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# The effects of algae fertilizer on wheat root morphology elucidated using modeling, phenotyping and metabolomics

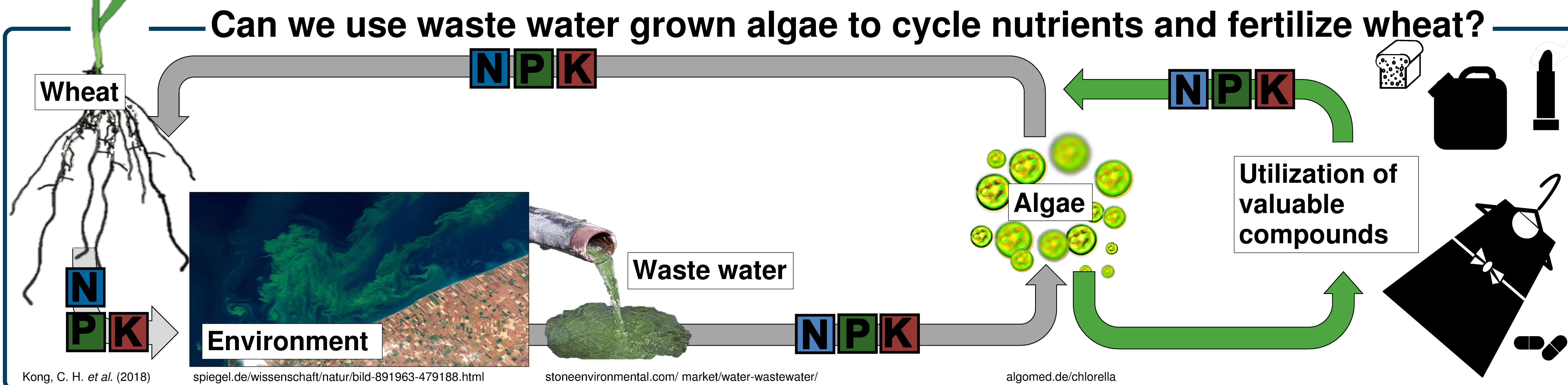
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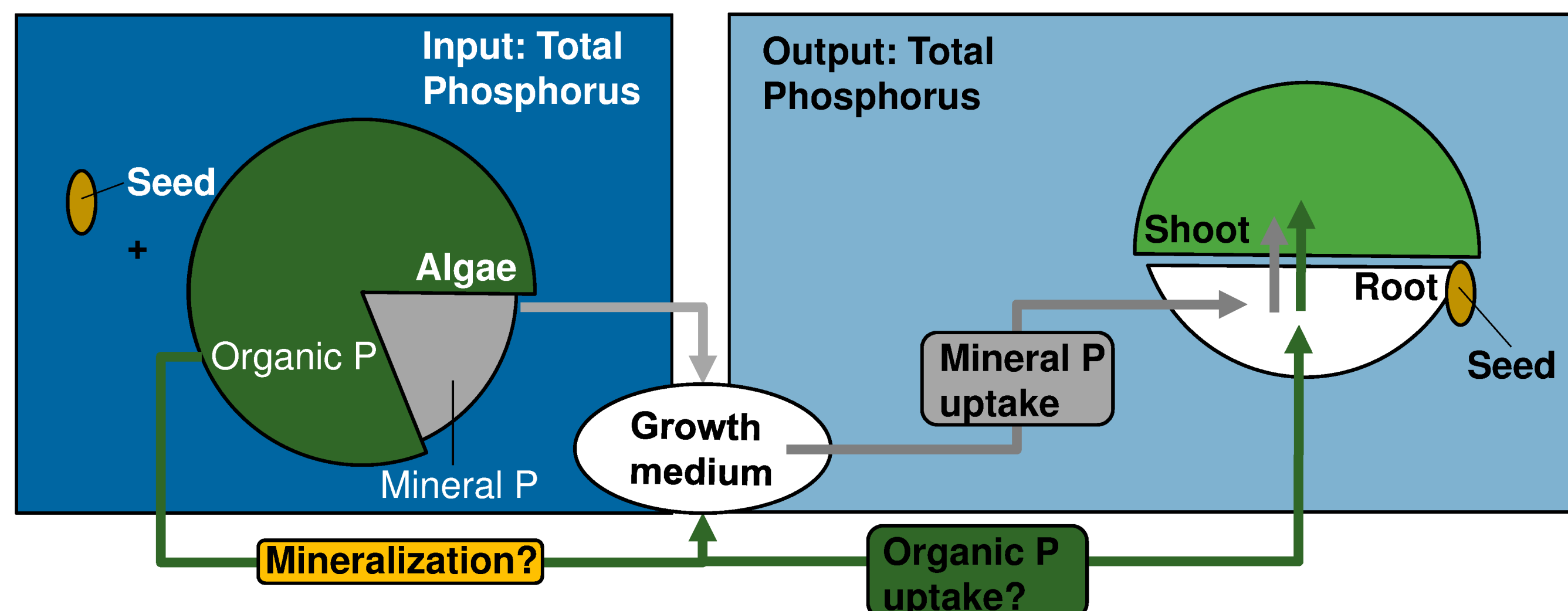
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## Methods and results - Experiments to test if wheat can utilize algal nutrients

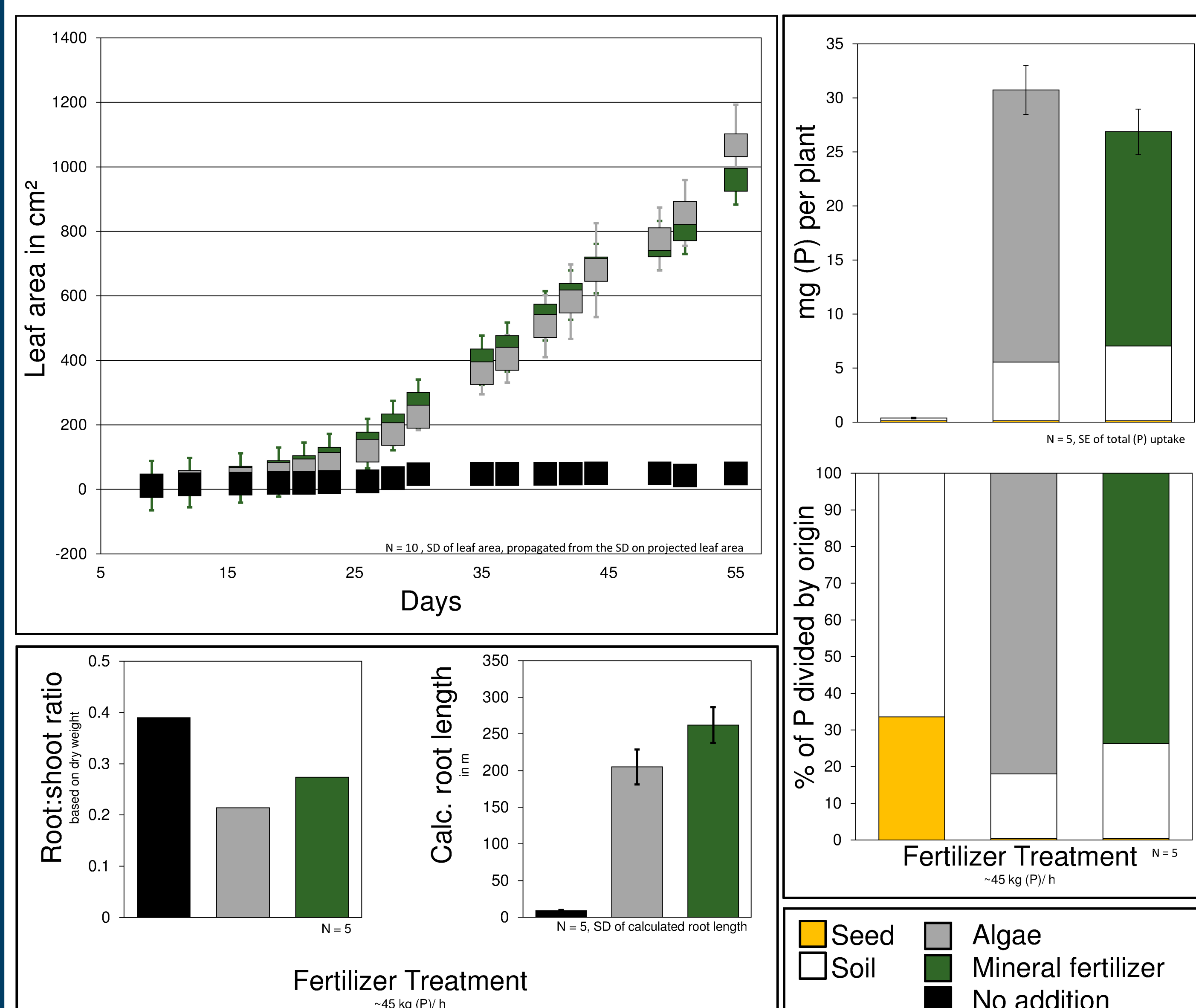
### Modeling

Nutrients from algae are available to wheat root uptake.



### Results so far:

Modeled phosphorus (P) uptake from different sources based on data from Schreiber *et al.* 2018.



Schreiber, C. *et al.* (2018) "Evaluating potential of green alga *Chlorella vulgaris* to accumulate phosphorus and to fertilize nutrient-poor soil substrates for crop plants," *Journal of Applied Phycology*, 30(5), pp. 2827–2836.

### Phenotyping

Roots respond to algae fertilizer with changes in root architecture and morphology that are different to conventional fertilizers.



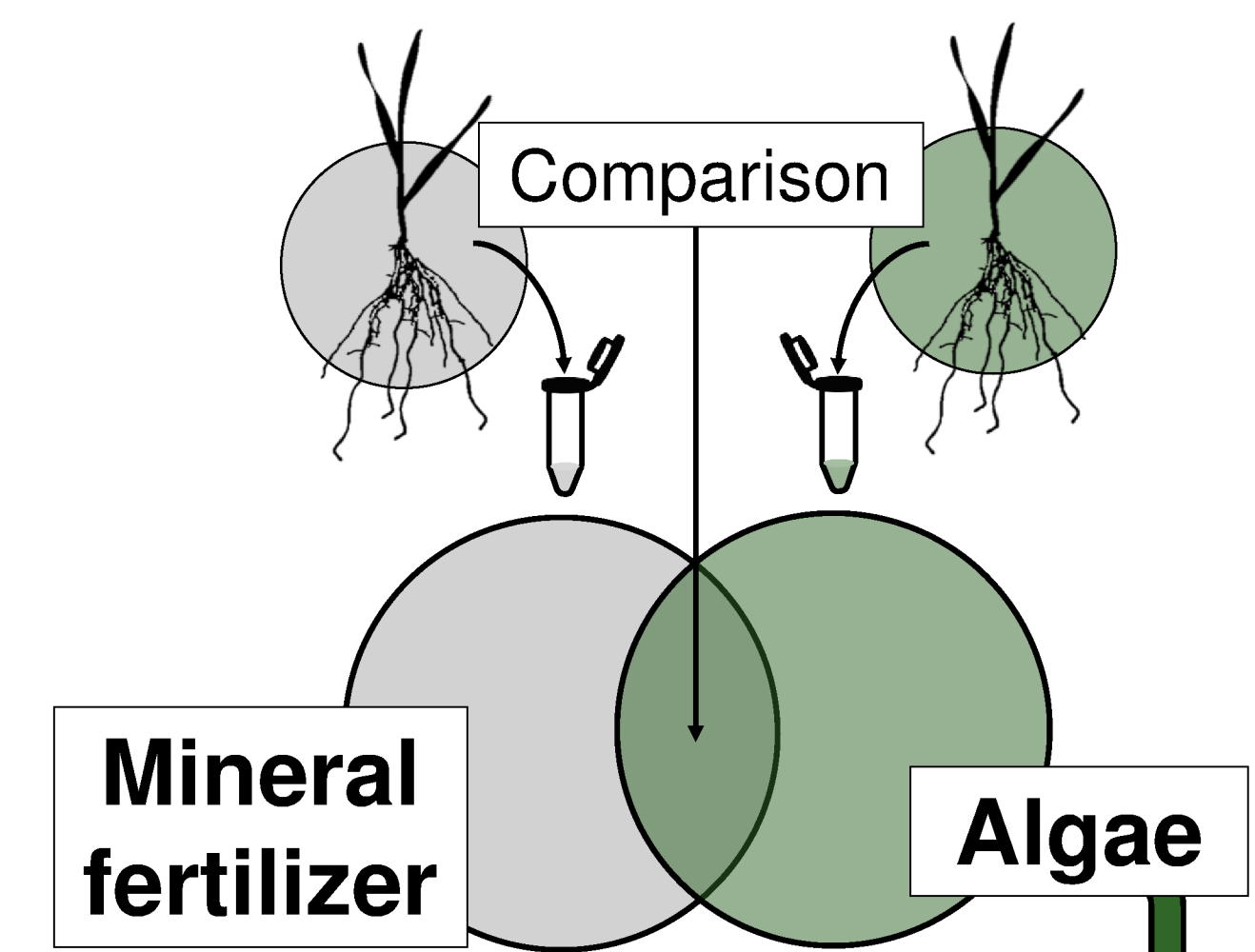
Sasse *et al.* 2019

➔ EcoFABs (Ecosystem FABrications, Gao *et al.* 2018)

Gao, J. *et al.* (2018) "Ecosystem Fabrication (EcoFAB) Protocols for The Construction of Laboratory Ecosystems Designed to Study Plant-microbe Interactions," *Journal of Visualized Experiments*, (134), pp. 1–16.

### Metabolomics

Active response of roots to algal nutrients is reflected in an alternate mode of nutrient uptake.



Candidate compounds for further evaluation

## Discussion of modeling results

- ➔ Algae fertilization supports shoot growth to a similar extent compared to mineral fertilization
- ➔ Root:shoot ratio and root length are affected by algae treatment
- ➔ Around 70% of plant phosphorus algae fertilized wheat is treatment related

## Take home message

- ➔ Algae addition can support continuous wheat growth in a soil system
- ➔ Algae treatment facilitates phosphorus uptake compared to unfertilized controls

## What's next?

