Delivery System for Fertiliser based on Biochar

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Introduction

In Europe, approximately 57 million tons of forest waste are produced annually.

Current linear models use leads to soil degradation, biodiversity loss, and fire risk.

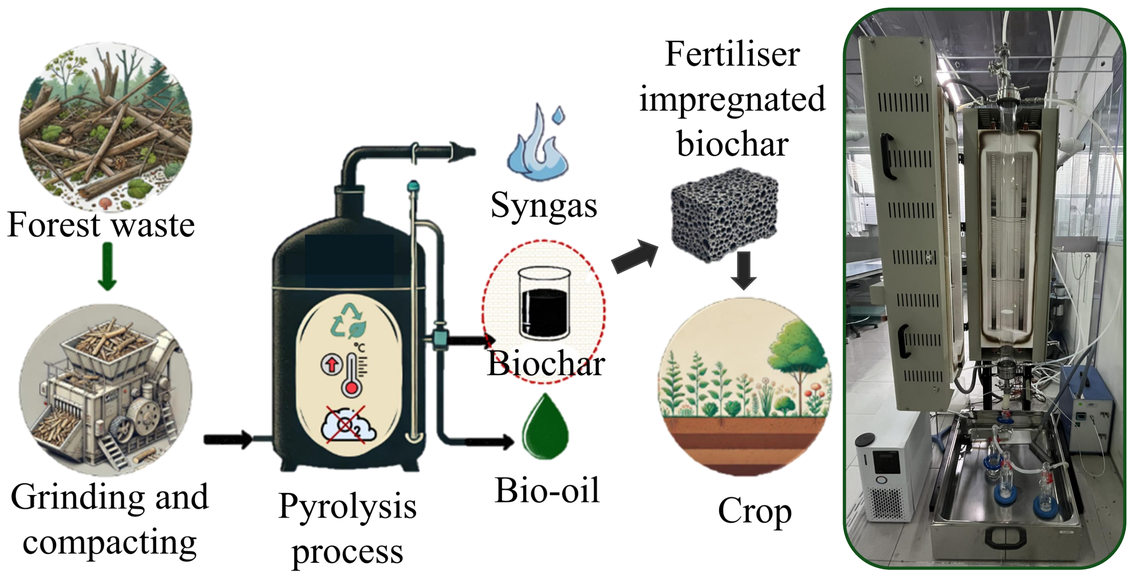
Overuse of agrochemicals have reached a limit of improving agricultural production. This causes not only large economic losses, but also significant environmental impact and it is a serious threat to human safety.

This Project proposes a CIRCULAR MODEL:

- Converting low-value forest biomass into BIOCHAR via pyrolysis.
- Used as a nanocarrier for slow-release fertiliser.
- Biochar enhances soil health, reduces chemical inputs, and captures CO_2.

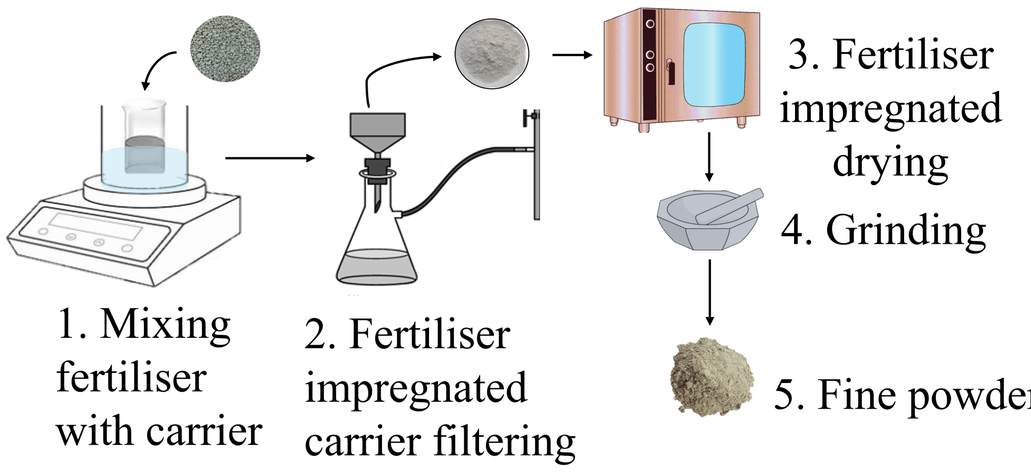
Methodology

• Biochar production



CTC pyrolysis equipment

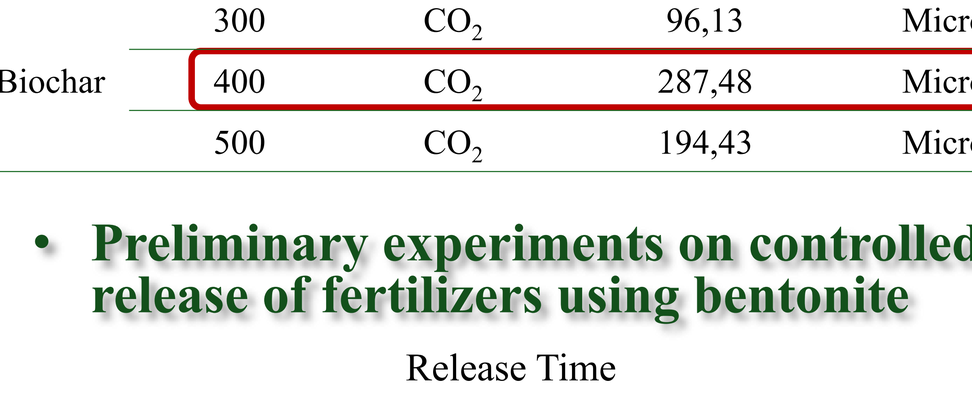
• Fertiliser infusion process



[2]Optimisation of the controlled release of fertilizers in the framework of the AGRO4AGRI project.

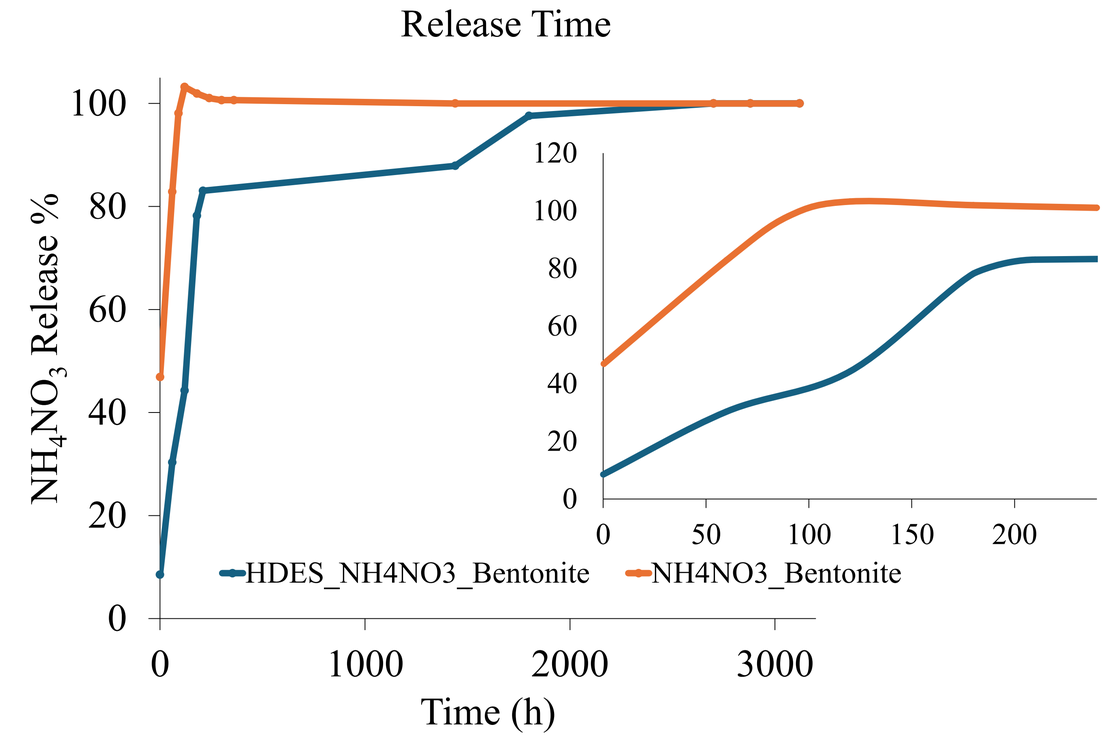
Results

• Biochar from Ulex Europaeus (Gorse)



Product	Pyrolysis Temperature (ºC)	Isotherm adsorption	Equivalent surface area (m^2/g)	Porosity type
Biochar	300	CO_2	96,13	Microporous
	400	CO_2	287,48	Microporous
	500	CO_2	194,43	Microporous

• Preliminary experiments on controlled release of fertilizers using bentonite



- In the infusion process, more than 80% of the fertiliser is successfully impregnated into the carrier.
- Additionally, by encapsulating the carrier with the fertiliser impregnated with deep eutectic solvents as an efficient slow and controlled release system, a slower release of the fertiliser is achieved compared to traditional fertilisation mechanisms.

Conclusion

This work represents a breakthrough in the optimisation of pyrolysis and also serves as a demonstration model for the use of biochar as a nanocarrier in slow and controlled release fertiliser system. The main findings include high fertiliser adsorption, efficient desorption and extended release times. The developed system offers a controlled alternative to conventional fertilisers, reducing agricultural overexploitation and environmental impact. It also favours the valorisation of biomass and the circular economy in rural areas. It falls within the framework of precision agriculture strategies and circular bioeconomic.

Acknowledgments

2 AGRO4AGRI

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