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ATB
Leibniz-Institut für
Agrartechnik und Bioökonomie

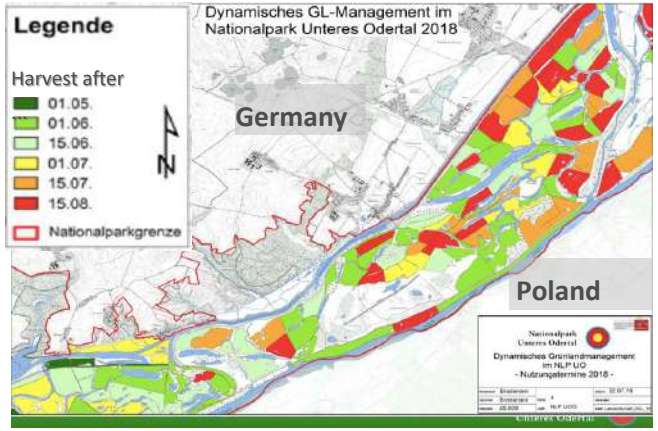
Valorisation of Grassland Biomass by thermochemical Conversion

Thomas Heinrich, Thomas Hoffmann

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

Motivation

- **Collaboration with Lower Oder Valley National Park Association**
- **Total area: 10,500 ha [1]**
- **4,190 ha managed semi-natural high nature-value grasslands [1]**
- **Approximately 500 ha annually of late-harvest grass**
- **Late-harvest grass is not well suitable as feed for animals or for biogas production**



Dates for utilisation 2018.

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[1] Vössing, A. et. al. (2009) *Nationalpark-Jahrbuch Unteres Odertal*.

Tested Technologies – Farm-scale

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Prodana - CarbonTwister®

- Untreated
- 580 kg grass
- 12,9 % biochar yield

SPSC - VarioL

- Briquettes
- 170 kg grass
- 36,3 % biochar yield

Biomacon – C-63F

- Pellets
- 2.460 kg grass
- 20,5 % biochar yield

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Demonstration Plant

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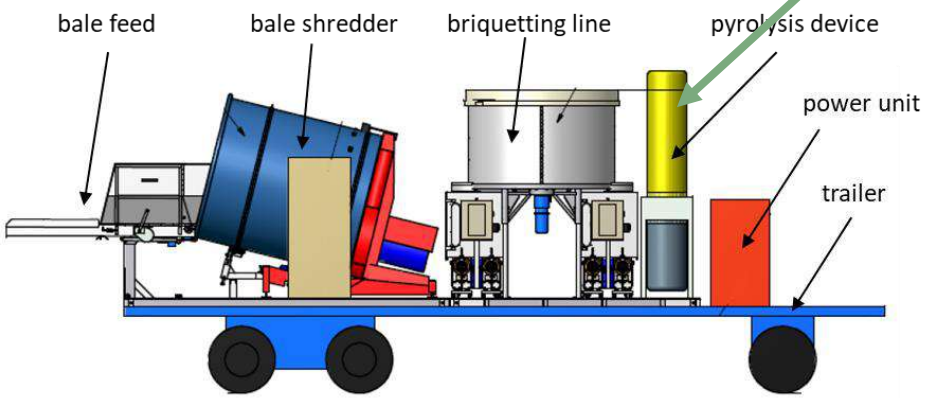
As planned until the amendment



SPSC batch pyrolysis + Briquetting line

Realised

Biomacon Pyrolysis plant from TerraBoGa Project [1].

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[1] Biomacon GmbH, „Betriebsanleitung der Dendromassekarbonisierungsanlage für das Projekt TerraBoGa".

Industriel Production

Carbonauten

- 12 m³ (about 4 t) Briquttes
- Planned for March 2024

Pyrolysis plant Carbonauten GmbH, Eberswalde [1].

REW Regenis

- 26 m³ (about 13 t) Pellets
- Scheduled for March 2024

Pyrolysis plant REW Regenis, Quakenbrück [2]

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[1] https://carbonauten.com/karbonisierung-und-pyrolyse/, 24.10.2023.
[2] https://regenis.de/, 05.03.2024.

Pre-Treatment

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Balling

Milling

Pellets

Briquettes

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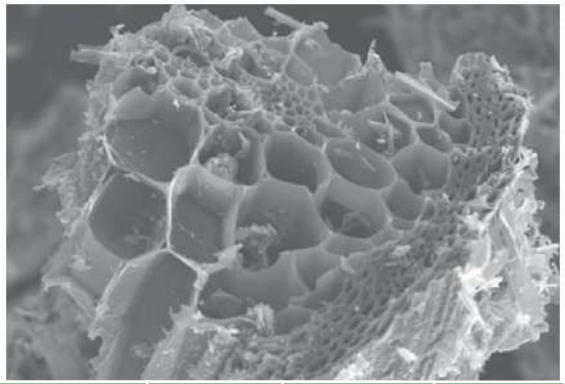
Biochar for soil application

- **Stable Carbon**
- **Ash**
- **High surface area**
- **Conforms with the European Biochar Certifciate**



[mg·kg^{-1}]	As	Cd	Cr	Cu	Ni	Pb	Zn	P	K	Mg	Ca	Fe	N	Cl
Biochar	0.99	0.12	3.63	19.09	2.69	< 0.01	147.63	6412,6	29192,8	6467,4	18317,7	1397,1	12563,2	9258,3

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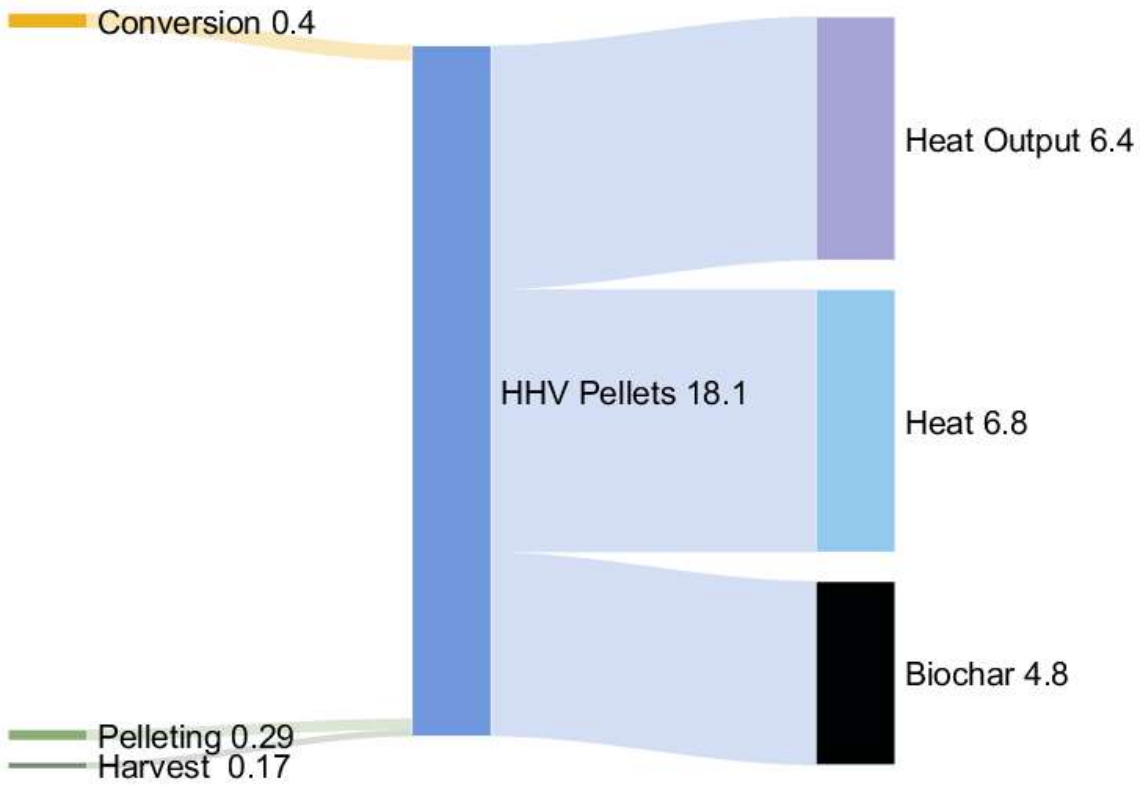
[1] s. Joseph, p. Munroe, „Biochar: a Guide To Analytical Methods"

Products



Energy flow scheme, values in MJ kg^{-1}

Biochar + Heat

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Cost and Benefit Analysis of biochar use

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Table 4: Cost and Benefit analysis of biochar production and use. Scenarios were calculated based on farm data (electricity and diesel consumption and heat production; infrastructure costs) and estimated assumptions (biochar and C credits prices).

	Scenario 1	Scenario 2	Scenario 3	Scenario 4	Unit
Costs					
Manual labor	5313	5313	5313	5313	€ year^{-1}
Infrastructure					
*Annual amortization	8945	8945	8945	8945	€ year^{-1}
**Annual maintenance	2178	2178	2178	2178	€ year^{-1}
Consumables					
Pelleting	5670	5670	5670	5670	€ year^{-1}
C-sink certification	2000	2000	2000	2000	€ year^{-1}
Electricity	5153	6979	5153	6979	€ year^{-1}
Diesel	364	590	364	590	
Total costs	29623	31085	29623	31085	€ year^{-1}
Benefits					
Biochar savings			24500	24500	€ year^{-1}
Fuel / energy savings	14940	18513	14940	18513	€ year^{-1}
C credits as C sink	3943	5258	3943	5258	€ year^{-1}
Total benefits	18883	23771	43383	48271	€ year^{-1}
Balance	-10740	-7314	+13760	+17186	€ year^{-1}

energies MDPI

Article

Influence of thermochemical conversion technologies on biochar characteristics from extensive grassland for safe soil application

Thomas Heinrich[1*], Korbinian Kaetzl[2], Judy Libra[1], Thomas Hoffmann[1]

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Chances

- Increasing the quality of agricultural soils
- Generating negative emissions
- Use of local renewable resources for heat generation
- Makes farmers more independent of fossil fuels and their prices
- Bedding material / Compost / Biogas

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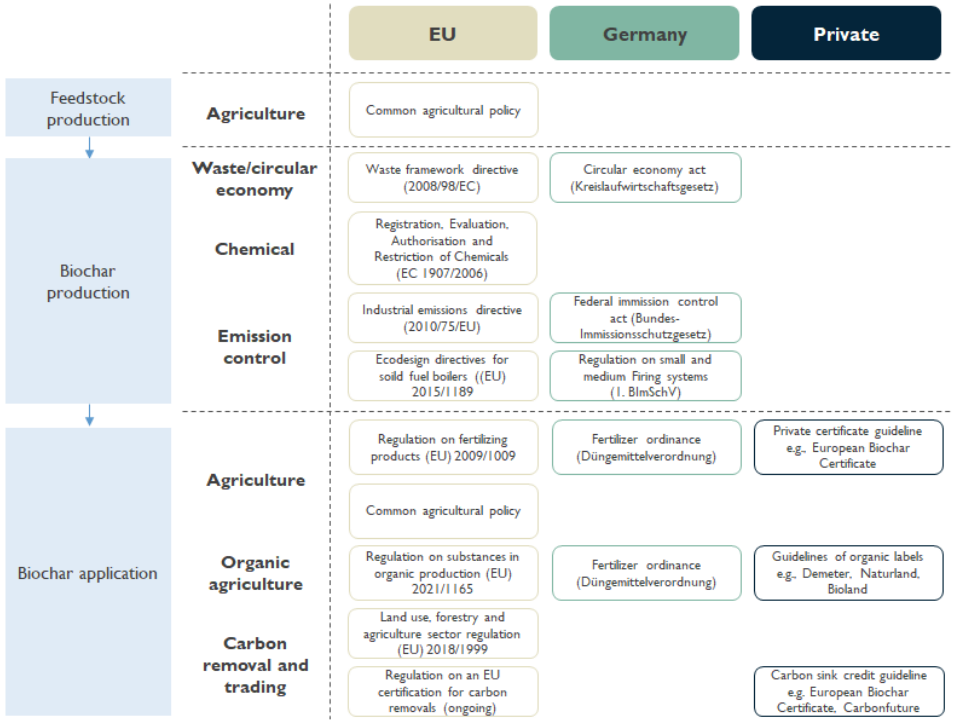
Barriers

- Infrastructure: Pelleting / Briquetting
- Ash
- Awareness of use of biochar
- Specialised machinery/technology for utilisation
- Legal framework



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Outlook

- **Many interested parties – including followers and other demos for combination**
- **Sufficient biomass available as well as stakeholders who would like to try**
- **Lack of suitable technologies**
- **Further research focused on technology development required**

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

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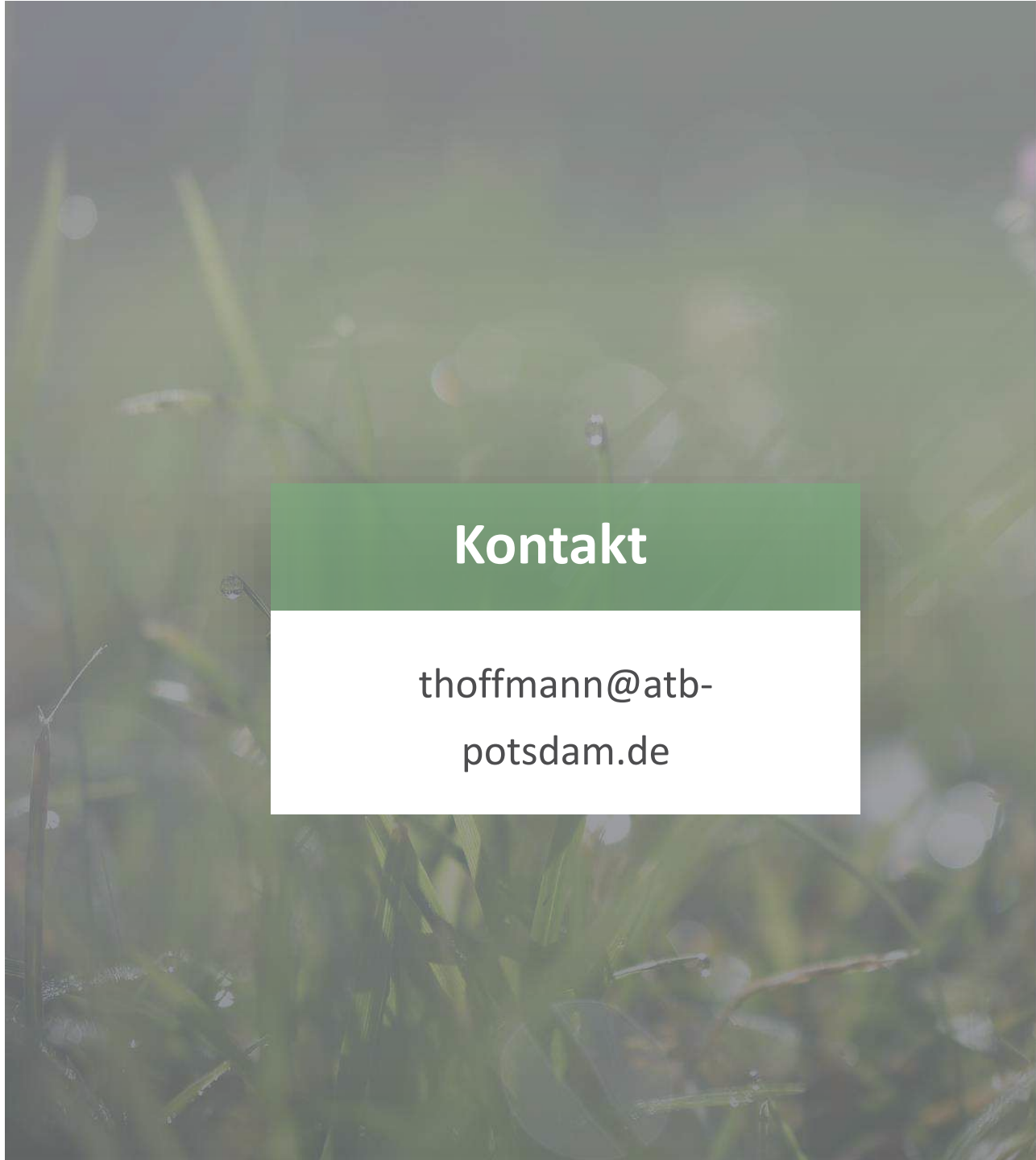

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