NITROGEN VALUE AND ENVIRONMENTAL IMPACTS BY PLASMA TREATMENT OF DIGESTATE

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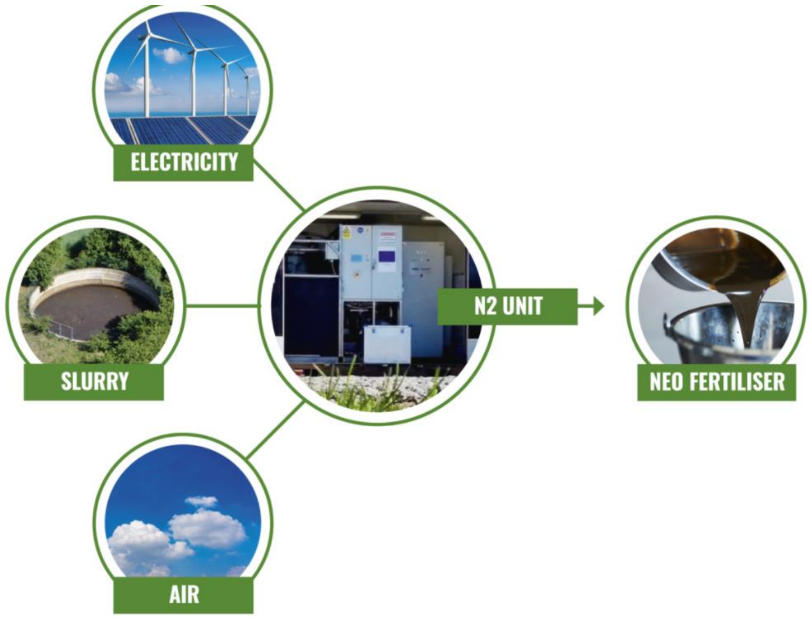
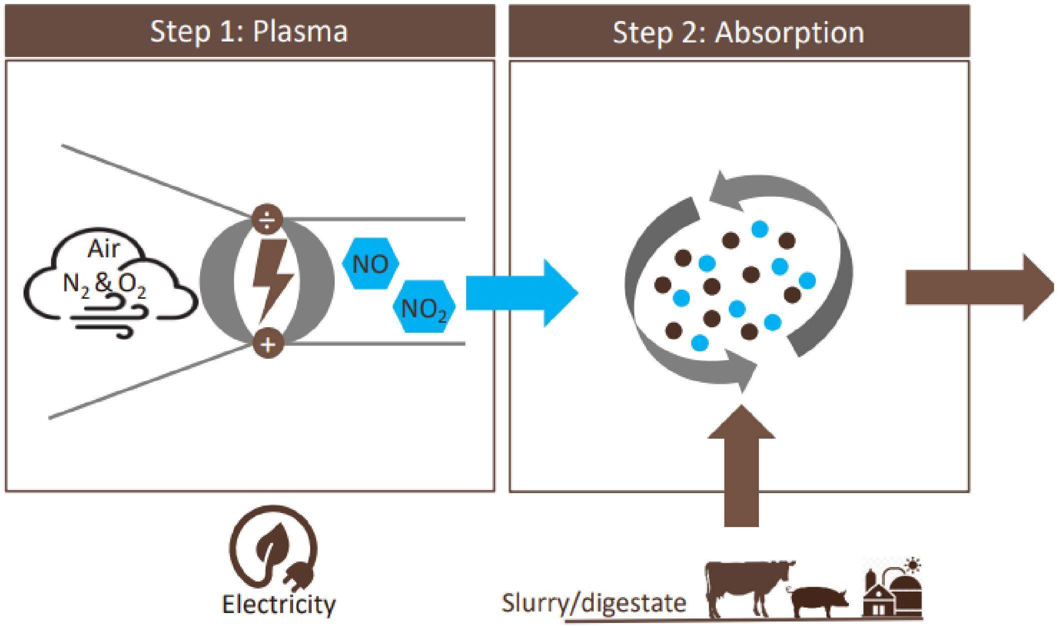
Plasma treatment - how it works





- Plasma treatment converts atmospheric N2 to nitrate and nitrite injection in slurry reduces pH.
- pH decreases

FOULUM SET UP – N2 APPLIED

Biomass → Biogas → Separation (Decanting centrifuge)

Separation → Fiber 25% TS → Drying → Dried frber

Drying → Ammonia → Ammonia scrubber

Separation → Liquid → Liquid → N2 applied

Liquid → Storage (CH_4, N_2O)

N2 applied → Storage (CH_4, N_2O)

Emissions from NEO by storage compared to storage of liquid fraction.

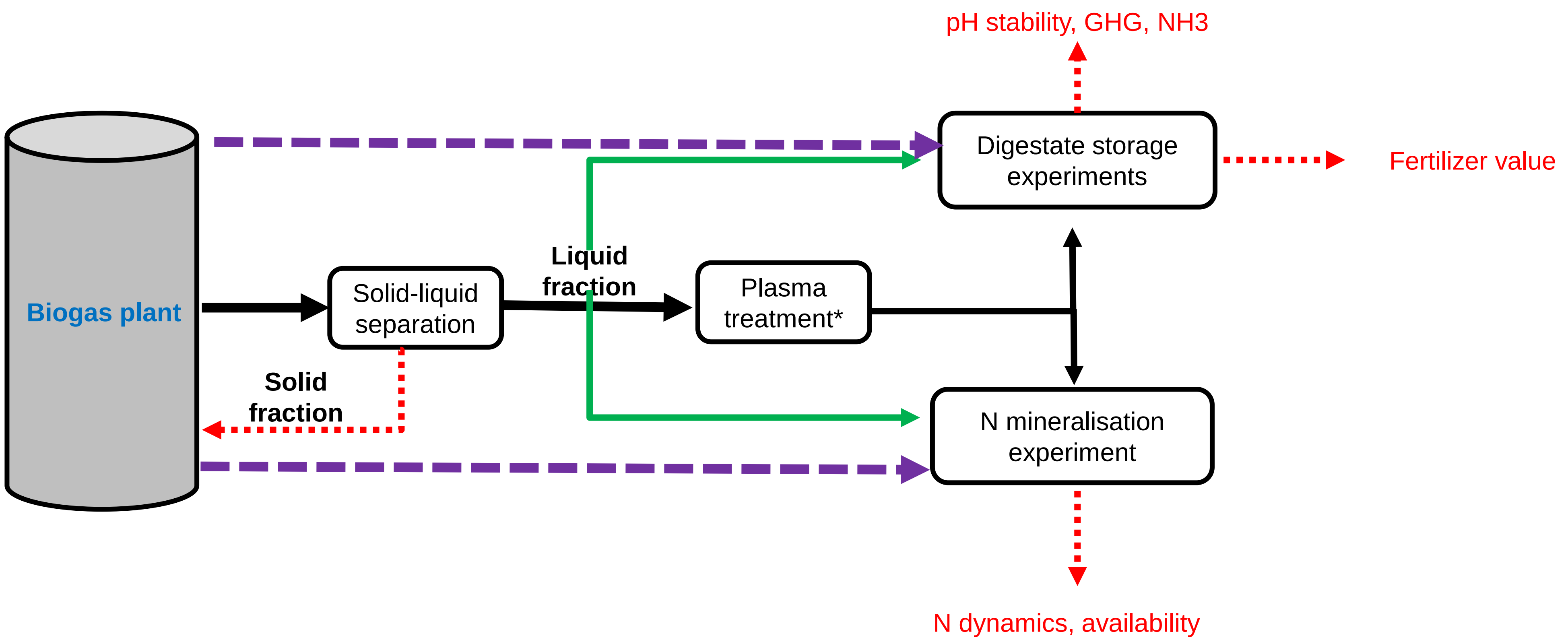
EXPERIMENTS

Effects of plasma treatment

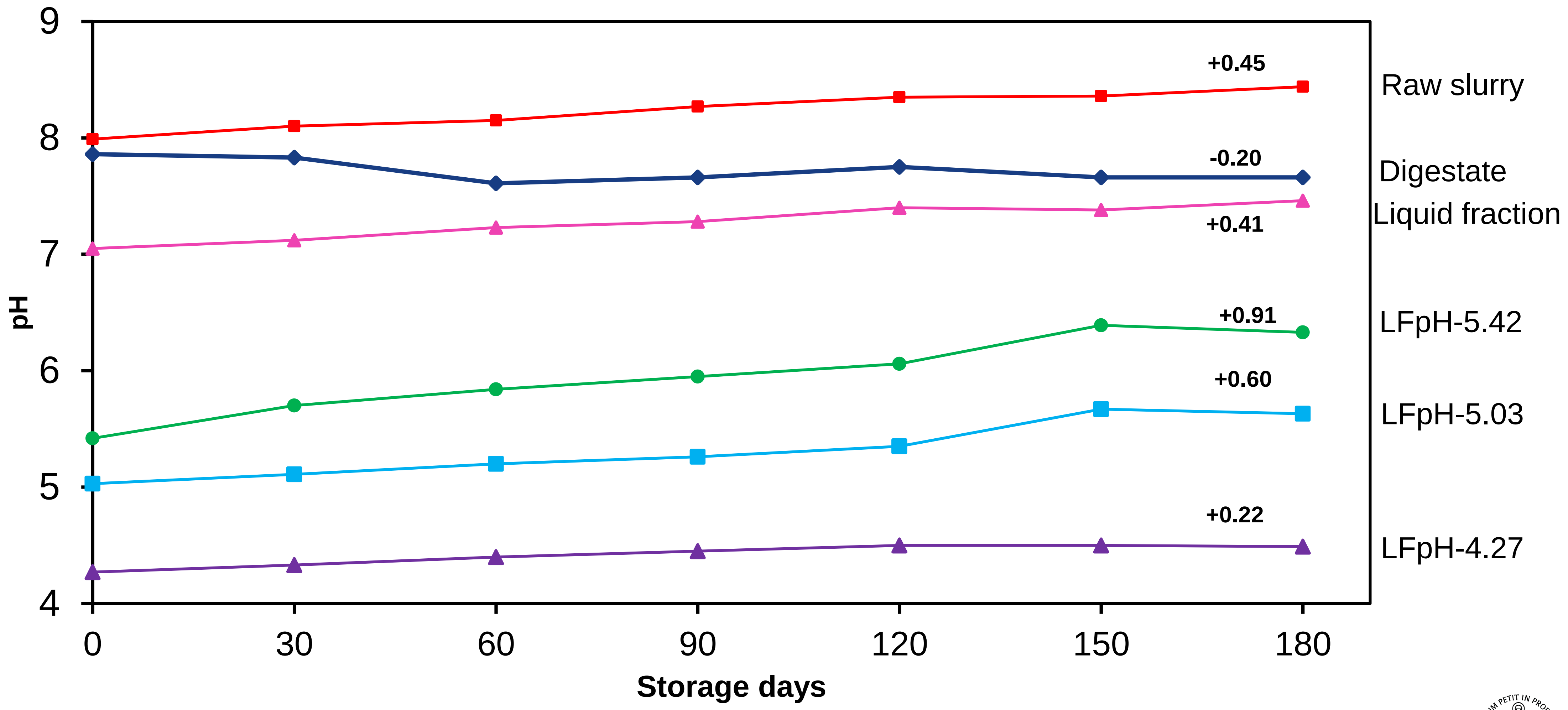
1) *pH, nitrification/ nitrogen turnover during storage and after soil application*

2) *Emissions of GHG and ammonia during storage*

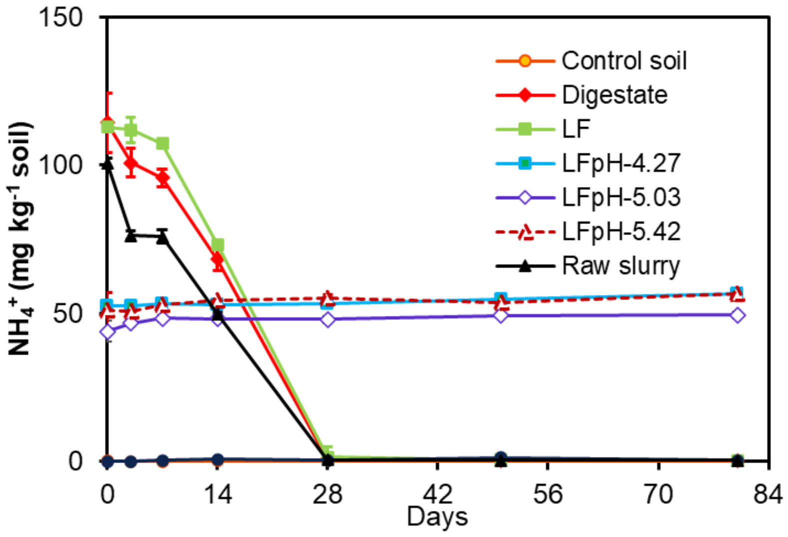
3) *Nitrogen value after field application*

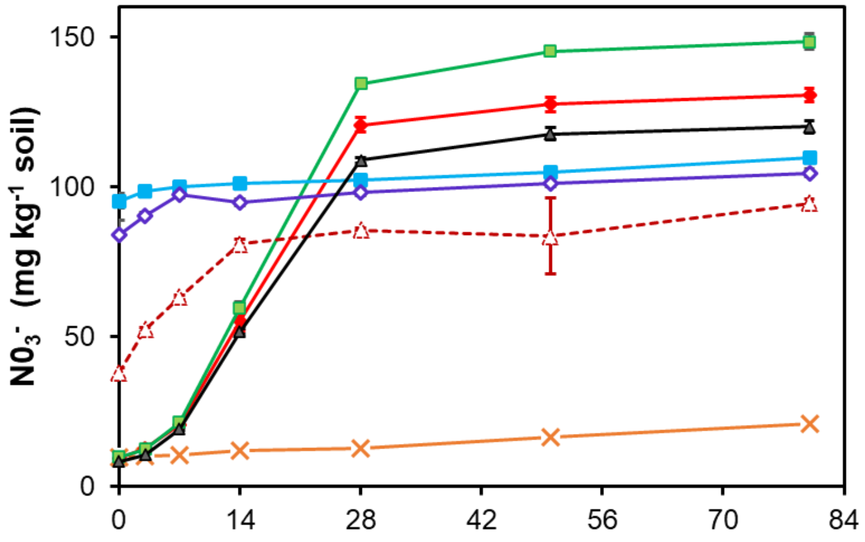


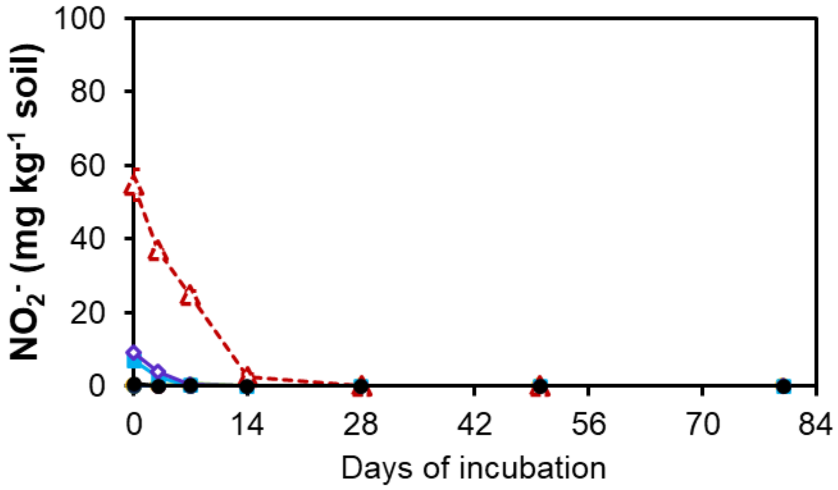
Evolution of pH during storage

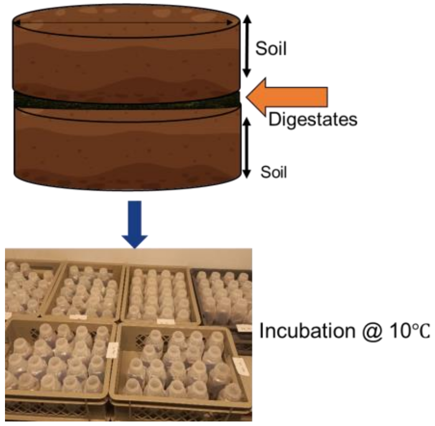


Results- N dynamics & nitrification

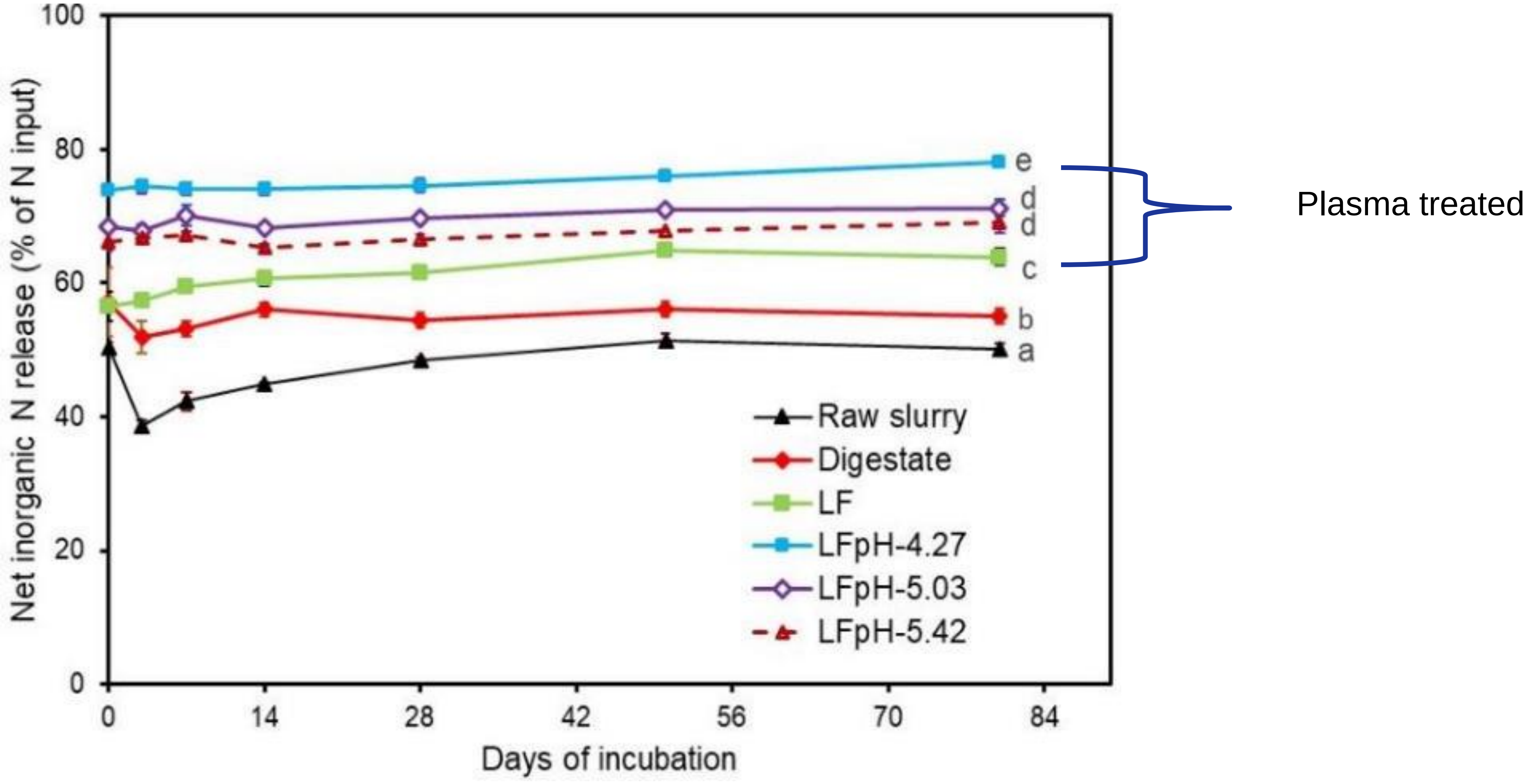




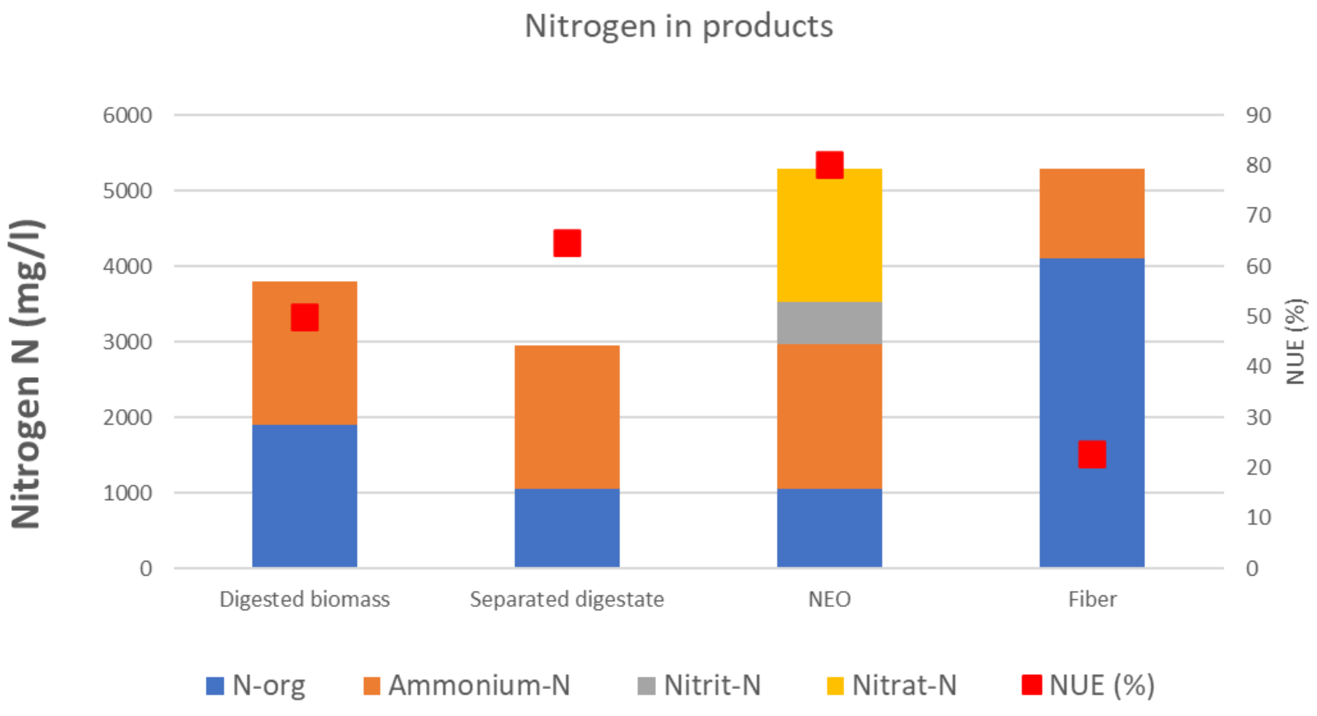


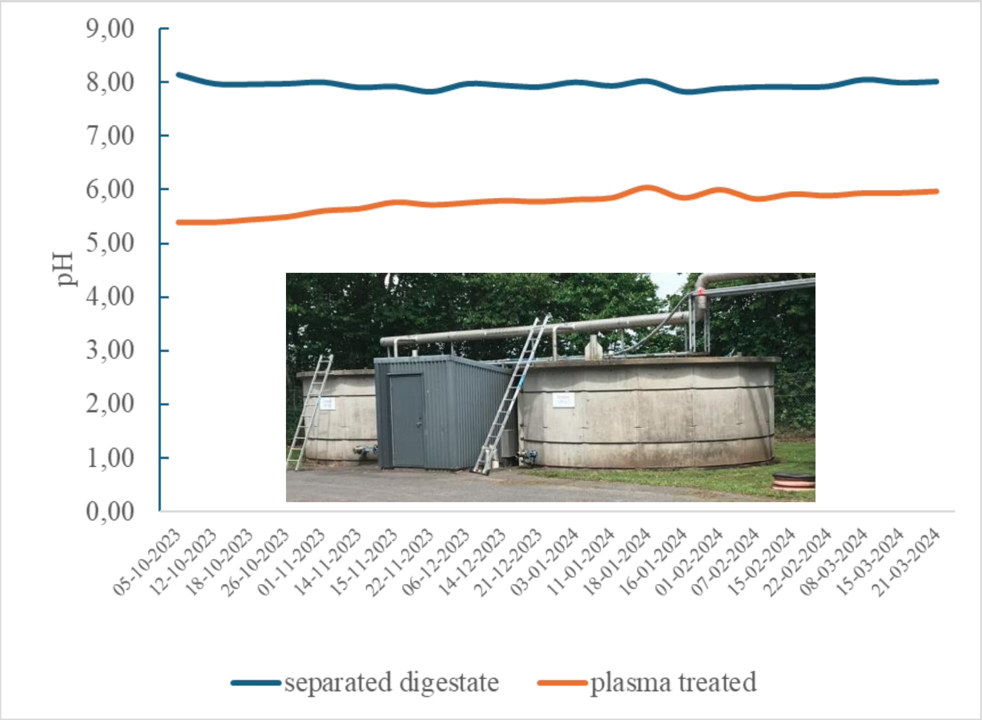


Results- Net N release in soil (% of N added)

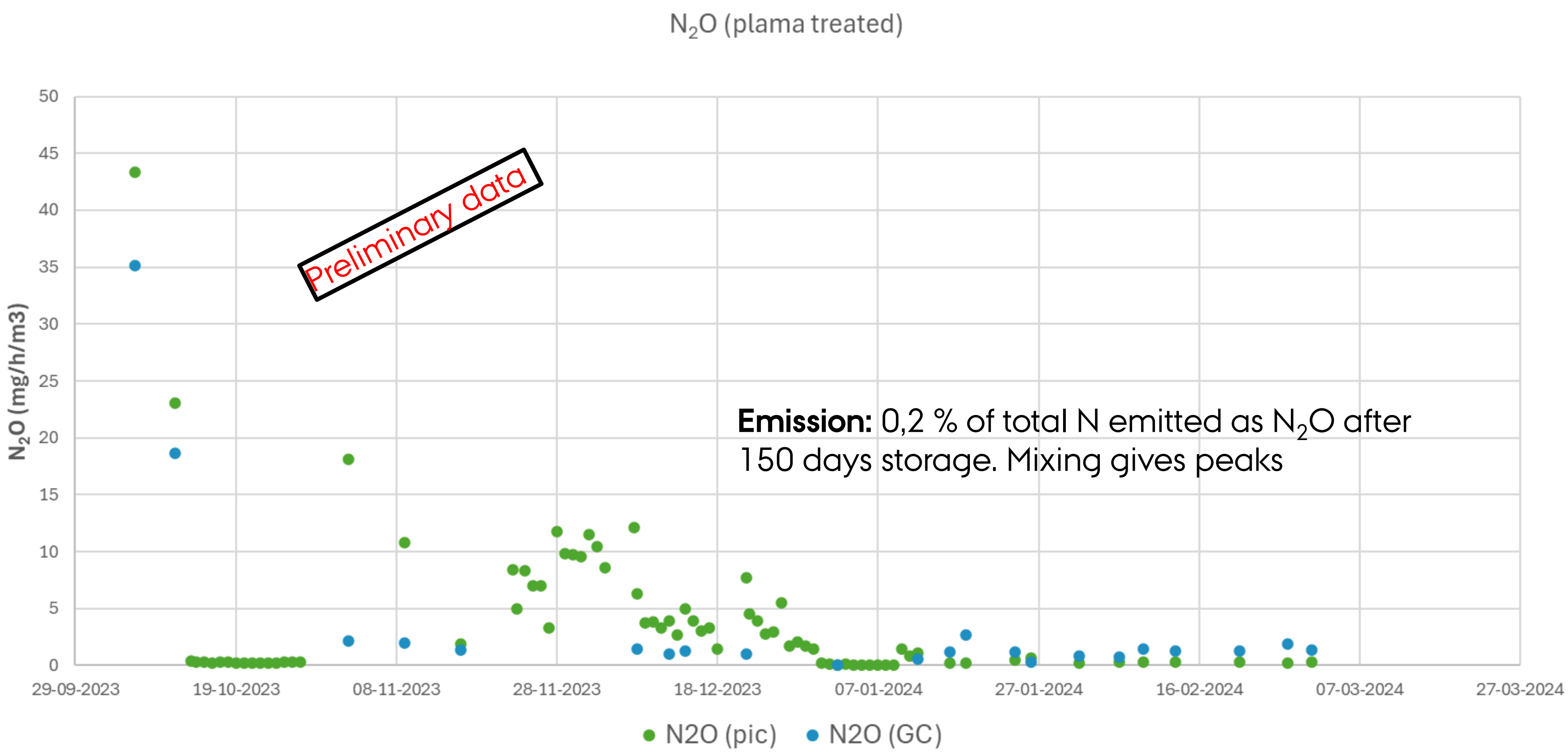


NITROGEN IN FRACTIONS



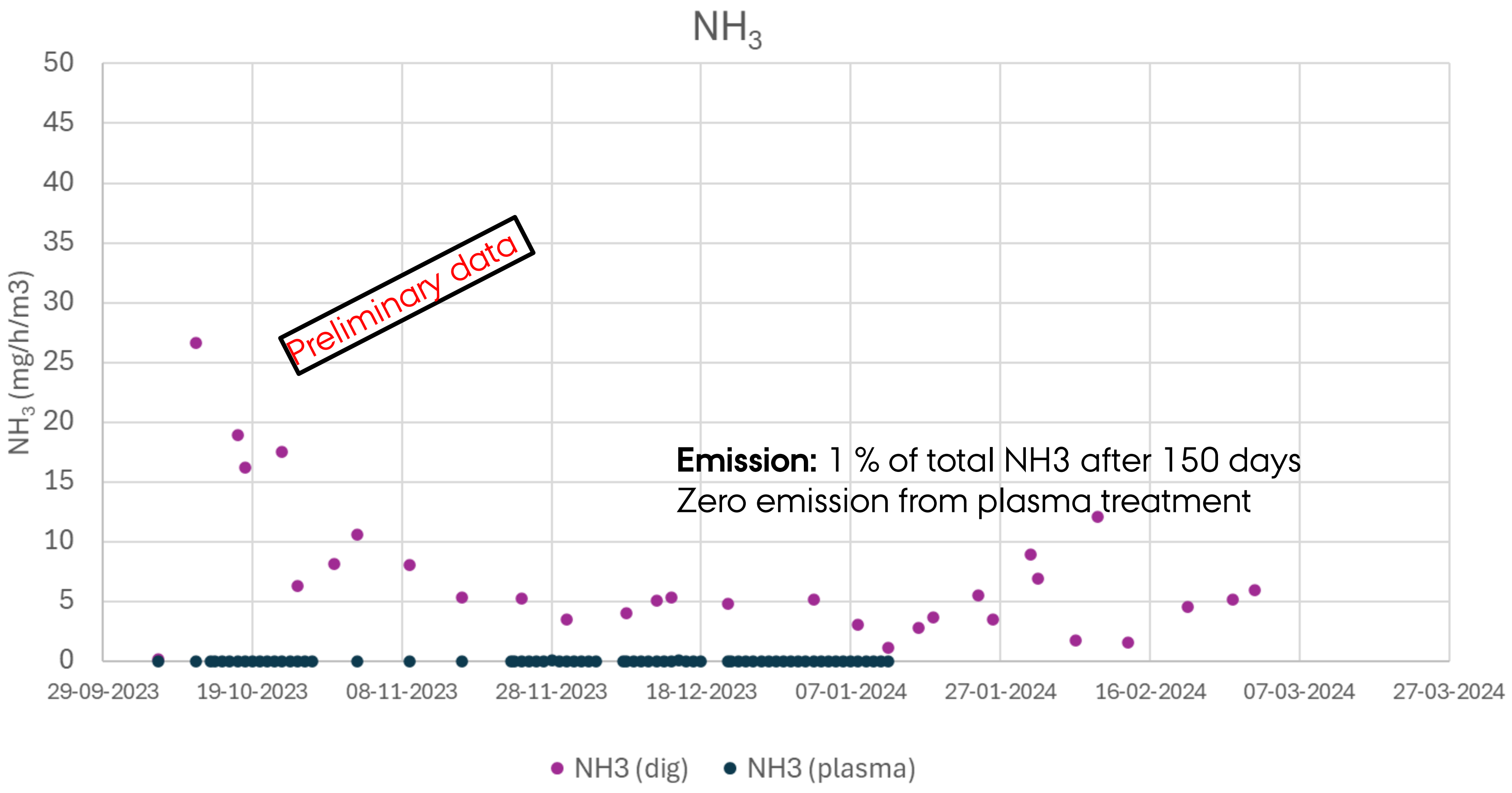


Results- GHG emissions

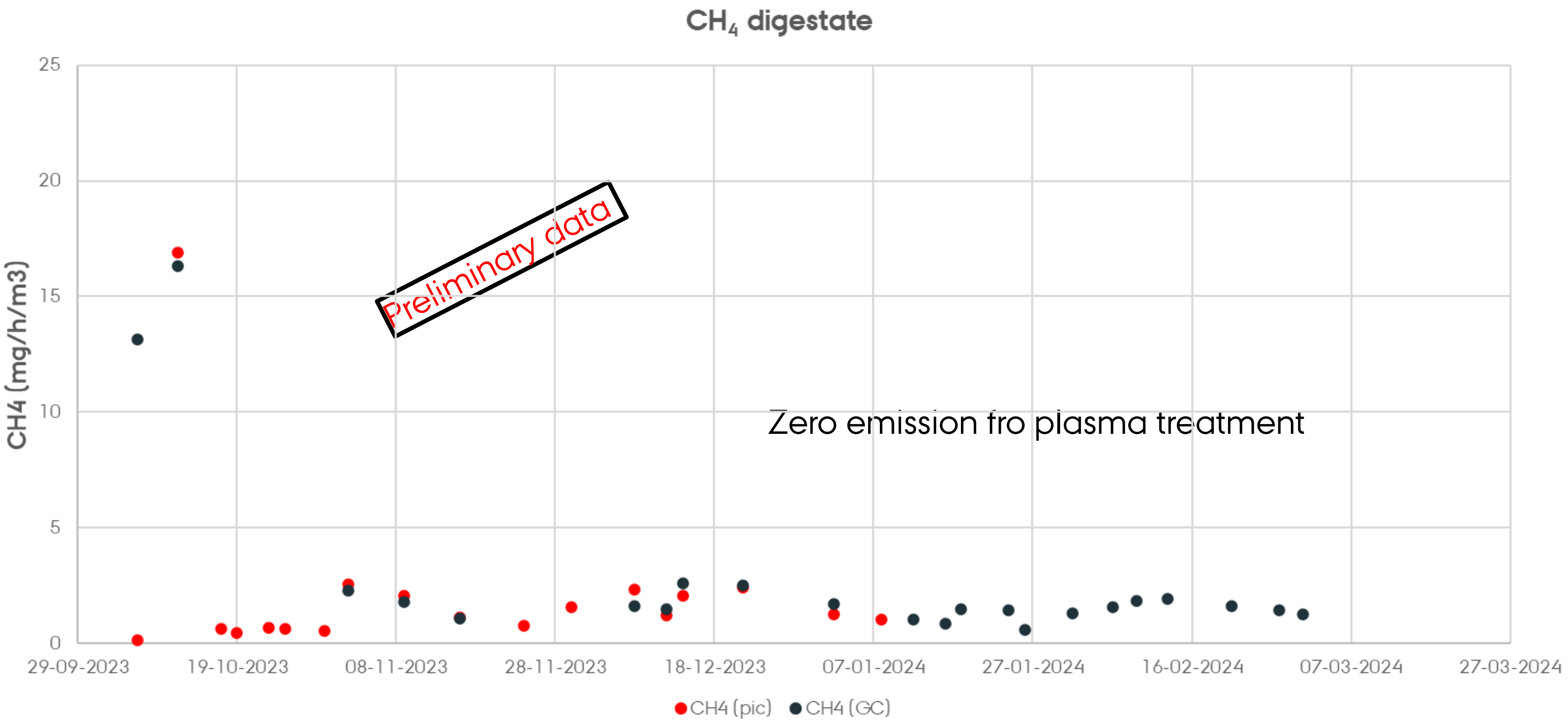


Emission: 0,2 % of total N emitted as N_2O after 150 days storage. Mixing gives peaks

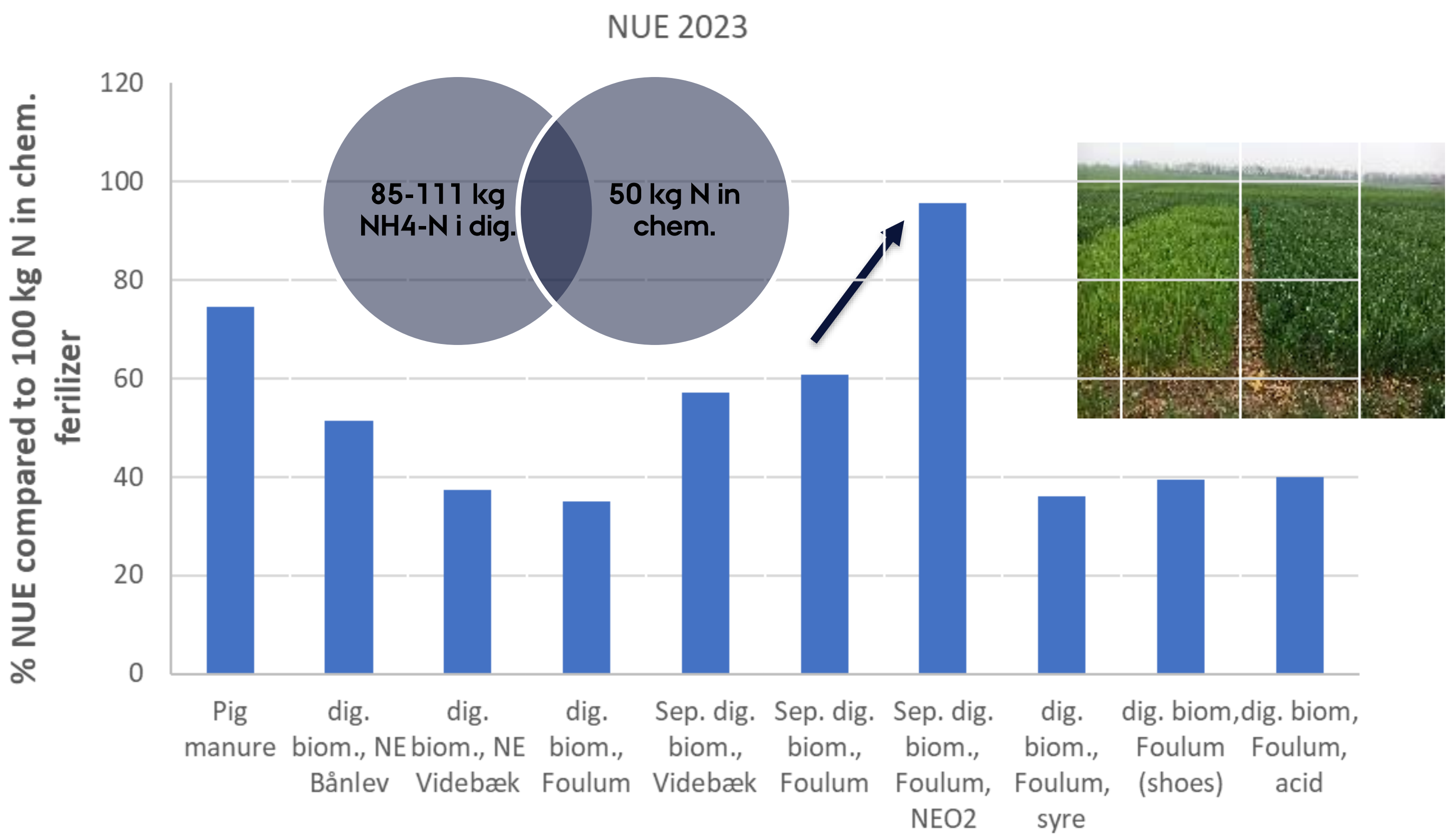
Results- NH_3 emissions

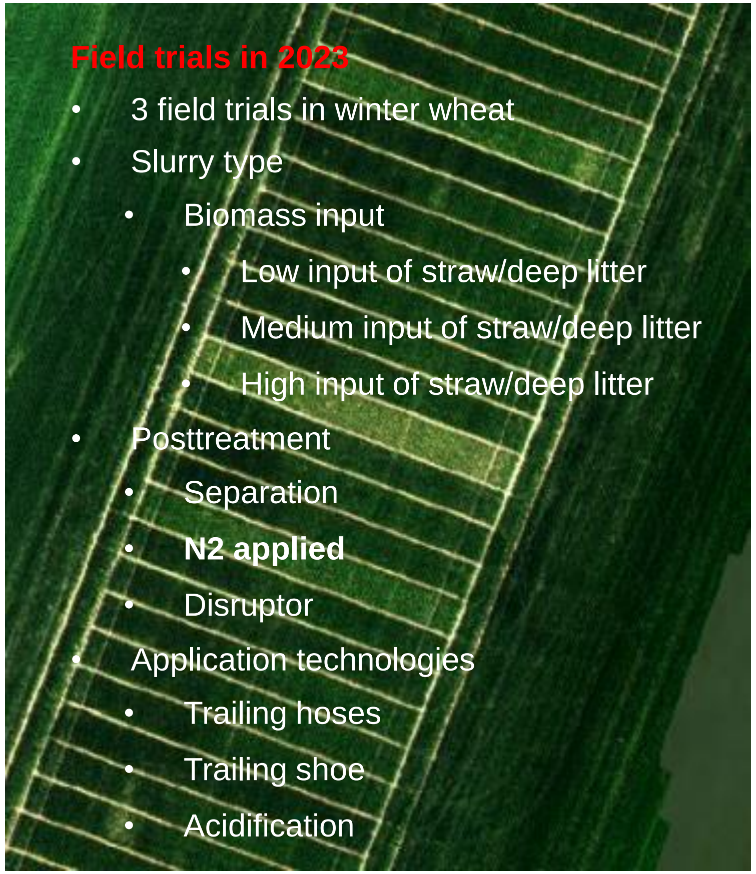


Results- CH_4 emissions

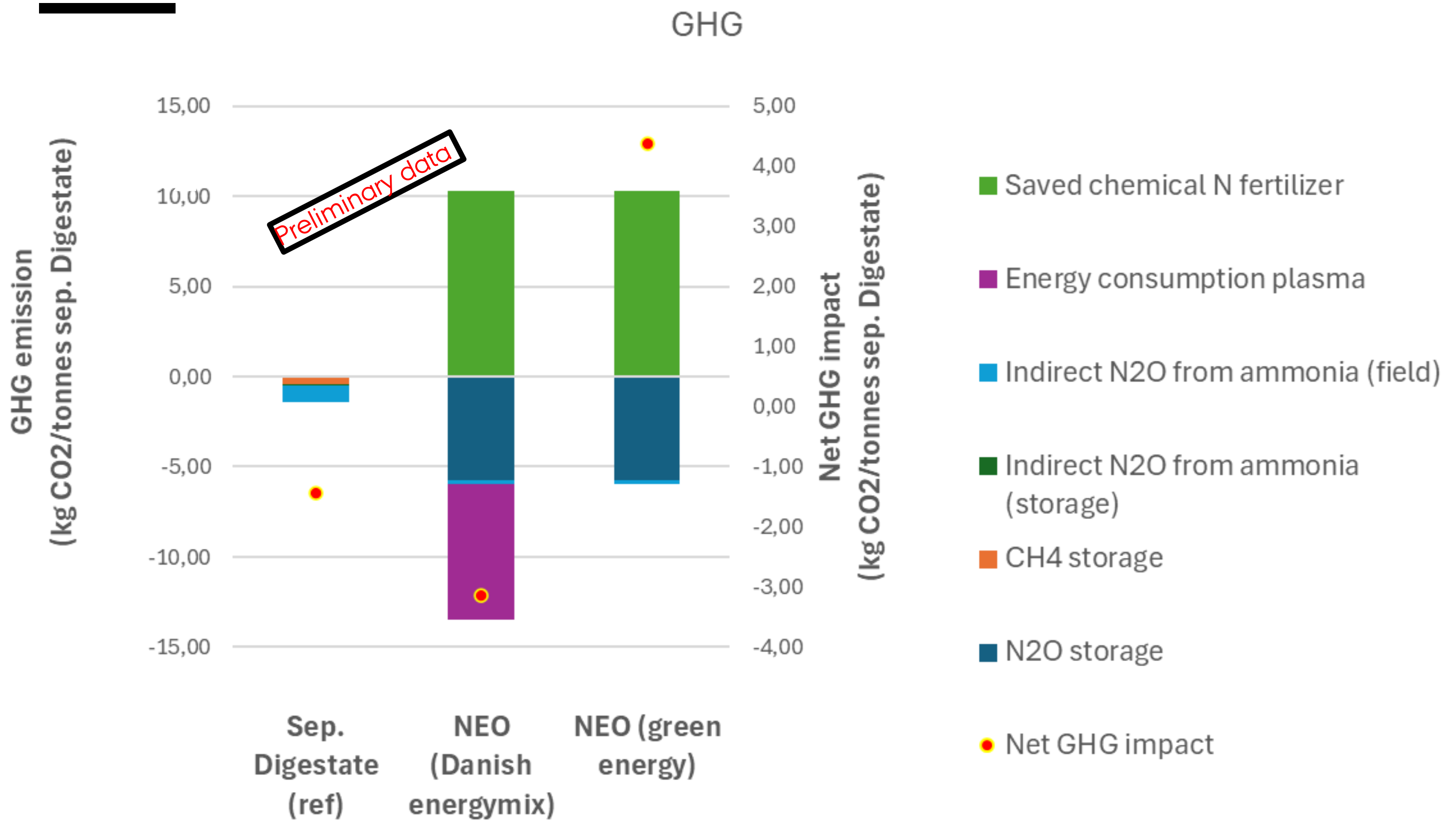


FERTILIZER VALUE





GHG BALANCE



Comparisons are done with decanting as separation. Separation with screw press will favour NEO

Conclusions

- ❖ Plasma treatment double the amount of inorganic N and reduce pH to around 5.
- ❖ There is indications that nitrification in soil can be reduced by plasma treated digestate.
- ❖ Nitrous oxide emissions during storage is higher than for none plasma treated digestate.
- ❖ Ammonia and methane emissions during storage of NEO is eliminated.
- ❖ The nitrogen utilization efficiency is very high for NEO due to high inorganic N and low emission of ammonia.
- ❖ The overall GHG emission by plasma technology is highly dependent on the energy source used and can range from -3 to 4 kg CO_2/ tonnes separated digestate.

THANKS FOR YOUR ATTENTION