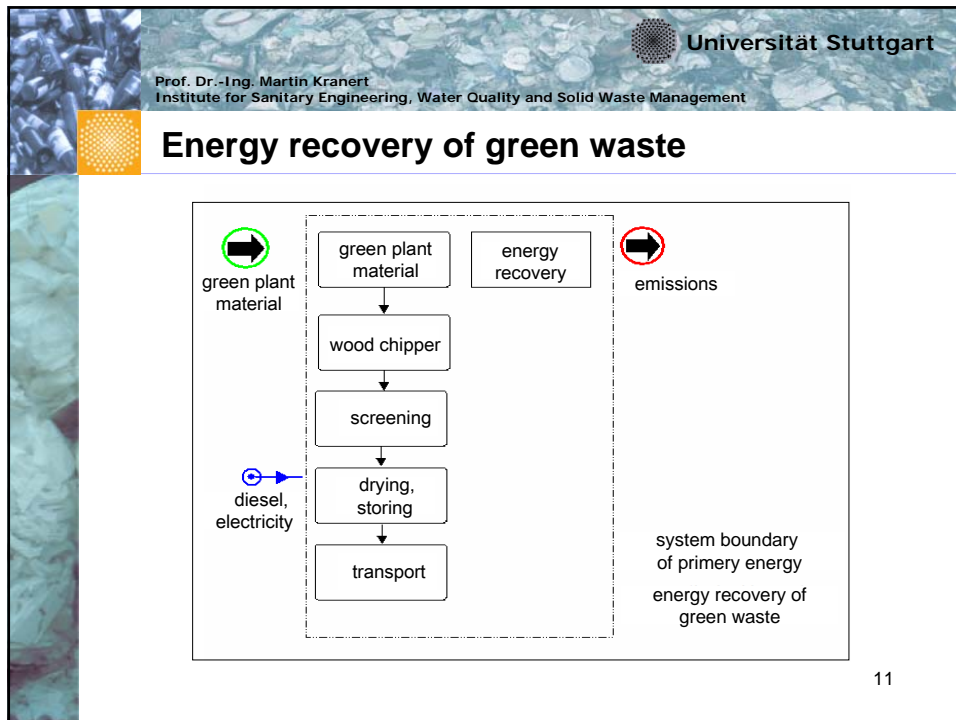
Season	Curbside collect. (red)	Bring system (blue)
spring	65 (top), 44 (middle), 33 (bottom)	43 (top), 32 (middle), 23 (bottom)
summer	60 (top), 52 (middle), 39 (bottom)	51 (top), 45 (middle), 39 (bottom)
autumn	82 (top), 70 (middle), 61 (bottom)	50 (top), 48 (middle), 45 (bottom)
winter	64 (top), 58 (middle), 50 (bottom)	-

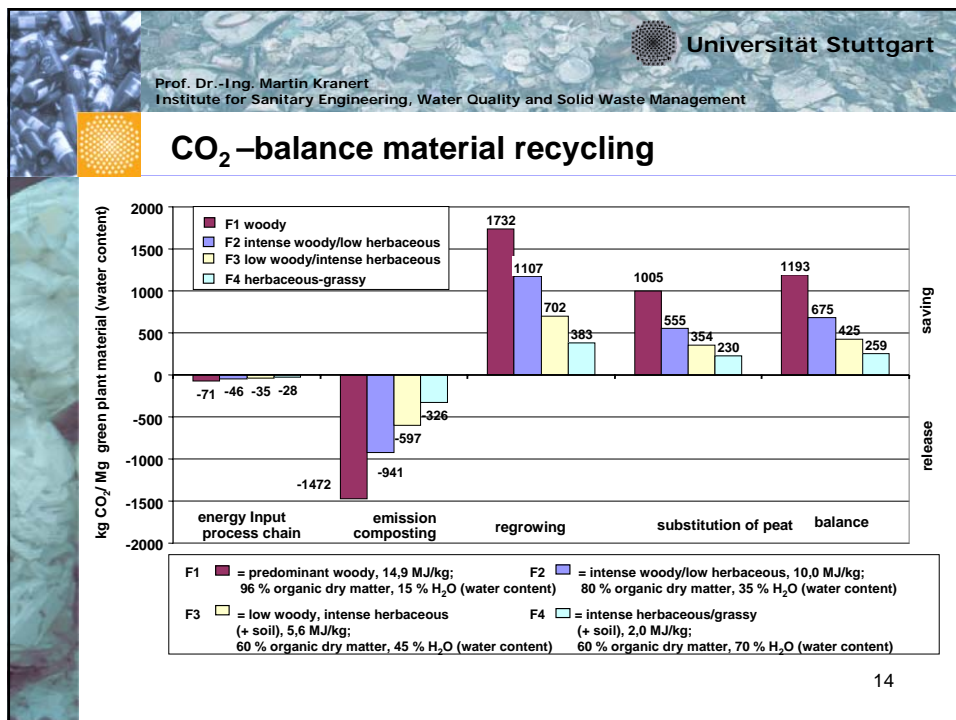
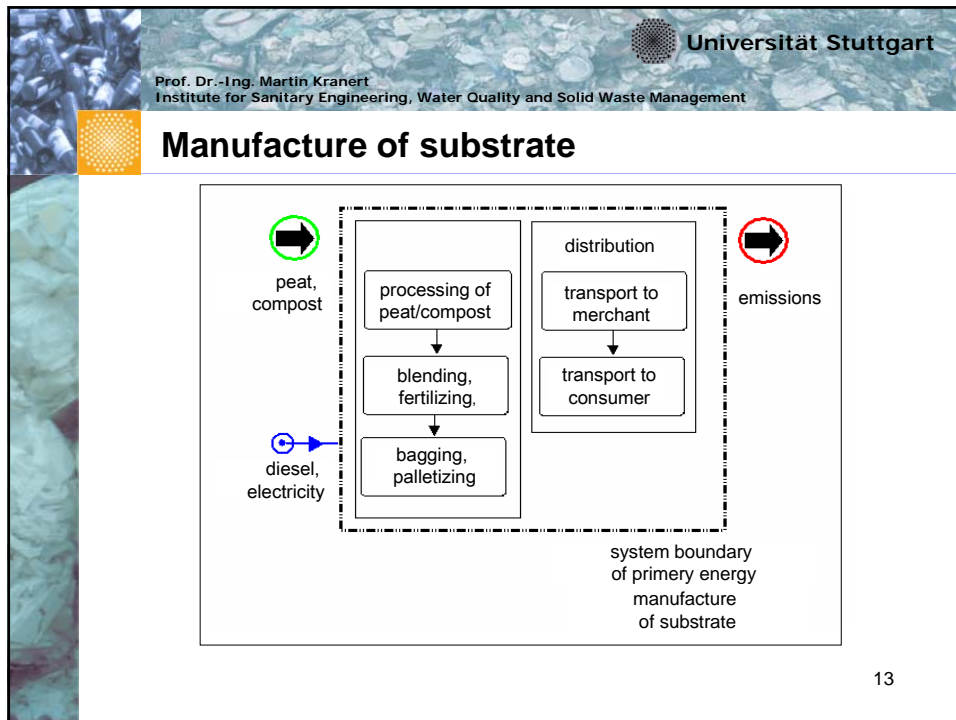
red: curbside collect. tree-cut/shrubby      blue:bring system: herbaceous/ shrubby

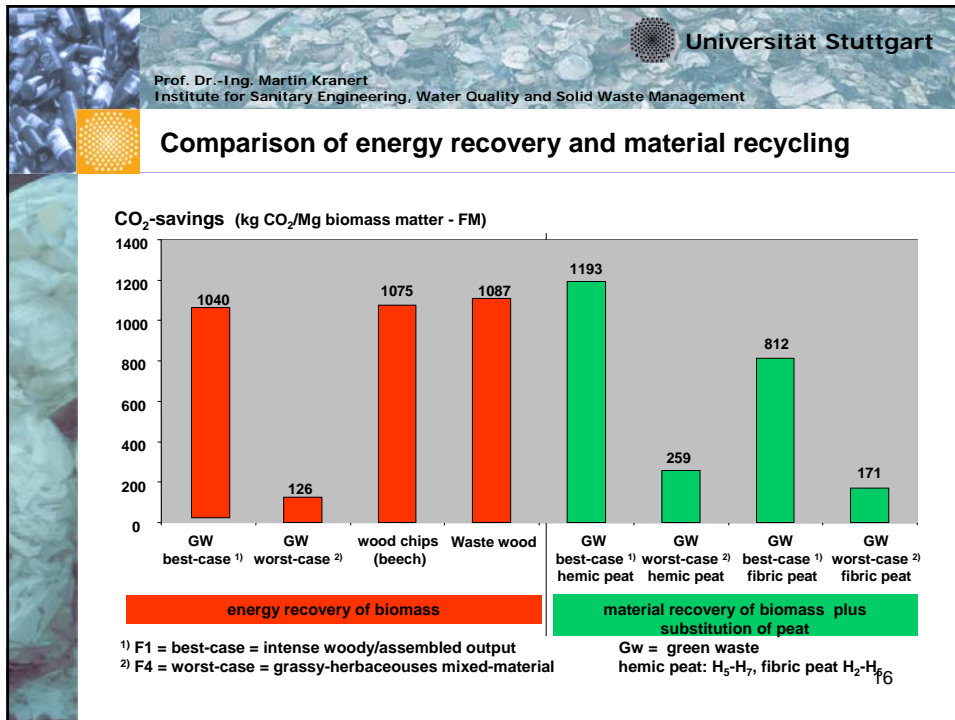
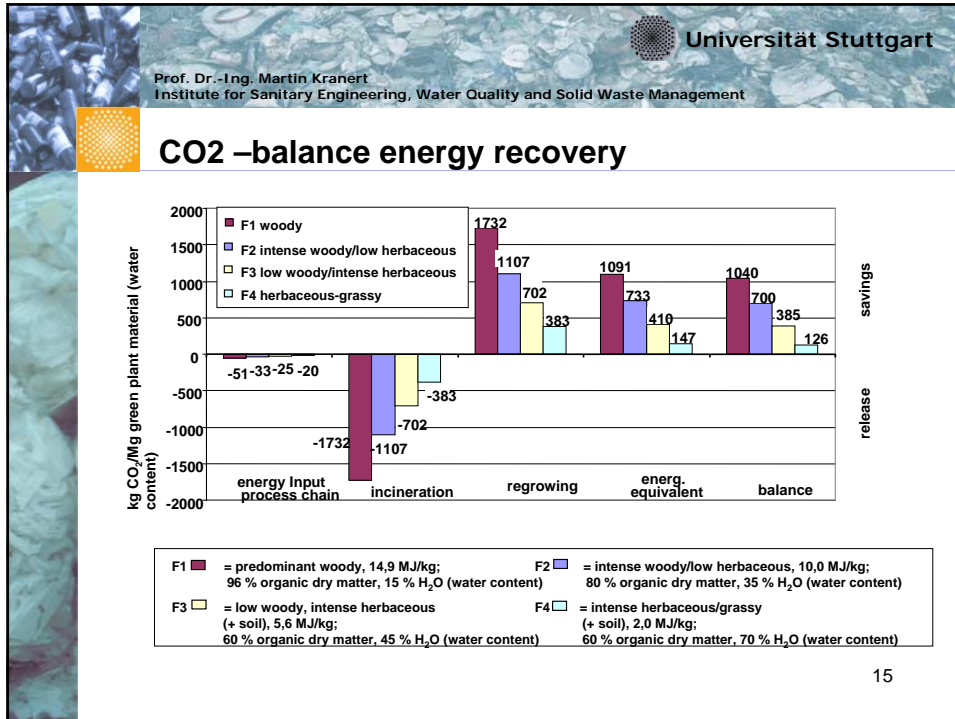
6

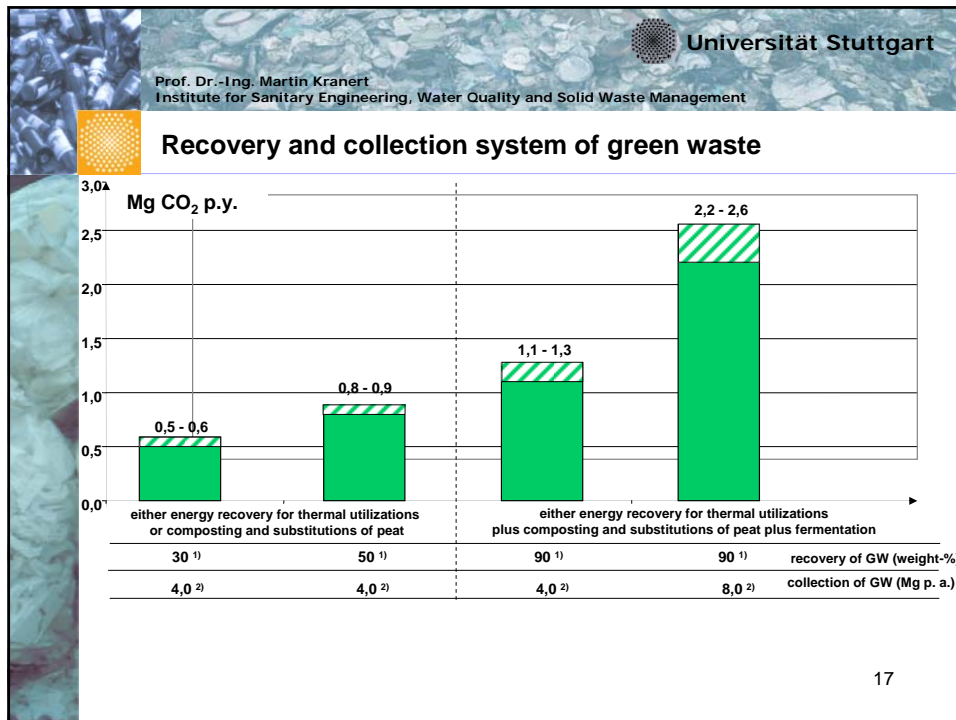












- Universität Stuttgart
- Prof. Dr.-Ing. Martin Kranert  
Institute for Sanitary Engineering, Water Quality and Solid Waste Management
- ### Conclusions
- Energy recovery and material recycling of green waste is equal for material with high calorific value (> 10.000 kJ/kg)
  - Lower calorific value : composting or anaerobic digestion
  - 25 to 35 % of input relevant for both ways
  - Substitution of peat: 25 -35 % (3 Mio m<sup>3</sup> of peat)
  - Increase capture rates for green waste for 50 %, additional potentials from green waste from landscape measures (up to 4 Mio Mg/a)
  - Saving of fossile CO<sub>2</sub> between 0,5 up to 2 Mio Mg/a
  - Measures for material flow management necessary
  - Credit for energy recovery **and** material recycling of green waste
- 18