

# AlgalFertilizer project: Algae delivering nutrients from phosphorous-rich media to soil and wheat

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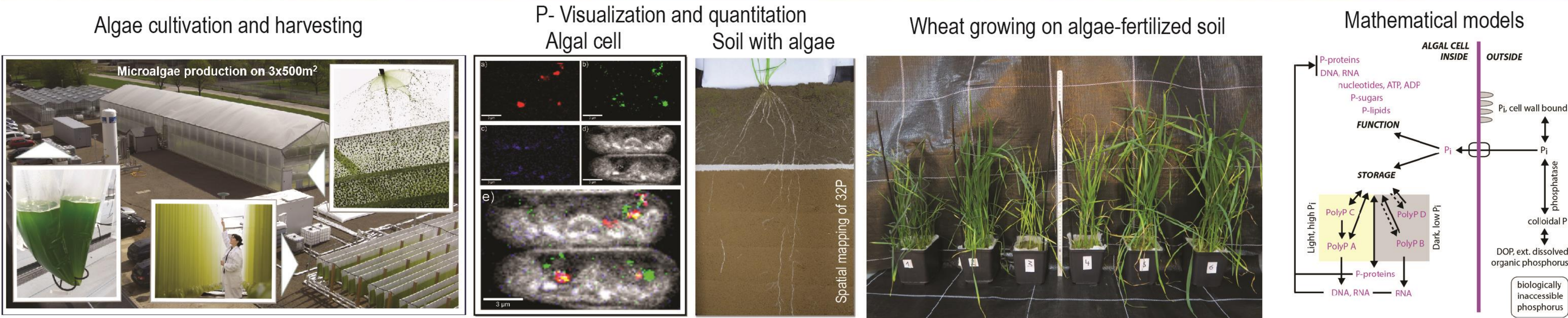
## SUMMARY

In the frame of the **AlgalFertilizer project**, we studied **wheat growth on algae-fertilized soils**

- Chlorella vulgaris*, IPPAS C1 was cultivated in the large scale photobioreactor system (3 x 500 m<sup>2</sup>) in Jülich, Germany in a batch in P-rich medium.
- The algal biomass was analyzed for phosphorus content and used as fertilizer to grow wheat on sandy substrate and on nutrient-poor Null-Erde, compared to growth on nutrient-rich soil (Dachstaudensubstrat, SoMi 513).
- The algal biomass was mixed into soil substrates either in form of spray dried powder or paste of fresh cells obtained by centrifugation.

- We applied amounts of algae corresponding to 45 kg(P)/ha or to 4.5 kg(P)/ha.
- We compared the growth of wheat on algal fertilizer with standard Hoagland mineral fertilizer of corresponding concentrations.
- The experiment was performed with 150 pots, 4L each that were continuously randomized in the greenhouse by a robotic system that also ensured uniform watering. Individual plants were moved regularly with their pots into an imaging system that served to quantify the plant growth.
- We also analyzed the dynamics of nutrients in the soil.

## OVERALL PROJECT STRUCTURE: AlgalFertilizer



## EXPERIMENT PART 1: ALGAE FOR SOIL FERTILIZATION



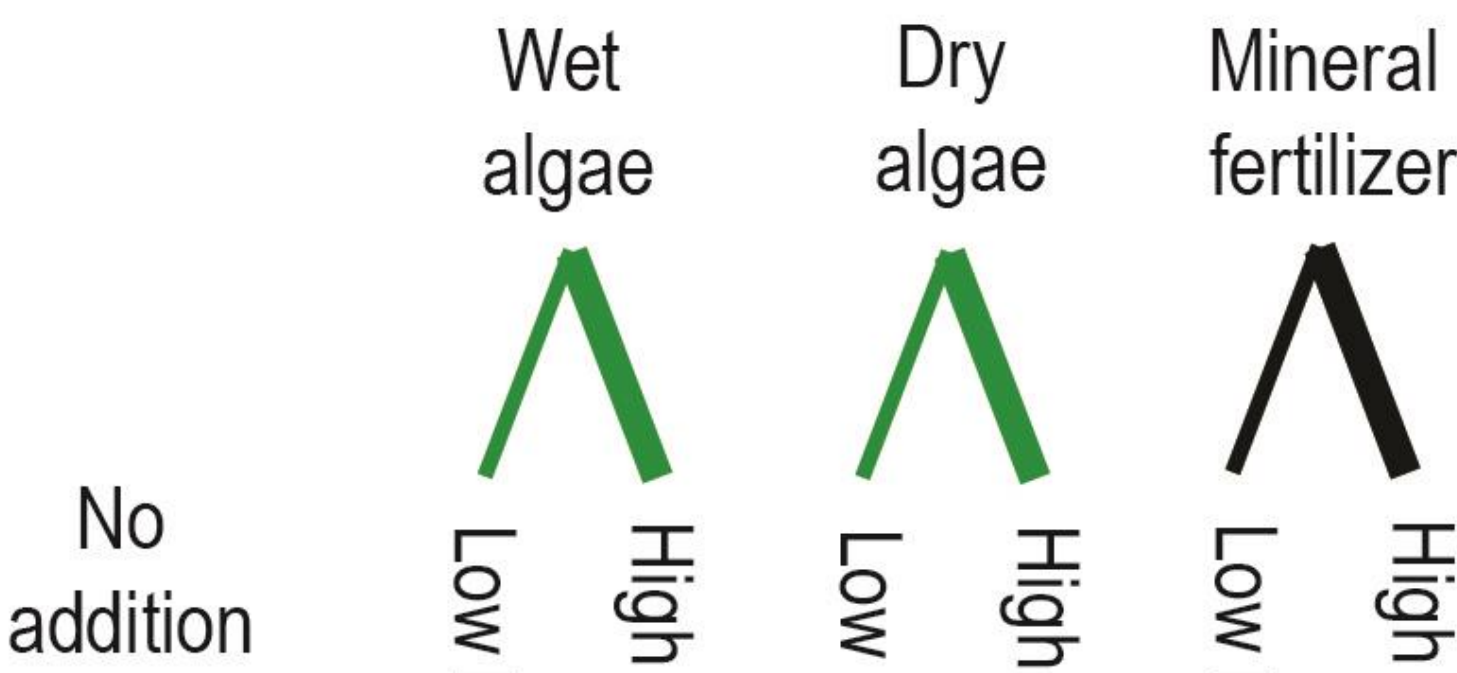
*Chlorella vulgaris* IPPAS C1 cultivation  
Harvesting & biomass P-analysis  
Application to different soils as  
- fresh biomass paste  
- spray-dried powder  
- high P: 45 kg(P)/ha  
- low P: 4.5 kg(P)/ha

## EXPERIMENT PART 2: SOILS & ALGAE

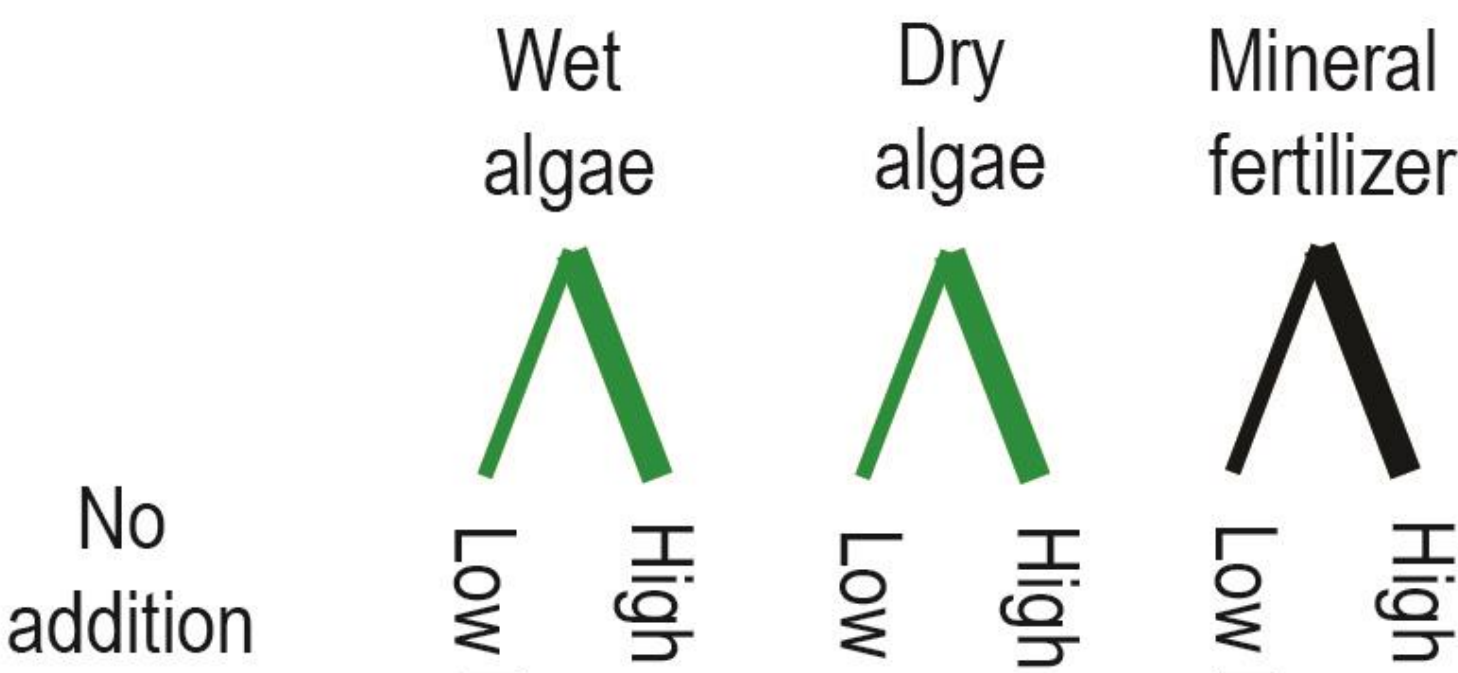


**NUTRIENT-RICH  
REFERENCE SOIL  
Somi 513**

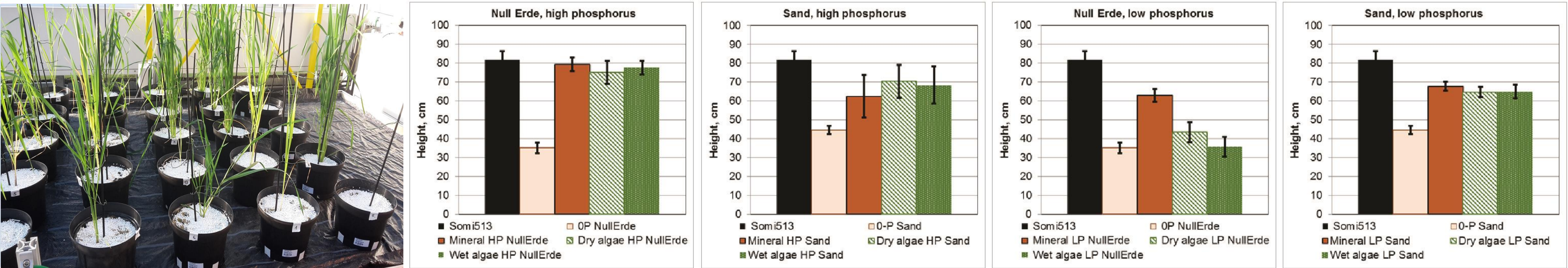
**POOR SOIL  
Null-Erde**



**SAND**



## RESULTS: WHEAT ON P FROM ALGAE



## CONCLUSIONS

- Fertilization of poor-soil by algae is at the same level compared to enriched soil as well as to mineral fertilizer (Fig.A).**
- Algae fertilization at high P concentrations performs slightly better on sandy substrates in comparison to mineral fertilizer (Fig.B).**
- No significant differences in fertilization effectiveness between spray dried algae and fresh algae paste (Figs.A-D).**

## REFERENCES

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## ACKNOWLEDGEMENTS

The research was financially supported by the BioSC AlgalFertilizer project funded by the Ministry of Innovation, Science and Research of the German State of North Rhine-Westphalia.