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Grass-based circular business models
for rural agri-food value chains

Local production of biochar using grassland-cuttings

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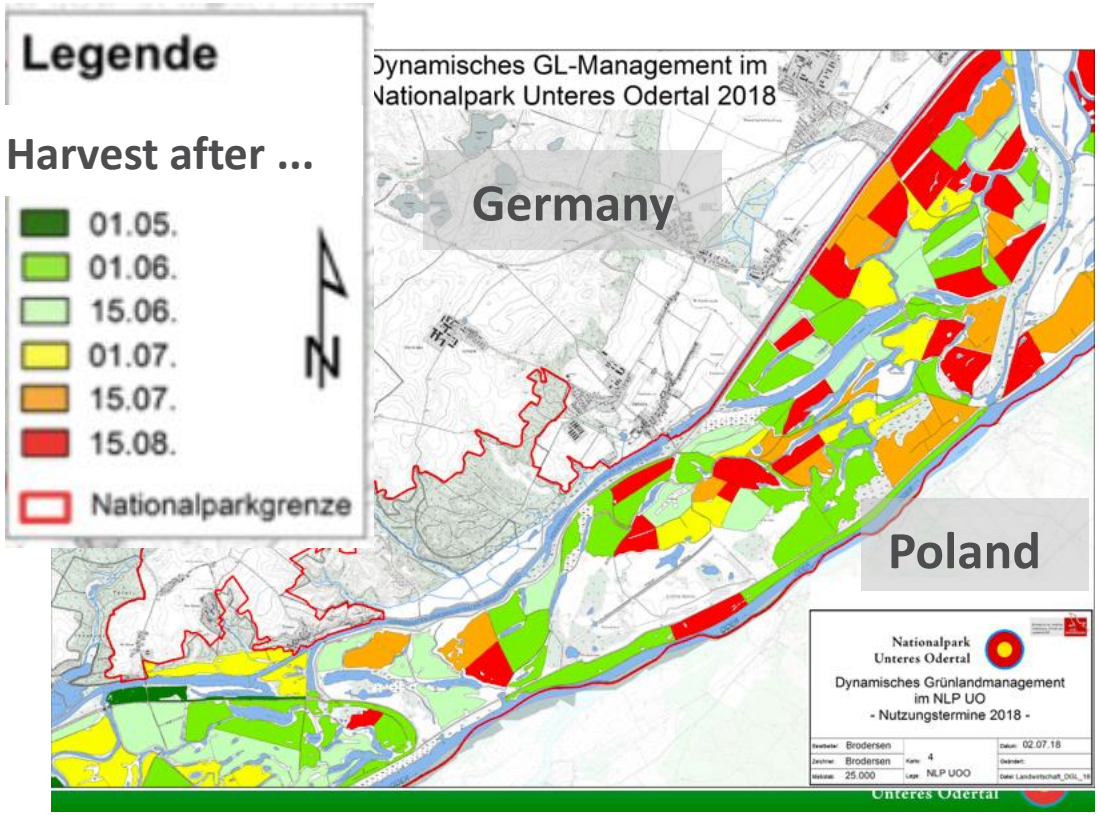
Nationalpark Unteres Odertal

Lower Oder Valley National Park



- large grassland areas with polder meadows
- strongly lignified, heterogeneous biomass – low nutritional quality

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement **N° 862674**

From Biomass to Biochar

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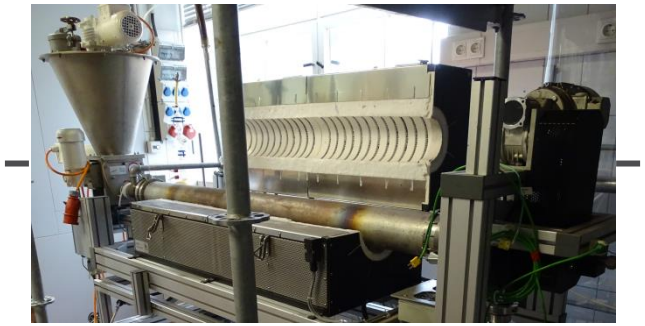
Harvest

Pyrolysis Air

Pyrolysis N_2



HTC

Biochar

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German Demo

HTC

Hydrothermal carbonisation was developed to replicate the natural coalification process. This is achieved with the aid of water at elevated temperatures and pressures.

- Temperature: 180 – 280 °C
- Residence time: minutes - hours
- Feedstock: wet or dry
- Medium: water
- Pressure: 10 - 45 bar

Continuous HTC reactor, to be installed at ATB.

Batch HTC reactor at ATB.

Hydrochar

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German Demo

Pyrolysis - N_2

Pyrolysis is the thermochemical conversion process that occurs in biomass upon heating in an inert environment.

Slow pyrolysis:

- Temperature: 400 – 900 °C
- Residence time: minutes
- Feedstock: < 20 wt-% moisture
- Medium: N_2

Rotary kiln pyrolysis reactor at ATB.

Pyrochar

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German Demo

Pyrolysis - Air

When limited amounts of air are provided to hot biomass, a fraction of the pyrolysis products are oxidised, releasing heat to sustain the process.

- Temperature: 500 – 1200 °C
- Residence time: minutes – hours
- Feedstock: < 50 wt-% moisture
- Medium: air
- Combustion of gases and liquid products. Potential for heat production.

Kon-Tiki kiln at EIP-poject partner.

Carbon-Twister at EIP-poject partner.

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German Demo

Products of Thermochemical conversion

Process	Gases	Liquid	Solid
HTC	CO_2, CO, CH_4, H_2S	Process Water, potentially including phenols	Hydrochar (50 – 80% carbon yield)
Pyrolysis N_2	CO_2, CO, CH_4, H_2	Condensable hydrocarbons	Pyrochar ((30 – 60% carbon yield)
Pyrolysis Air	CO_2, CO, CH_4, H_2	Condensable hydrocarbons	Pyrochar ((0 – 60% carbon yield)

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Applications of pyrochar or hydrochar

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Technical applications

- fuel
- adsorbent or absorption material

Applications in agricultural area (biochar)

- *soil amendment to enhance water holding capacity*
- *enrichment of C in agricultural soil*
- *components of fertilizer*
- *stabalization of anaerobic digestion*
- *bedding material in stables*
- *culture substrates (peat substitute)*

For the environment

- long term storage of carbon
- reduction of emissions
- recovery of nutritious or chemical elements

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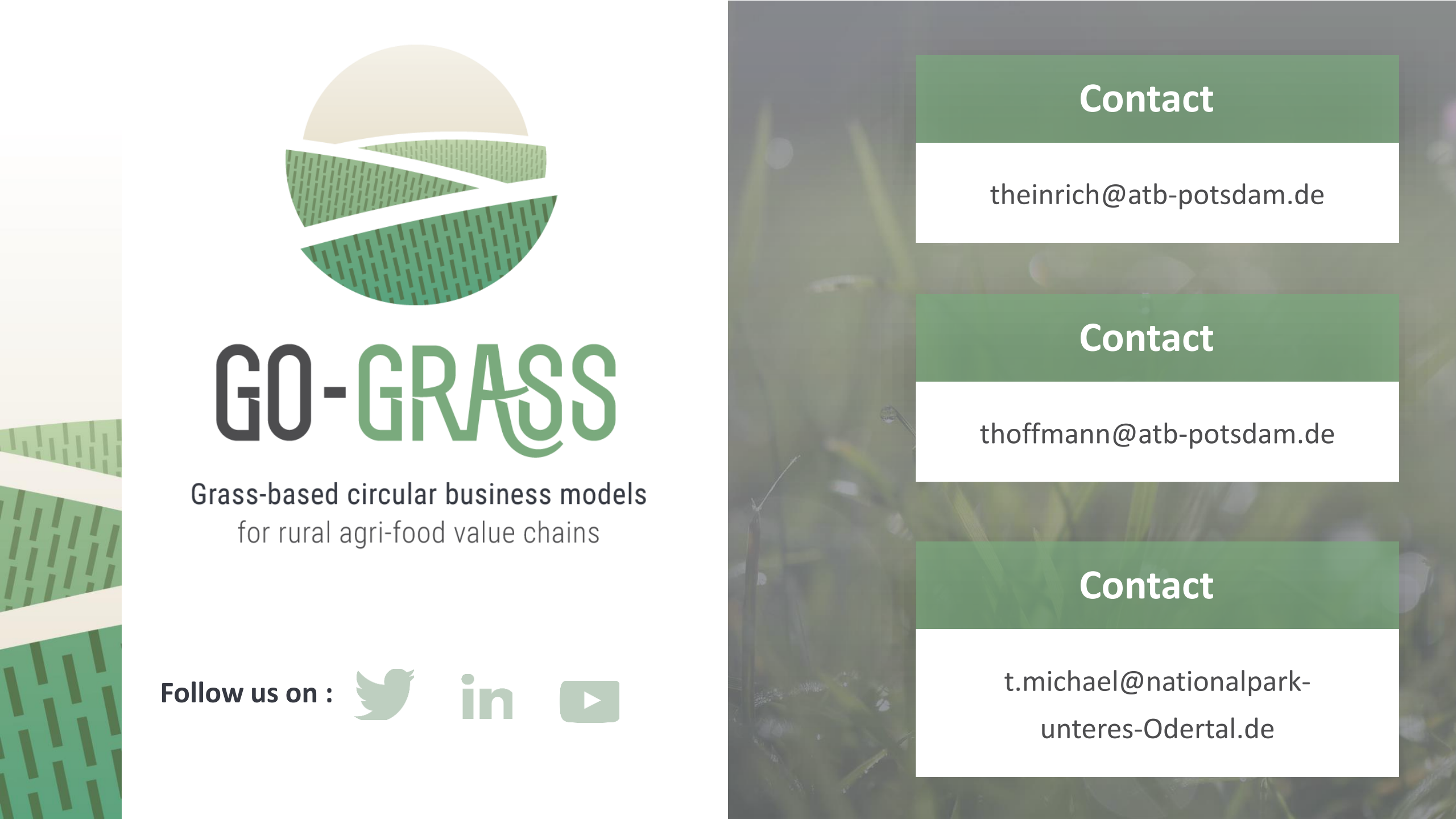

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