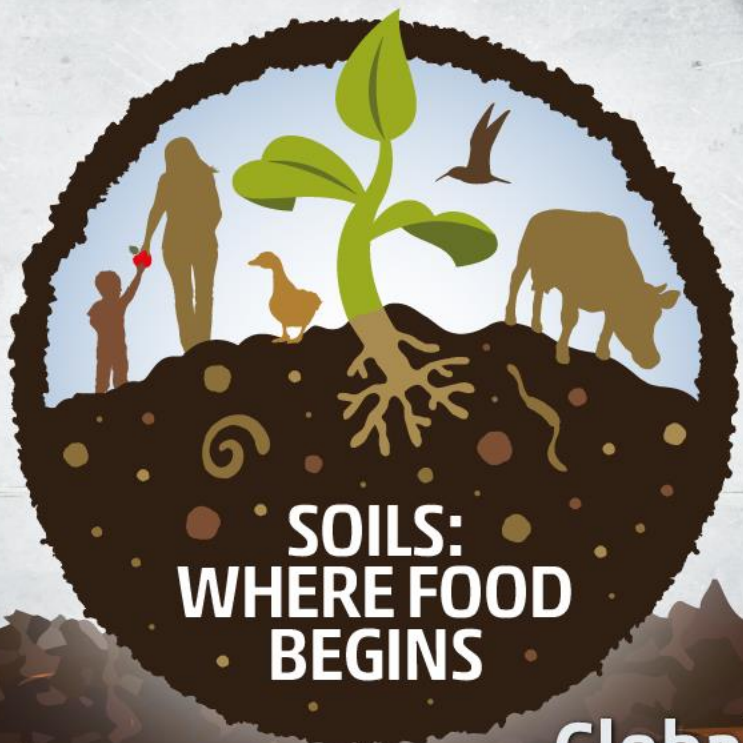




Where do we need to apply Zn fertilizers in sub-Saharan Africa?

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Problem statement

Fertilization with Zn

- to increase crop yields^{1,2}
- to decrease human Zn deficiency^{3,4}

Can the soil tell us where Zn fertilization is a good strategy?



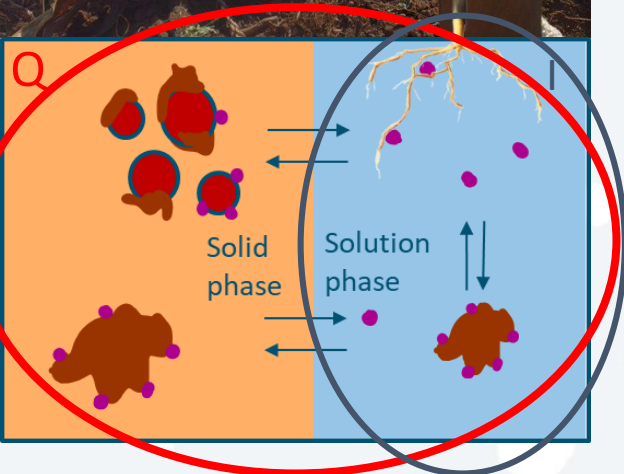
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¹Kihara et al. 2017 ²Wortmann et al. 2019 ³de Valença et al. 2017 ⁴Manzeke et al. 2012 ⁵Hengl et al. 2021

Methodology

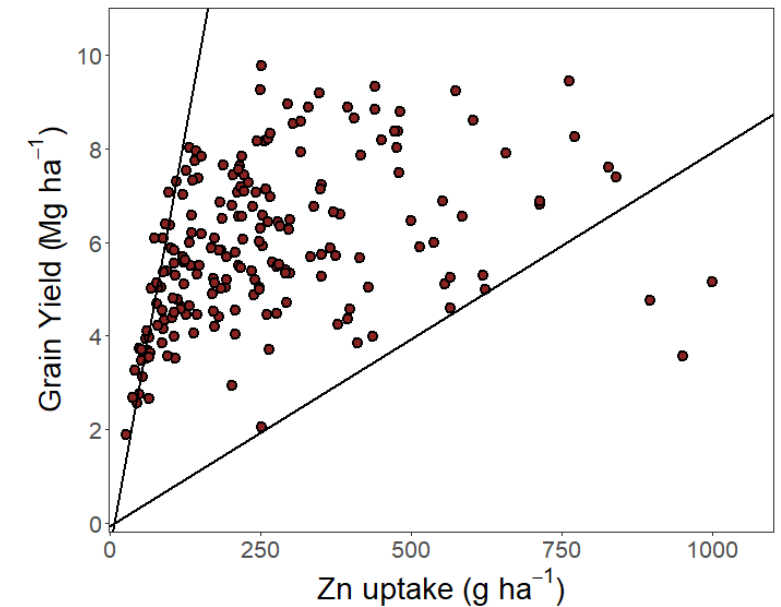
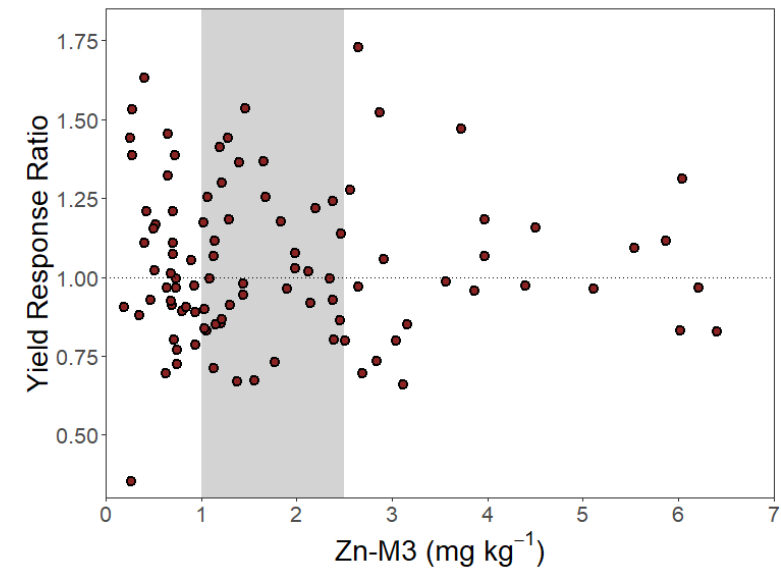
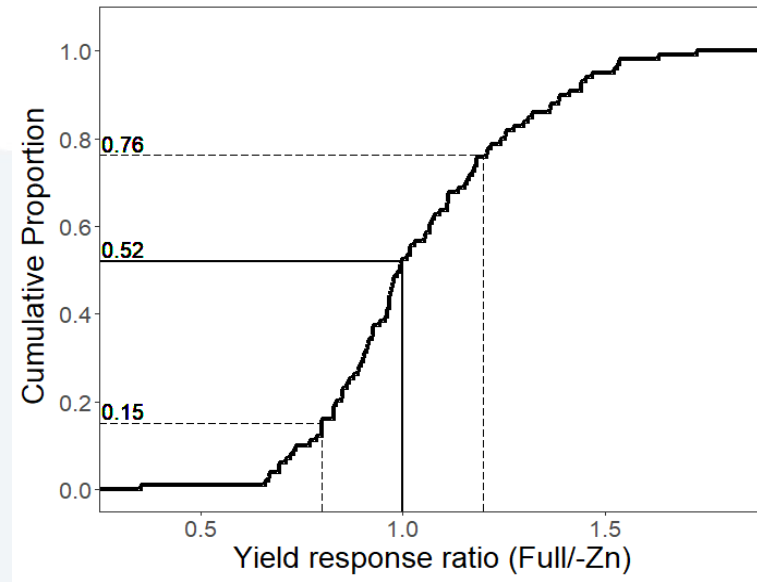
- On Farm Nutrient Omission Trials: 'Full (=NPK + ...)' and '-Zn'
- 3 countries, 3 varieties, 19 locations with 4/5/6 replicates
- Stover and grain: biomass and concentrations
- Soil: Zn pools and other properties



Soil ~
Crop yield, Zn uptake, grain Zn & response

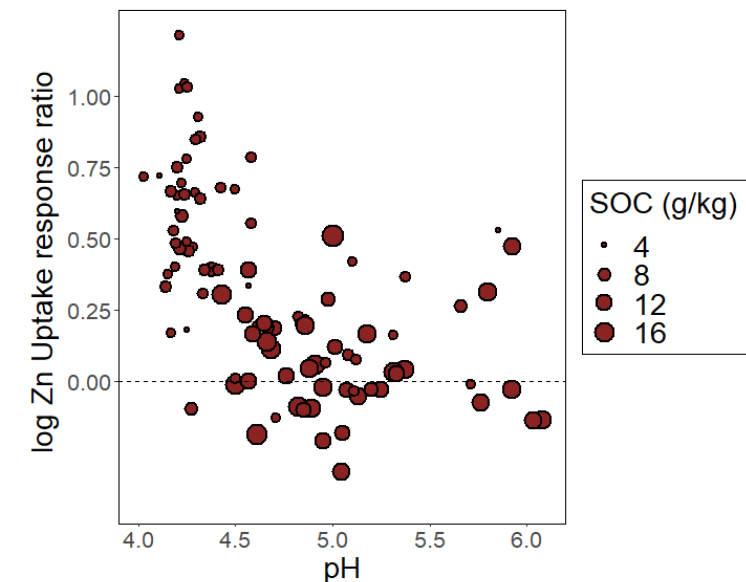
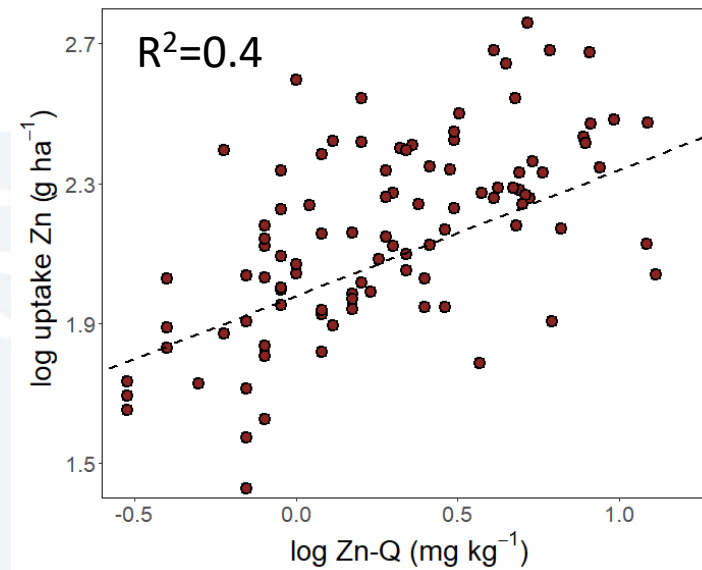
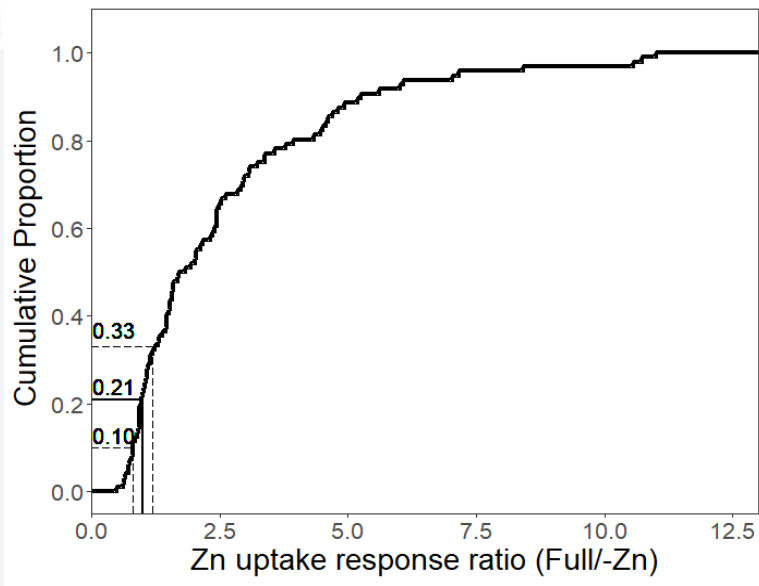
Yield

- Zn fertilization does not result in higher yields
 - Despite low soil Zn levels
 - Despite strong Zn dilution in the crop



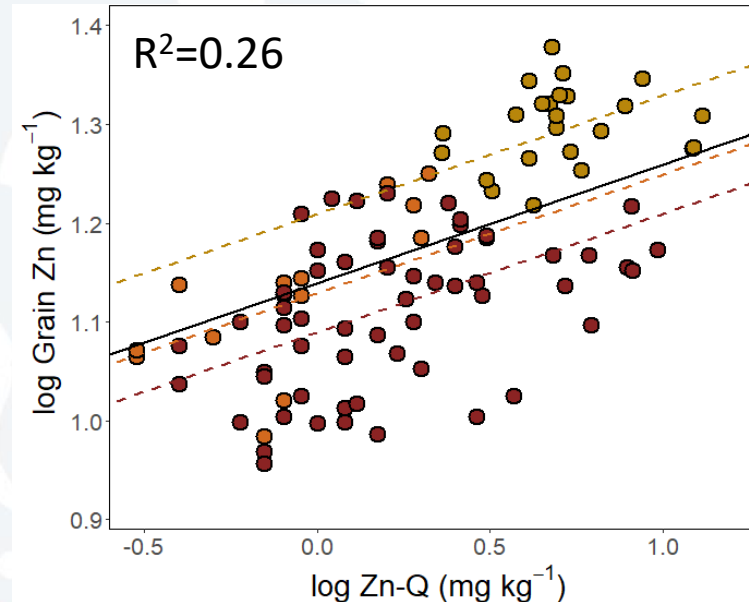
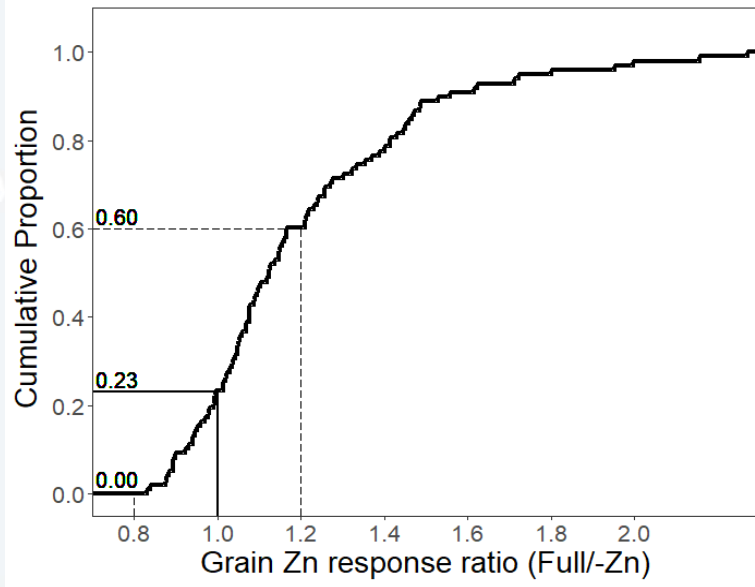
Zn uptake

- Zn fertilization increases Zn uptake
- Zn uptake relates better to Q than I soil Zn
- Response in Zn uptake depends on the soil adsorption affinity



Grain Zn

- Zn fertilization increases grain Zn (20 % or 2.4 mg kg⁻¹)
- Soil Zn explains less variation in grain Zn (26 %)
- Variety / Country affects grain Zn concentrations



Discussion points

- Increased Zn uptake did not result in higher maize yields
- Existing critical soil Zn levels do not give information about yield response
- Zn fertilization increased grain Zn, but below target level (27 mg kg⁻¹ with 5 kg Zn ha⁻¹)
- Identification of areas with crop and human Zn deficiencies based on soil properties remains challenging



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Thank you !

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