Innovative Agricultural Technologies Congress
IAT CONGRESS' 25
15-19 October 2025, Antalya - Türkiye
The meeting point of science

ReMe-diation
Resilient Mediterranean

TUHH IUE

ORCHID https://orcid.org/0009-0003-5039-0772
DOI https://doi.org/10.15480/882.160244

Techno-economic assessment

DES pretreatment of common reed for phenolic compound extraction and biogas production

Jana Schultz[1],
Martin Kaltschmitt[1], Marvin Scherzinger[1], Asli Isci[2]

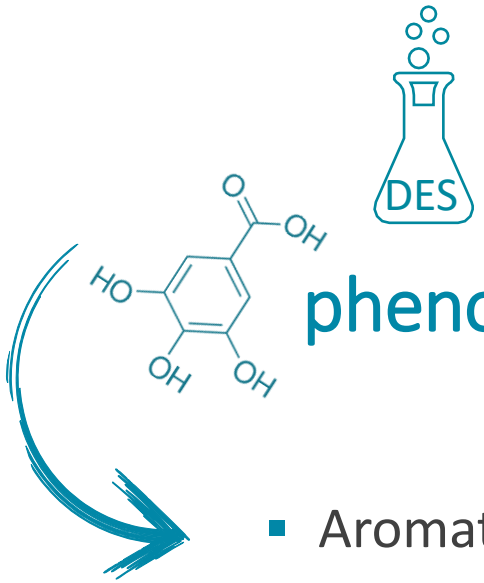
[1]Hamburg University of Technology (TUHH) | Institute for Environmental Technology and Energy Economics (IUE) | www.tuhh.de/iue
[2]Ankara University, Food Engineering Department, 06830 Golbasi, Ankara, Turkey

DES pretreatment of common reed for phenolic compound extraction and biogas production

DES pretreatment of common reed for
phenolic compound extraction and biogas production

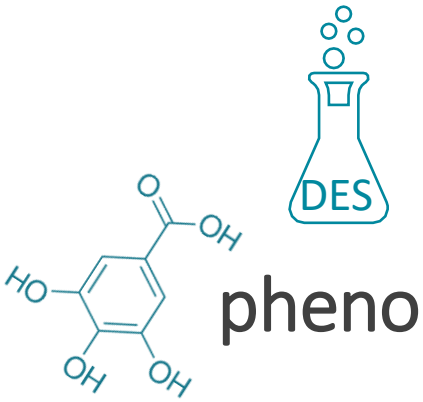
DES pretreatment of common reed for phenolic compound extraction and biogas production

- Composed of hydrogen bond donor and hydrogen bod acceptor
- Strong hydrogen bond network & ionic structure → good solvation properties
- Considered as green solvents



DES pretreatment of common reed for phenolic compound extraction and biogas production

- Aromatic hydrocarbon + hydroxyl group(s)
- Bioactive compounds (antioxidants, anti-inflammatory, antimicrobial, anti-proliferative)
- Application is studied in pharma, food, cosmetics, packaging & textile industry

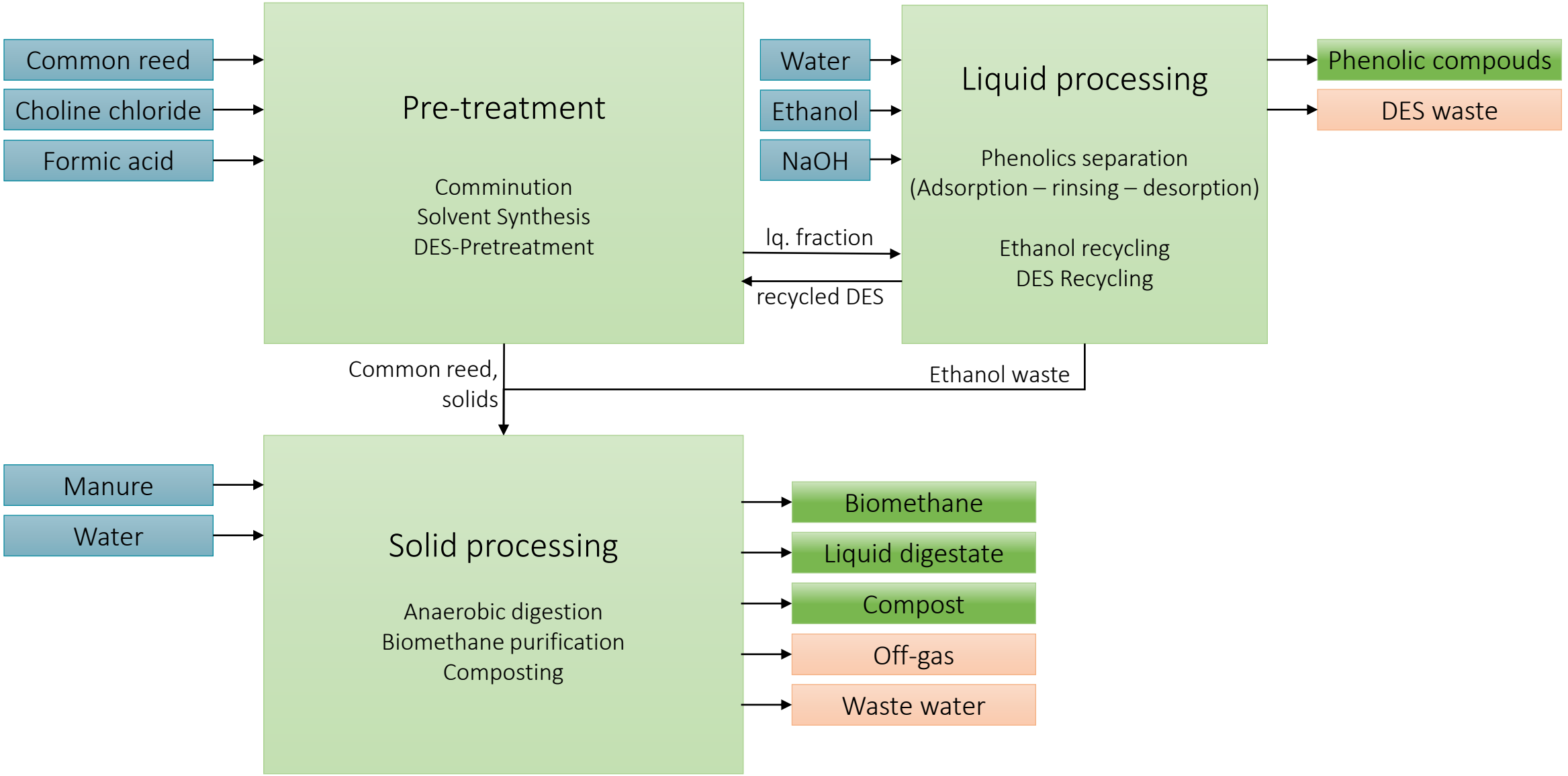


DES pretreatment of common reed for phenolic compound extraction and biogas production

- Utilization of processing residues via anaerobic digestion
- Biomethane purification

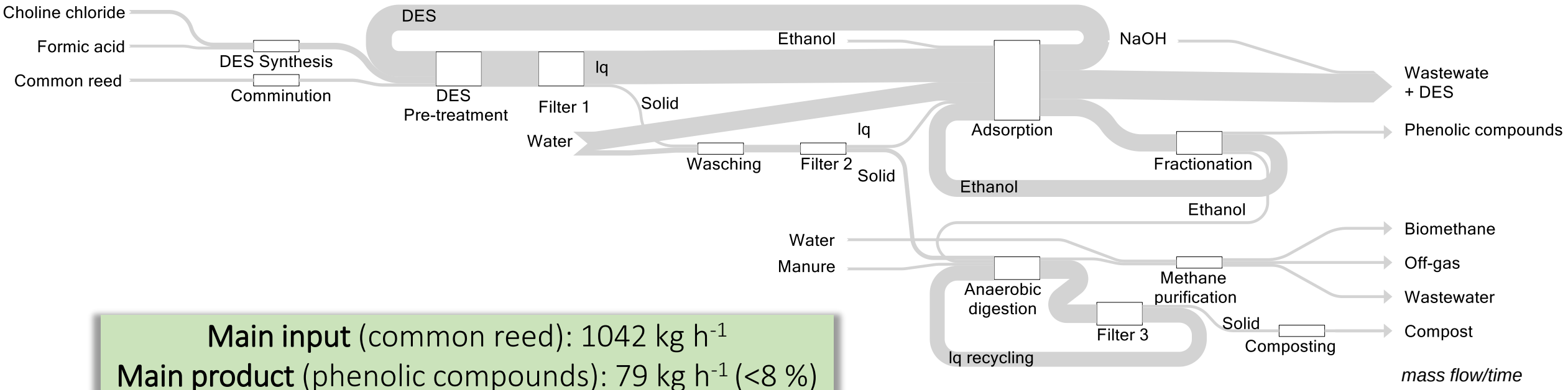
Process design

Biorefinery of common reed



Mass flows

Biorefinery of common reed



Main input (common reed): 1042 kg h^{-1}

Main product (phenolic compounds): 79 kg h^{-1} (<8 %)

Side products

Biomethane 209 m^3 h^{-1}

Compost 555 kg h^{-1}

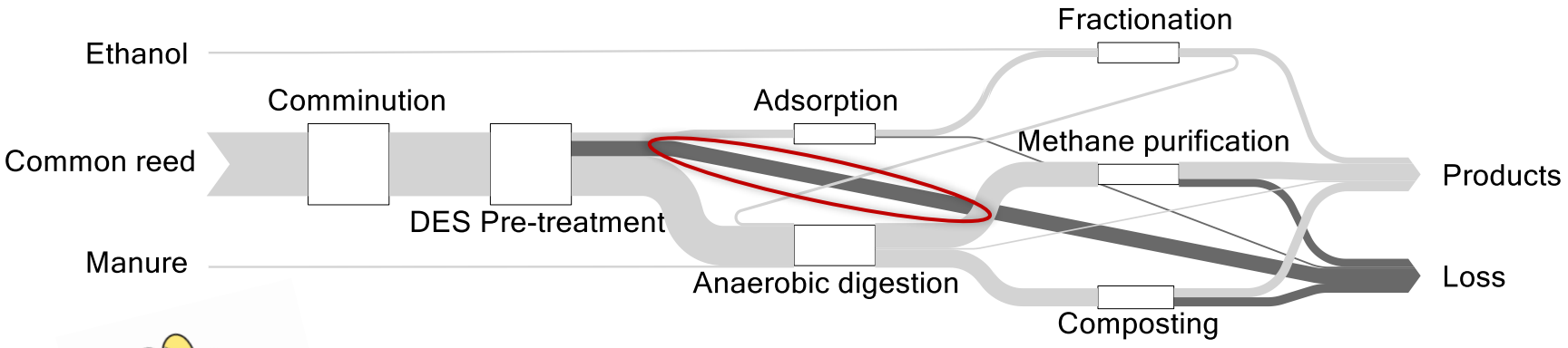
Large mass flow of auxiliaries

Large wastewater outflow

lq: liquid

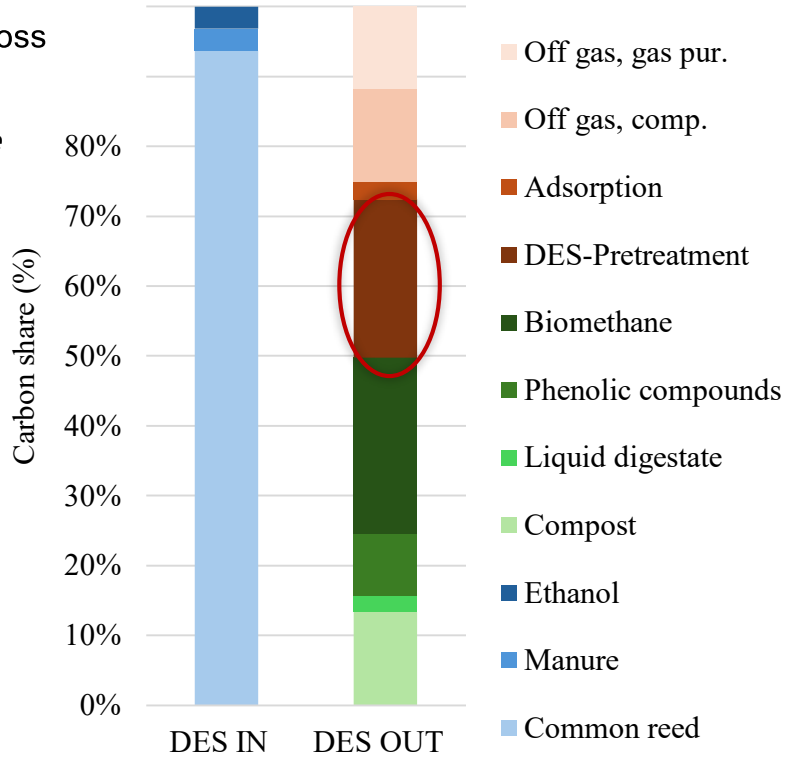
Carbon flows

Biorefinery of common reed



carbon flow/time

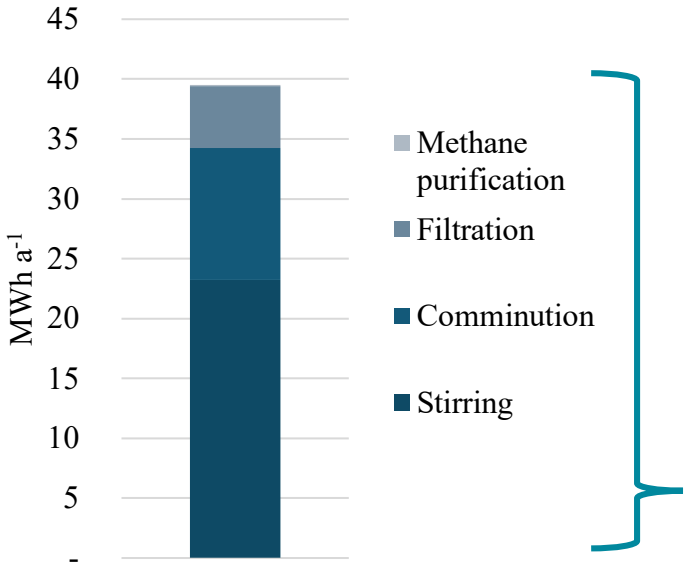
DES: large carbon loss during pre-treatment



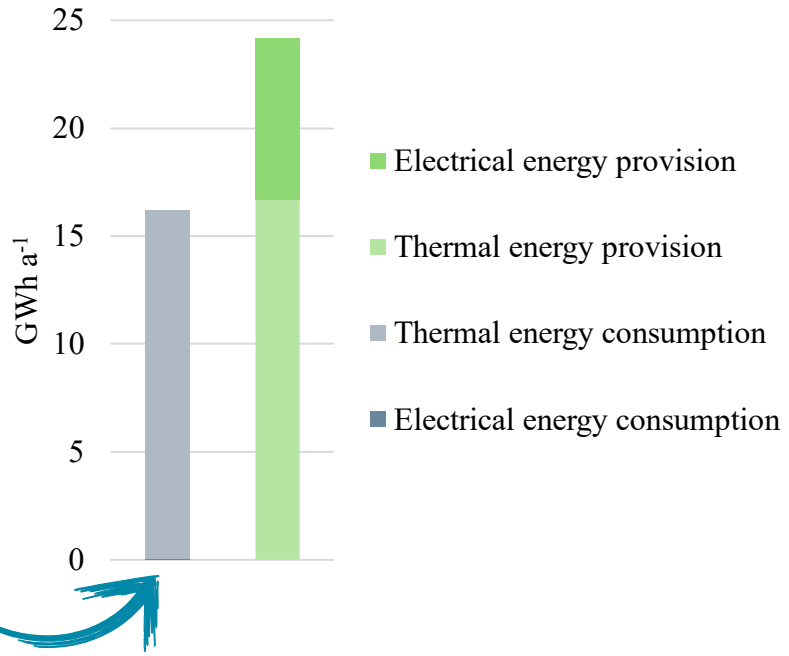
Energy consumption

Biorefinery of common reed

Electrical energy consumption



Energy consumption & provision



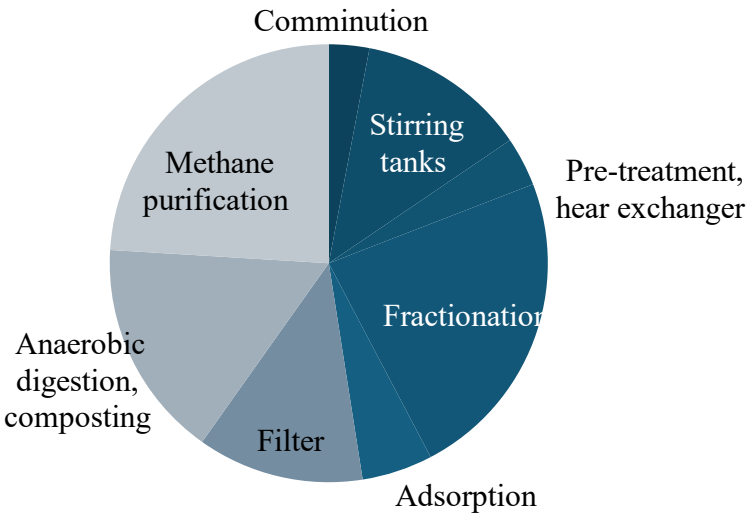
Evaporation is
major driver of energy consumption

Process consumes most of the
(potentially) produced thm. energy

Costs

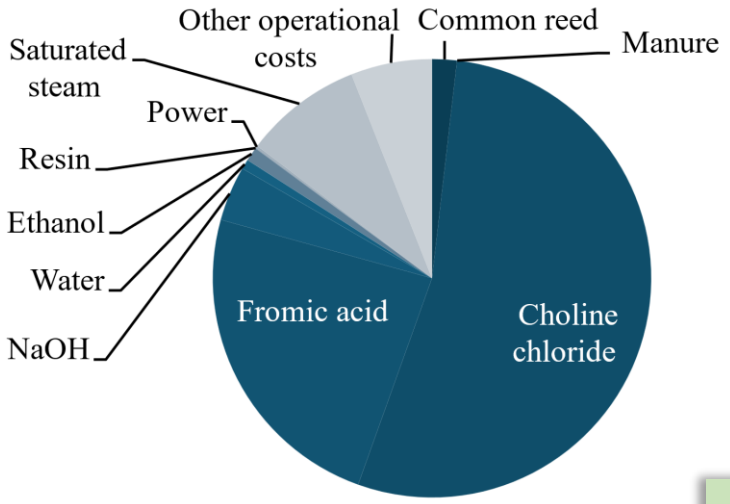
Biorefinery of common reed

CAPEX



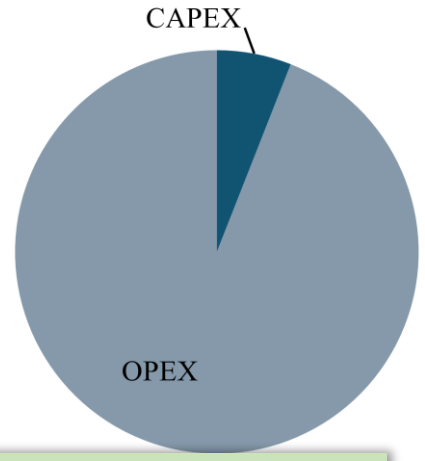
~19 Mio € CAPEX
8.3 t biomass/year

Opex



~36 Mio €/year OPEX
8.3 t biomass/year

Annuities



OPEX >> CAPEX
High costs for auxiliaries

Minimum selling price
57 €/kg

Costs

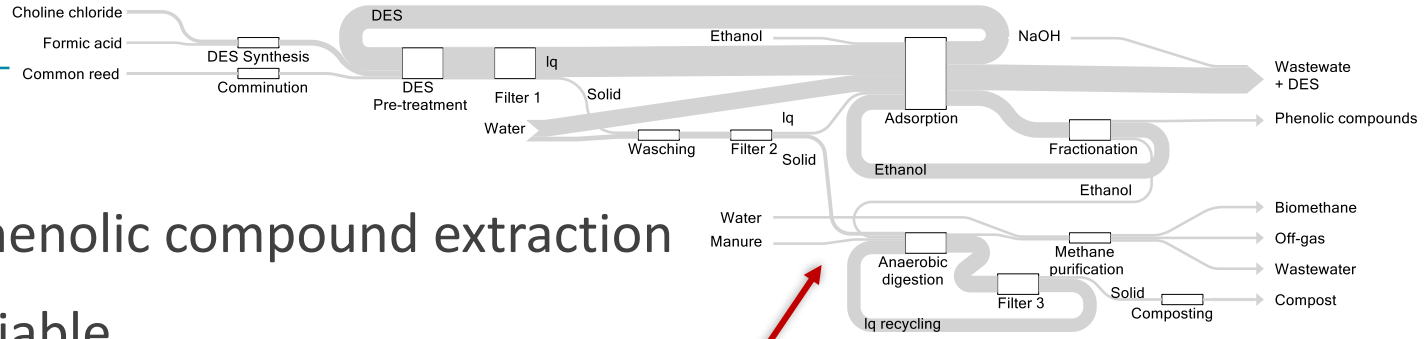
Biorefinery of common reed

- Phenolic compounds
  - Minimum product selling price MPSP (present study) 57 €/kg
  - Phenol, laboratory supply (reference) 98 €/kg
  - Gallic acid, laboratory supply (reference) 531 €/kg
  - Catechin, laboratory supply (reference) 273 €/10 mg

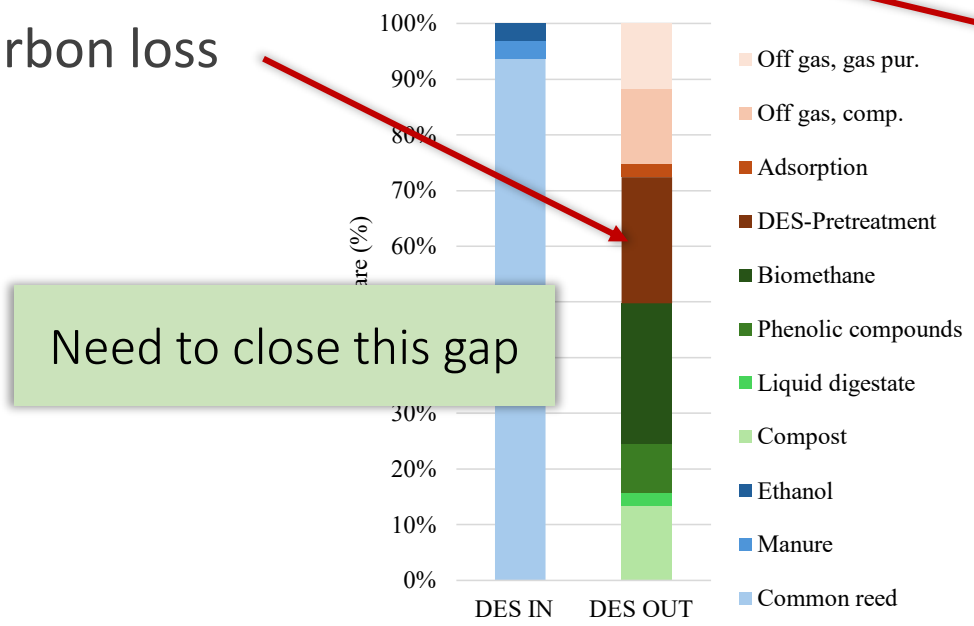
Competitive,
Further processing costs expected

Conclusion

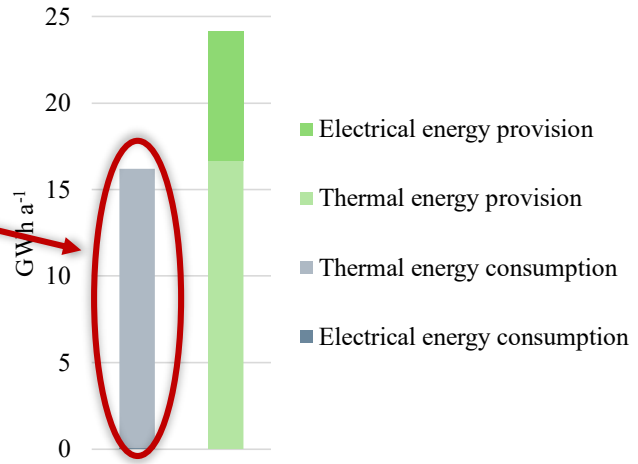
Biorefinery of common reed



- Technical process solution for phenolic compound extraction
- Process could be economically viable
- Energy consumption and costs driven by large mass flow of auxiliaries
- Energy provided is largely consumed by the process
- Considerable mass/carbon loss



Need to close this gap



Thank you for your attention!

Questions?

SPONSORED BY THE
Federal Ministry of Education and Research

Project:
ReMe-diation
Resilient Mediterranean

PRIMA
PARTNERSHIP FOR RESEARCH AND INNOVATION IN THE MEDITERRANEAN AREA

Jana Schultz M.Sc.
Technische Universität Hamburg (TUHH)
Institut für Umwelttechnik und Energiewirtschaft (IUE)
Eißendorfer Str. 40, D-21073 Hamburg
+49 40 42878 4747 | jana.schultz@tuhh.de | www.tuhh.de/iue