# CropBooster-P

#### Roadmap to future-proof Europe's plants





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# Improving micronutrient uptake and use efficiency

- Wednesday June 9, 2021
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# Micronutrients impact crop yield and human health



**Plant essential micronutrients**: boron (B), chlorine (Cl), copper (Cu), iron (Fe), manganese (Mn), molybdenum (Mo), nickel (Ni) and zinc (Zn).

- Low micronutrient availability **limits crop yield**
- Symptoms of micronutrient deficiency: not always obvious
- Micronutrient deficiency impacts essential plant functions
- Micronutrient availability: **regional differences** in the EU
- Poor knowledge of micronutrient availability in soils



# Micronutrients impact crop yield and human health



**Micronutrient deficiencies:** the most widespread nutritional deficiencies in human populations

- Low micronutrient intake affects human health (hidden hunger),
- Iron deficiency causes anemia
- Zinc repletion is required to fight infection
- Populations at risk: children, pregnant women
- Vegetarians, a growing population in the EU, are prone to micronutrient deficiency.



### The basics of micronutrient homeostasis

On a narrow edge between deficiency and toxicity



### Approches to study micronutrients

Elemental analysis ICP AES, ICP MS « ionomics »

#### Speciation analysis

LC ICP MS, « metallomics », « metallo proteomics »



From Chen et al. 2015

<u>Elemental mapping:</u> X-ray fluorescence, SIMS, nanoSIMS, LA ICP MS







#### State of the art

#### Mobilization & uptake / snapshot on iron



From Gao et Dubos 2021



#### State of the art

#### Regulation and sensing / snapshot on zinc





From Lilay et al. 2021

### Key issues: Micronutrient vs global change



## Key issues: Micronutrient fertilization

Micronutrients are not members of the NPK club!

Agroecology

Propose smart intercropping systems Micronutrient mobilizing green fertilizers





Chemical fertilizers

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From Bales et al. 2019
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Precision combined foliar application





#### Actions to take I

#### Raise awareness!

**Inform** farmers, breeders and the population about the **importance of micronutrition**.

Take micronutrient content into account to determine **market value**.



# CropBoosterys

# Where is micronutrient availability in european soils limiting?





### Actions to take II

#### Targeting micronutrients for efficient nitrogen fixation



### Actions to take III

#### Targeting micronutrients for human nutrition

Transport pathways from root uptake, or from leaf remobilization to grain filling.



Localization and speciation in grains.



Select varieties and species with improved micronutrient content in edible parts.

Importance of food processing.



## Relationships with other focus groups

