

From BIOCHAR to BioCASH: a short summary of 15 years of biochar research at ILVO

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Seminar: Biochar application and enhanced weathering for increasing soil carbon storage

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EJP SOIL
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Outline

Biochar as direct and indirect soil amendment

Biochar use in cascade vs. targeted applications

Biomass/manure processing: interaction of biochar with N

Role of biochar for circular horticulture

Chemical or biological acidification of biochars

The forgotten carbon in biochar

Biochar: it does never end? (priming)

What's next?



Project Code: 2014-10-000000000000000000

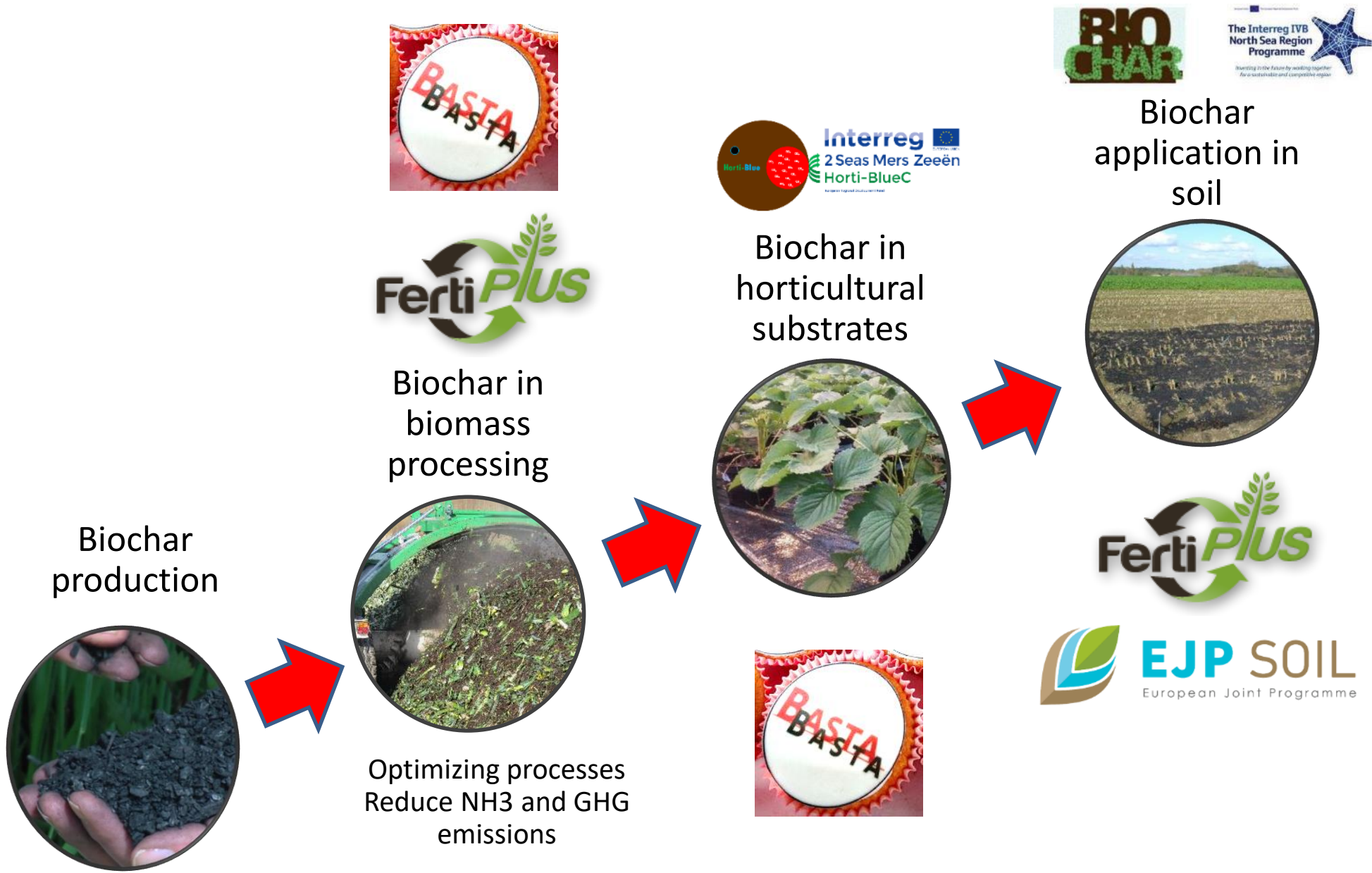
**The Interreg IVB
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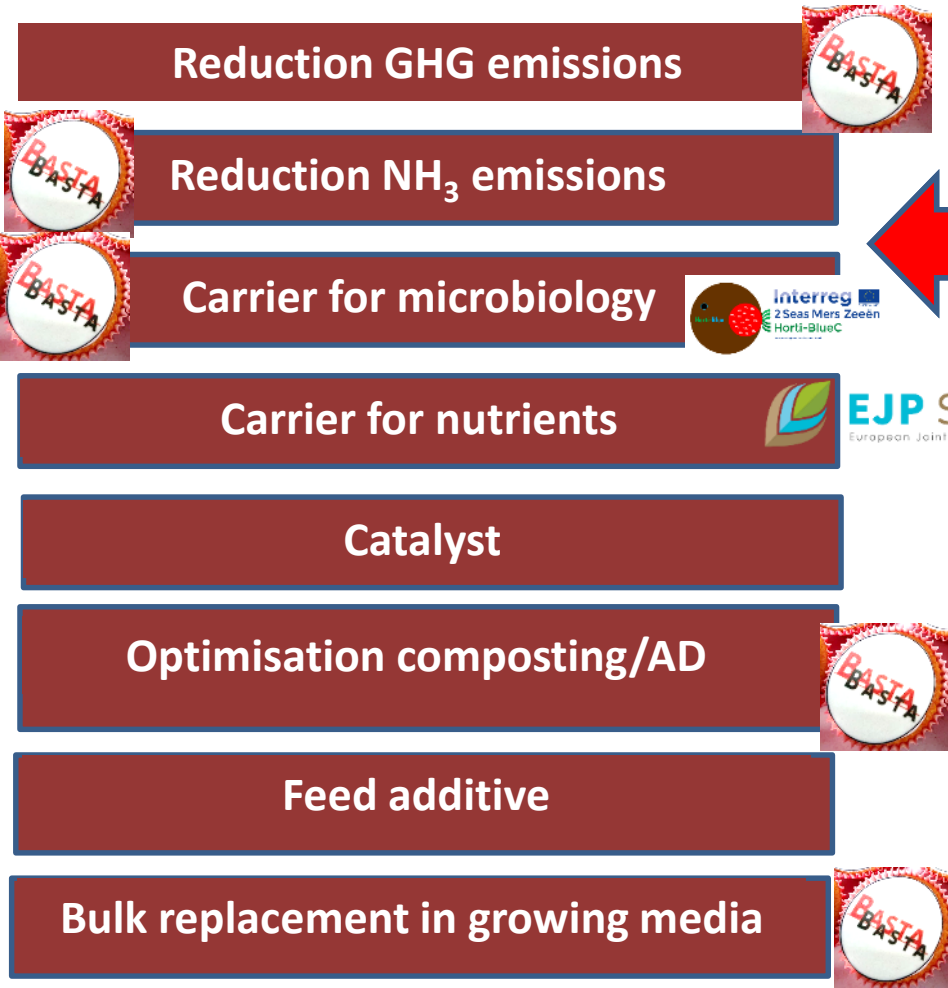
*Investing in the future by working together
for a sustainable and competitive region*

<https://doi.org/10.1016/j.apsoil.2020.103706>





- Sorption organic pollutants
- Sorption inorganic pollutants
- Reduction toxicity heavy metals
- Reduction GHG emissions
- Reduction NH₃ emissions
- Carrier for microbiology
- Carrier for nutrients
- Catalyst
- Optimisation composting/AD
- Feed additive
- Bulk replacement in growing media



Optimization



Renewable energy production



Biochar production



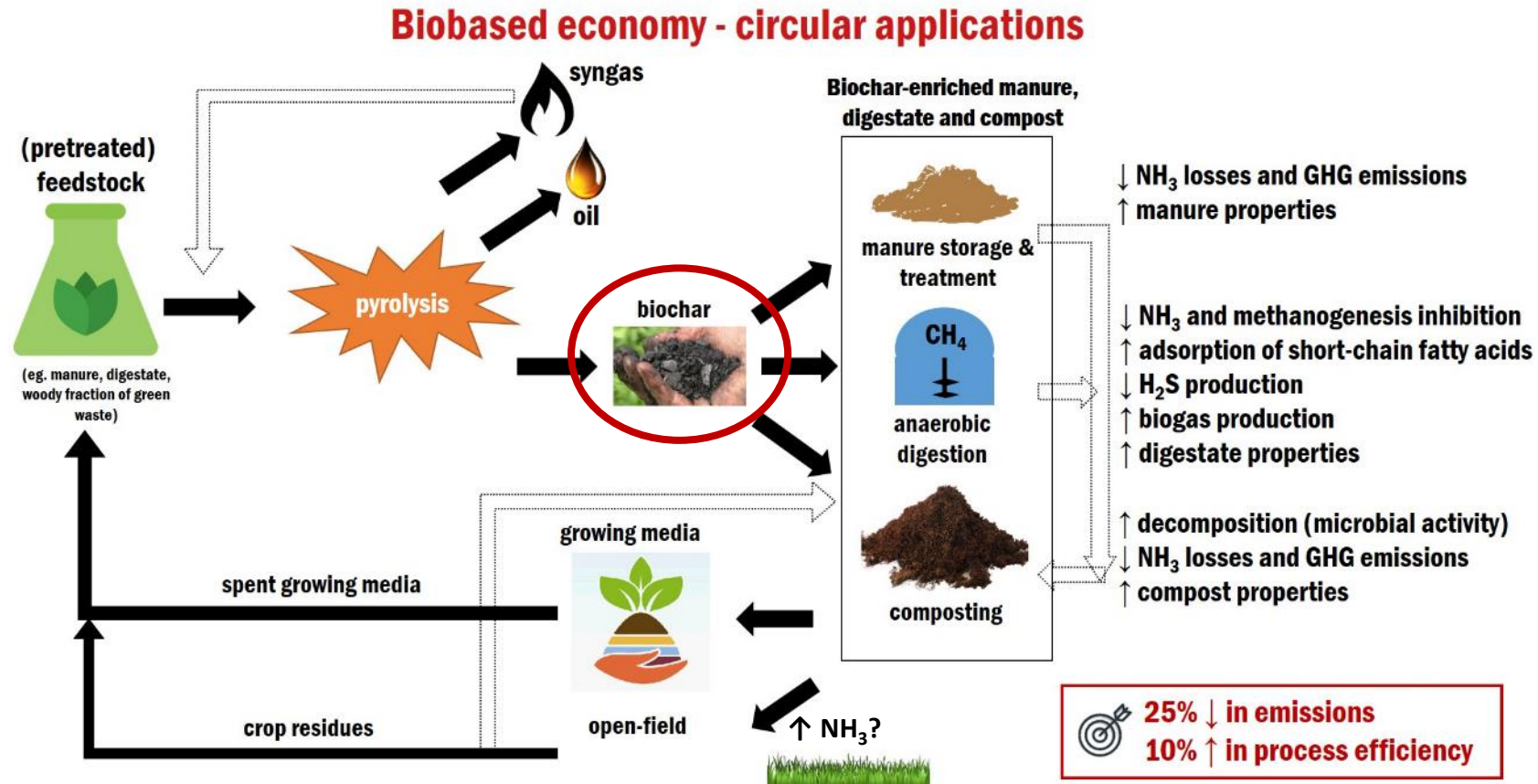
wood = optimal feedstock

Biochar

Biochar application in field soils



Biochar use in cascade



<https://doi.org/10.1016/j.wasman.2023.05.023>

Webinar: <https://www.youtube.com/watch?v=Zf9DqaUJxiw>

Biochar added during manure/AD/compost processing

Use low biochar doses

Sorbed NH_3 is not released \Leftrightarrow sorbed NH_4^+ is slowly released

Biochar use during AD and digestate treatment: higher NH_4 sorption, no NH_3 release in soil

Biochar use during manure storage and treatment: lower NH_3 emissions, no NH_3 release in soil

You can only use biochar once for reducing NH_3 and GHG emissions, but you can reuse biochar for other applications

Nutrient-rich biochars: higher sorption capacity



Biochar available in different shapes and particle sizes



Reuse of growing media

New materials



Biochar in growing media



Different functions:

g/L	Disease suppression
	Carrier for biocontrol organisms or nutrients
	Liming agent
1 vol%	Fertilizer
5 vol%	Perlite replacement
10 vol%	Bulk material in horticultural substrate
100 vol%	Stand-alone horticultural substrate
	Biochar as an upcycling strategy
	Biochar as a cleanup method (pollutants & pathogens)

Or part of system:

Pyrolysis = heating and CO₂ for greenhouse + biochar for growing media

Webinar:

<https://www.youtube.com/watch?v=R9kB-F54Tow>

Biochar



Chitin



Elemental S



**Mode of action: microbiological
Effect: chemical**

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Effect: chemical**



Microbial activation or Biological acidification of biochar?

S: change in pH, EC and sulphates

Chitin: mineral N release

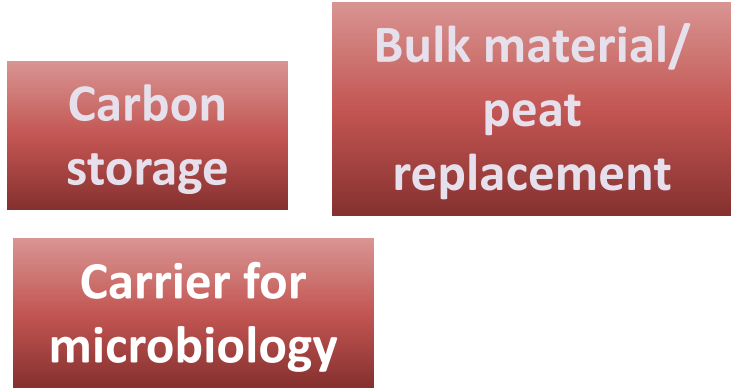
Microbial interaction:

Chitin: only N mineralization in presence of S

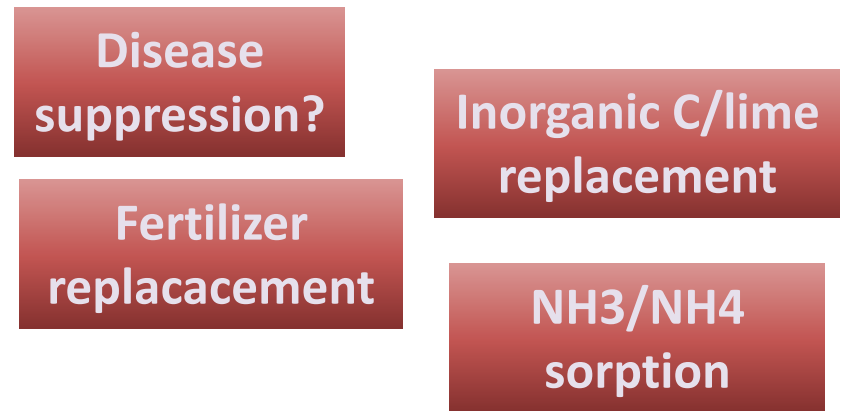
S: faster pH decrease when chitin is present

Webinar: https://www.youtube.com/watch?v=gdJGDUvZ_4

Carbon



**Targeted
applications**



Nutrients

Biochar as a cleaning method

Reduce contaminants, e.g., microplastics (Ni et al., 2020), PFAS (Eben et al., 2022), antibiotics (Chen et al., 2021)

Eliminate pathogens or antibiotic resistance genes (Kimbell et al., 2018)

Change nutrient balance: removal of N but increase in P, K, Ca, Mg and C

Biochar and enhanced weathering



Biochar and C storage in the soil

Biochar may not save the world, but it definitely saved soil science.

Soil application: now, later or never? The role of priming effects ...

Biochar versus biochar-enriched materials

From BIOCHAR to BIOCASH: why apply biochar to the soil?

Biochar for other applications

Use biochar in cascade to avoid competition for biochar

Biochar for circular horticulture: circular use of bulk material, C and nutrients

Interaction between biochar, nutrients and microbiology => emerging field of research



Thank you!

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