# Valorization potential from organic waste fractions

## A case study for Austria

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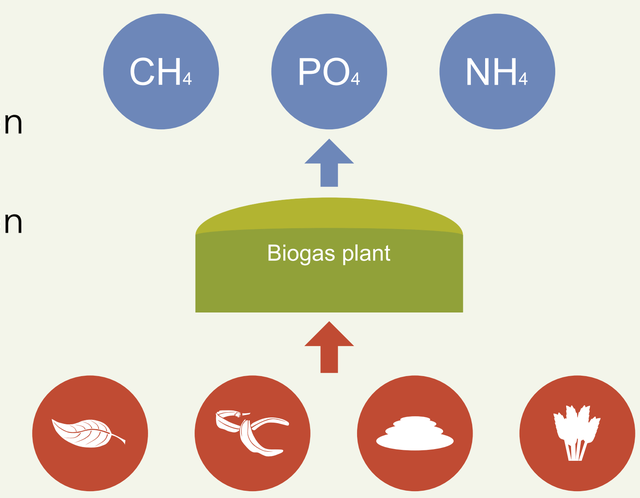
## Introduction

- Most of Austrias organic waste fractions are currently unused related to energy production
- Biogas/Biomethane potential has profitable side effects by combining biomethane production with nutrient recovery
- Nutrient recovery will become more and more important in the future due to rising population and limited phosphorus ressources
- Project focuses on the following analyses for an Austrian case study:
  - Austrias theoretical biomethane potential
  - Austrias theoretical phosphorus and ammonia nutrient recovery potential
  - Possible $CO_2$ emission reduction potential related to these potentials




## Methodology and concept

- Fig.1 shows the overall concept of the work
- First the organic waste potential for Austria was identified
- Next specific values for biomethane production, N and P proportion, and N and P recovery rates were identified (see Tab.1)
- In the end the recovery and production rates were applied to the substrate potential values and further interpreted

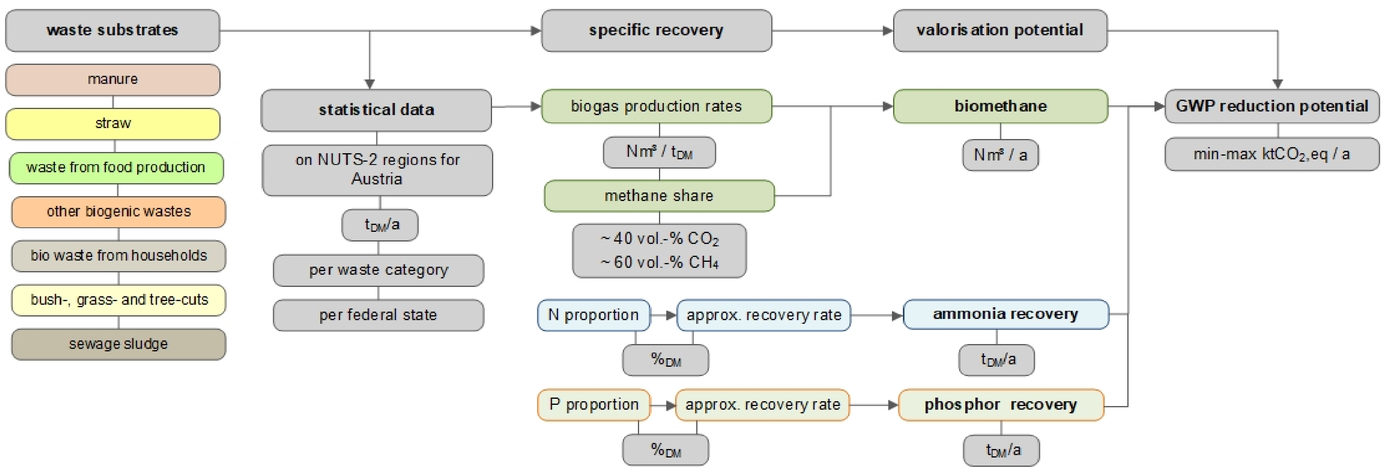



Fig 1.: Concept of biomethane production coupled with nutrient recovery

| | biomethane production | N proportion | P proportion |
|---|---|---|---|
| manure | | | |
| cow dung | 36 $Nm^3 / t_{DM}$ | 0.4%$_{DM}$ | 0.1%$_{DM}$ |
| pig dung | 36 $Nm^3 / t_{DM}$ | 0.5%$_{DM}$ | 0.3%$_{DM}$ |
| pig manure | 12 $Nm^3 / t_{DM}$ | 0.4%$_{DM}$ | 0.2%$_{DM}$ |
| poultry manure | 48 $Nm^3 / t_{DM}$ | 0.5%$_{DM}$ | 0.2%$_{DM}$ |
| horse manure w/o straw | 36 $Nm^3 / t_{DM}$ | 0.5%$_{DM}$ | 0.1%$_{DM}$ |
| straw | | | |
| cereal straw | 169 $Nm^3 / t_{DM}$ | 0.5%$_{DM}$ | 0.3%$_{DM}$ |
| maize straw | 169 $Nm^3 / t_{DM}$ | 0.9%$_{DM}$ | 0.2%$_{DM}$ |
| rape straw | 97 $Nm^3 / t_{DM}$ | 1.1%$_{DM}$ | 0.6%$_{DM}$ |
| beet straw | 105 $Nm^3 / t_{DM}$ | 0.3%$_{DM}$ | 0.1%$_{DM}$ |
| waste from food production | 145 $Nm^3 / t_{DM}$ | 0.7%$_{DM}$ | 0.1%$_{DM}$ |
| bio waste from households | 185 $Nm^3 / t_{DM}$ | 0.9%$_{DM}$ | 0.1%$_{DM}$ |
| bush-, grass- and tree-cuts | 105 $Nm^3 / t_{DM}$ | 2.5%$_{DM}$ | 1.7%$_{DM}$ |
| sewage sludge | 312 $Nm^3 / t_{DM}$ | 7.5%$_{DM}$ | 5.8%$_{DM}$ |

Tab. 1: Biomethane production rates and N and P proportions in the wastestreams

## Results

- 981 Million $Nm^3$ biomethane per year could be produced from organic waste
  - The highest share comes from straw with 374 million $Nm^3$
  - This corresponds to 11% of Austrias natural gas demand
  - 2.4 Mt $CO_2$,eq. emissions per year could be saved by substituting fossil natural gas with biomethane from the theoretical organic waste potential in Austria
- 88 kt N and 28 kt P per year occur in organic waste fractions
  - 63 kt N and 24 kt P per year could be recovered from organic waste fractions
  - 556 kt $CO_2$,eq. emissions per year could be avoided by recovering nutrients

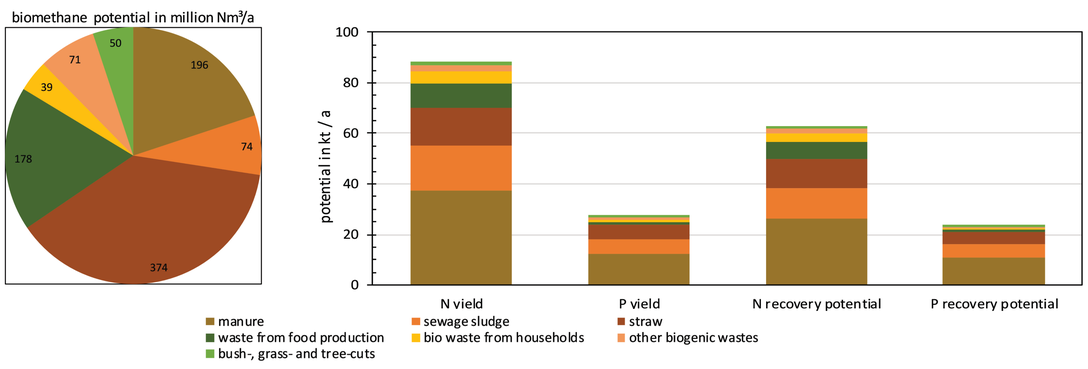



Fig 2.: Biomethane production (left); P and N yield and recovery potential (right)

## Conclusion and outlook

- A total waste stream of 13 Mt per year was identified
- 63 kt N per year could be potentially recovered
- 24 kt P per year could be potentially recovered
- 3 Mt $CO_2$,eq. emissions could be avoided by using biomethane instead of natural gas and nutrient recovery
- Future research could focus on using the biogenic carbon emissions from the biomethane production for power-to-gas or for utilisation in the chemical industry

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