

Healthy Soils for Healthy and Nutritious Crops: Evidence and Missing Links

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World Soil Day

Swedish University of Agricultural Sciences

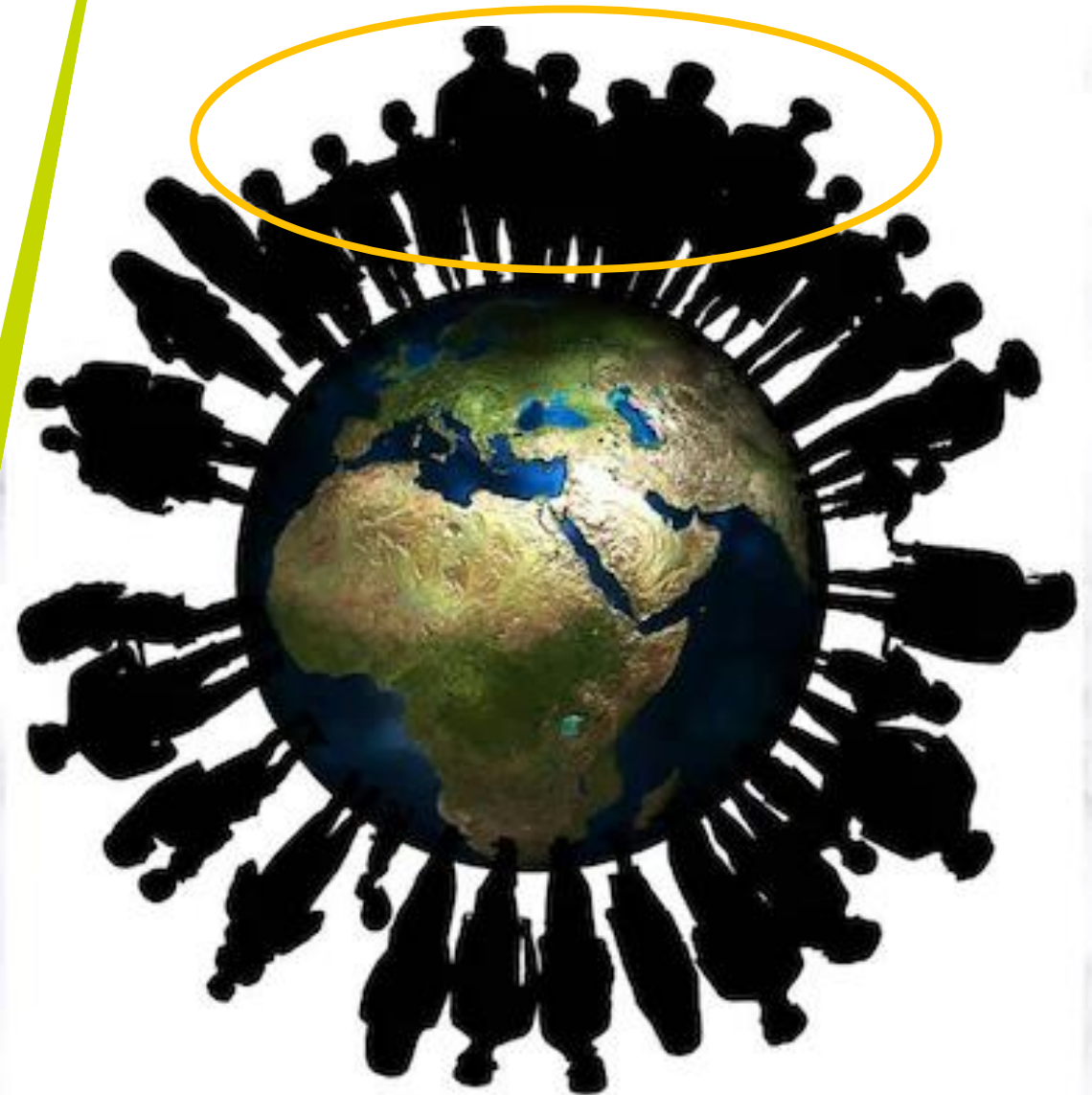
05 December 2022

Presentation Outline

1. Global Population and "Hidden Hunger"
2. Prevalence of "Hidden Hunger"
3. Smallholder Farming Systems in SSA
4. Micronutrients Surveillance Work
5. "Agronomic Biofortification"
6. Missing Links

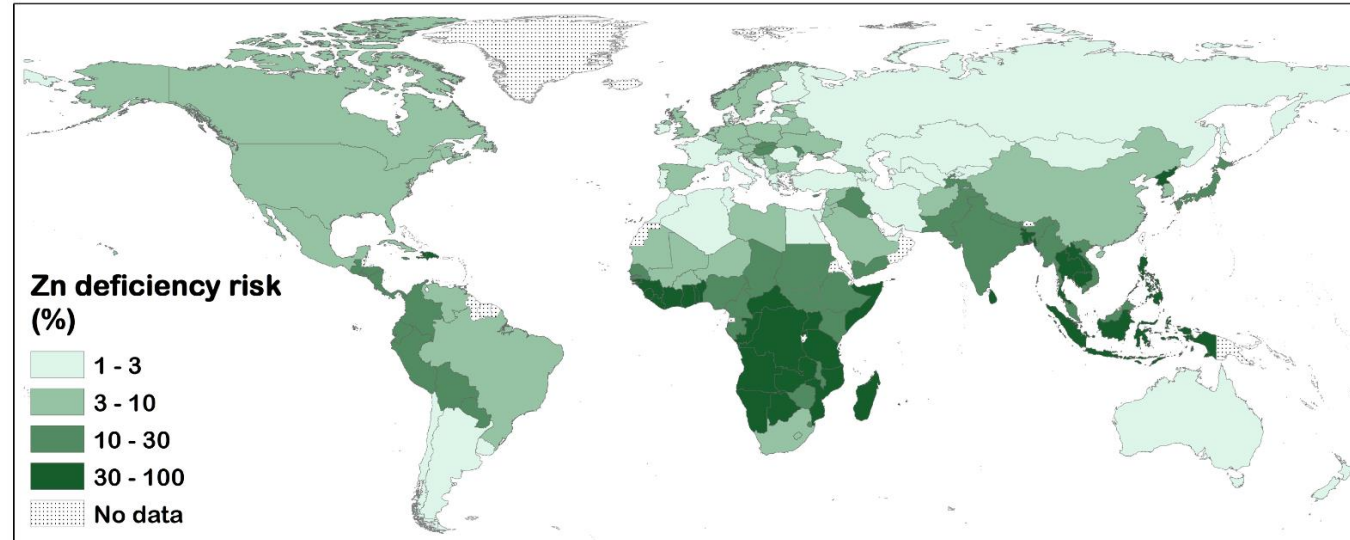
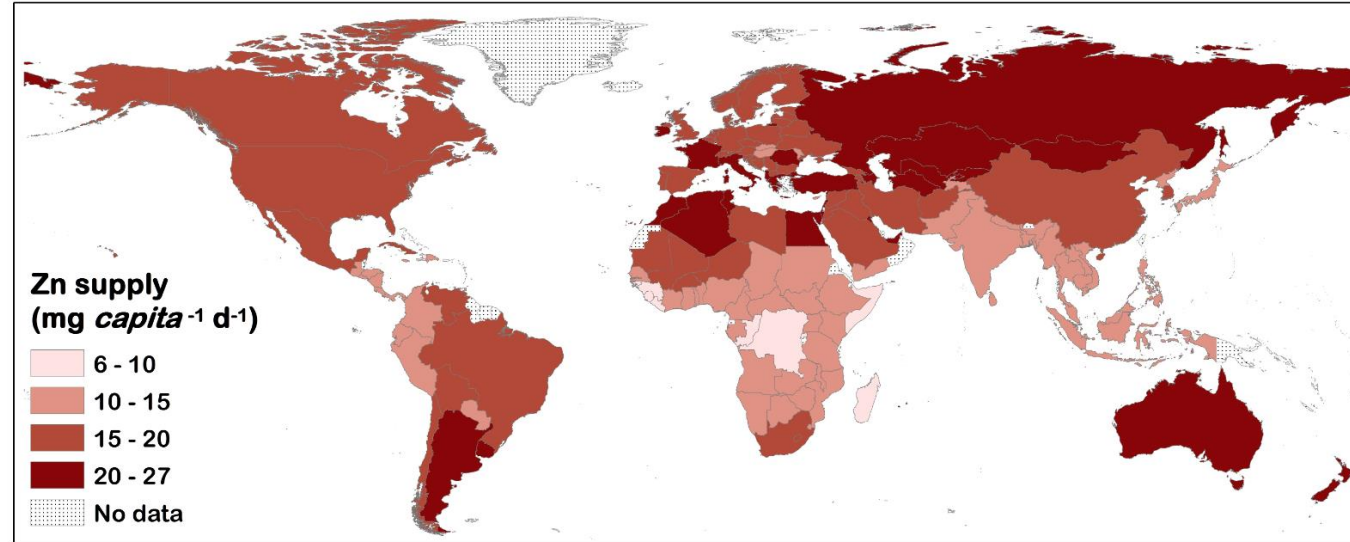
“Hidden Hunger”

- Deficiencies in essential micronutrients.
- Affects over 2 billion people globally.
- 50% in low and low-middle income countries.



Zinc Supply & Deficiency Risks

Zn: 17%



Estimated Average Requirement (EAR): ~10 mg d⁻¹



SCIENTIFIC REPORTS

OPEN Dietary calcium and zinc deficiency risks are decreasing but remain prevalent

Received: 27 November 2014
Accepted: 30 March 2015
Published: 22 June 2015

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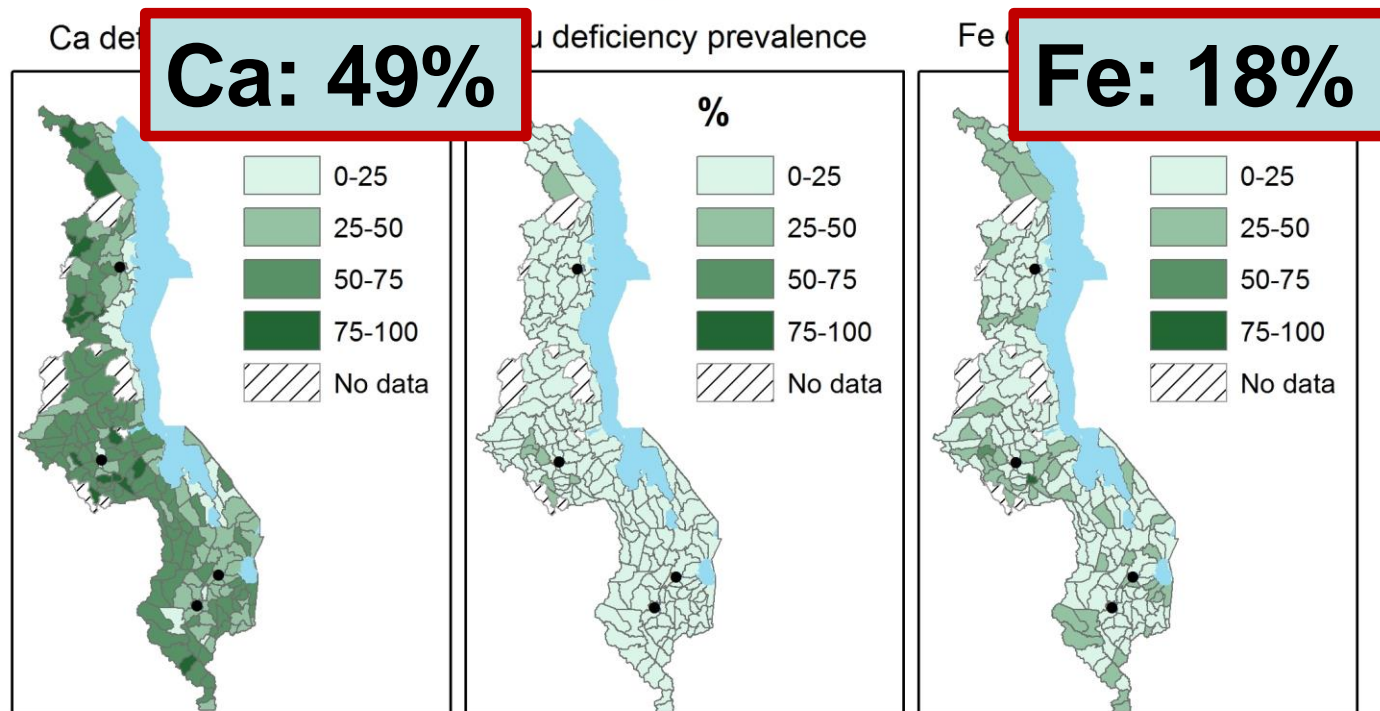
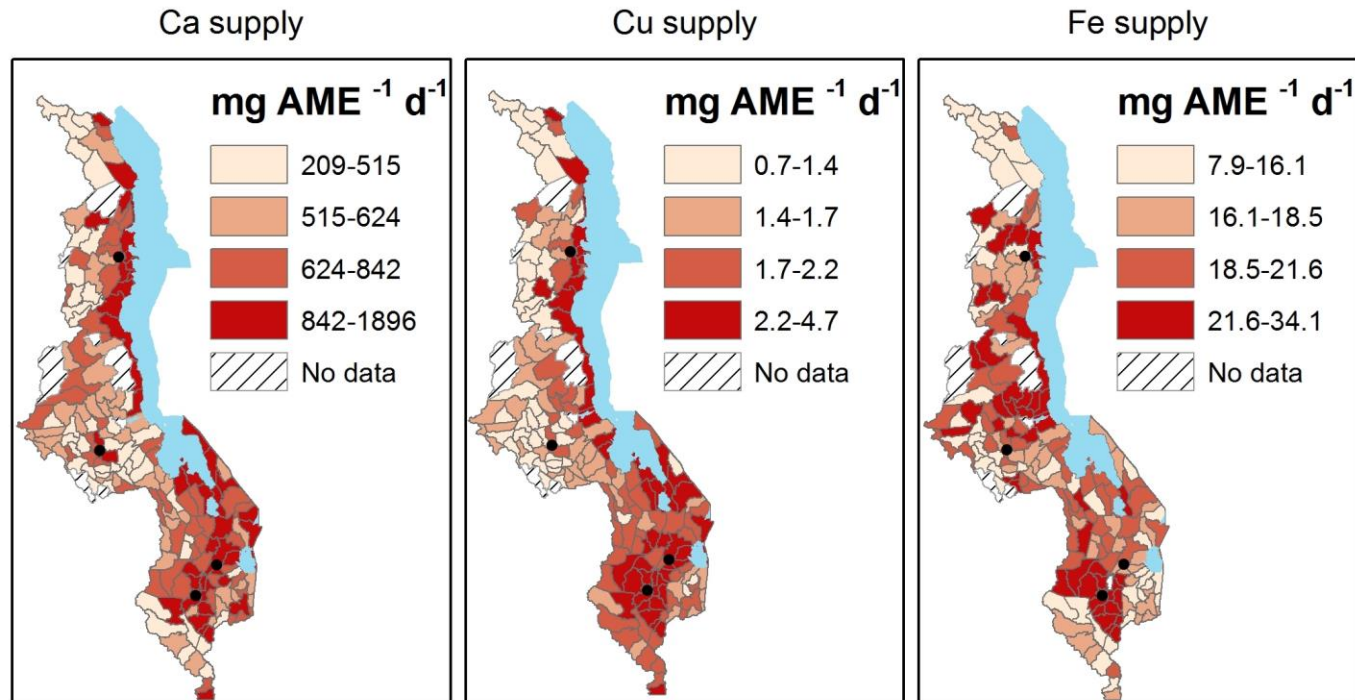
Micronutrient Supply

Malawi: secondary data analysis

Food consumption module (IHS3)

7-d recall (12,500 households)

Local food composition data



Joy et al. BMC Nutrition (2015) 1:42
DOI 10.1186/s40795-015-0036-4

BMC Nutrition

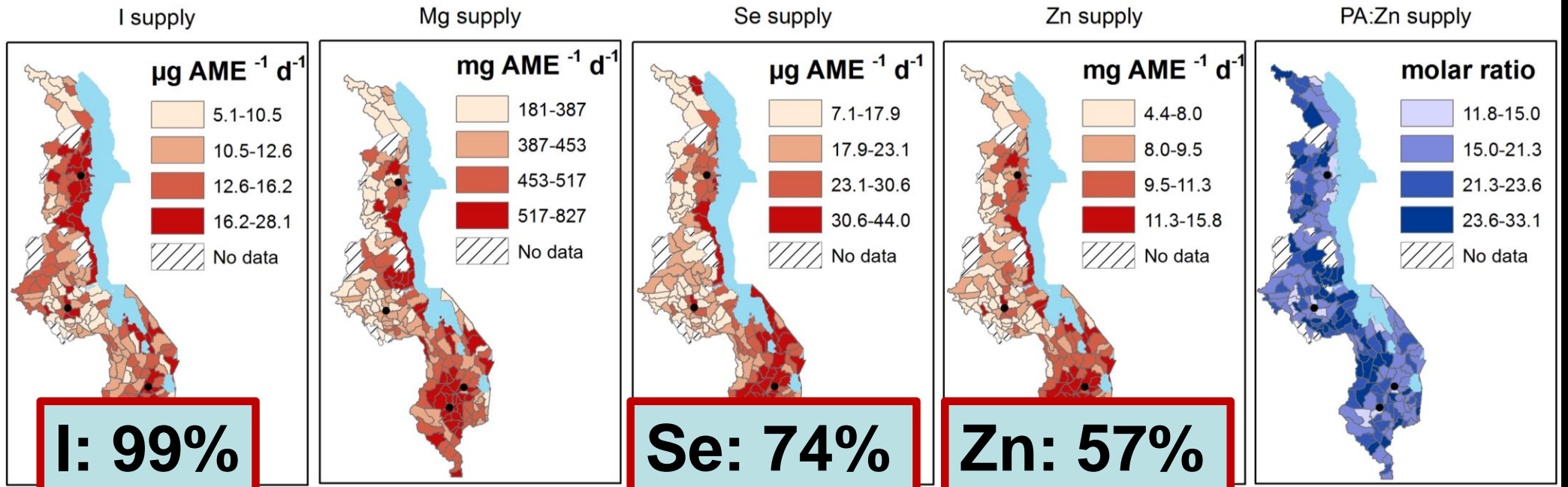
RESEARCH ARTICLE

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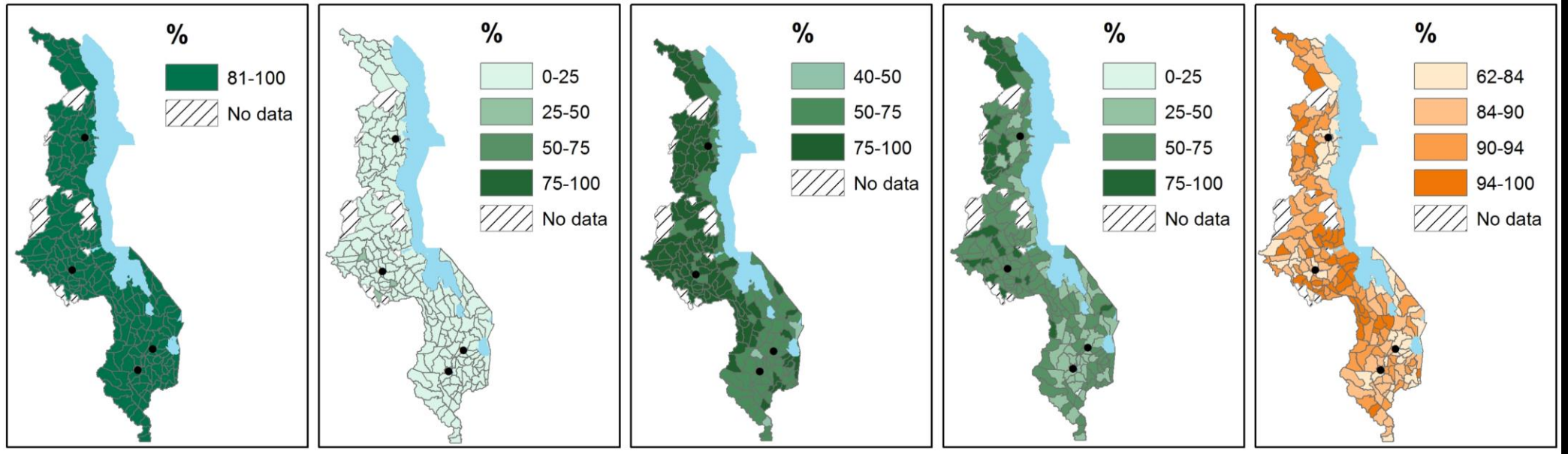


Dietary mineral supplies in Malawi: spatial and socioeconomic assessment

Edward J. M. Joy^{1,2†}, Diriba B. Kumssa^{1,2,3†}, Martin R. Broadley¹, Michael J. Watts², Scott D. Young¹, Allan D. C. Chilimba⁴ and E. Louise Ander^{2*}



I deficiency prevalence Mg deficiency prevalence Se deficiency prevalence Zn deficiency prevalence PA:Zn>15



By mid-century

Stevens et al (2022) Lancet Global Health

196 M
Children

2x
bigger problem

62%
Children
98 M

80%
Non-
pregnant
WRA

**Impossible for future generations to
escape the “nutrition” poverty trap**



Poor soils, low crop yields of low nutritional composition

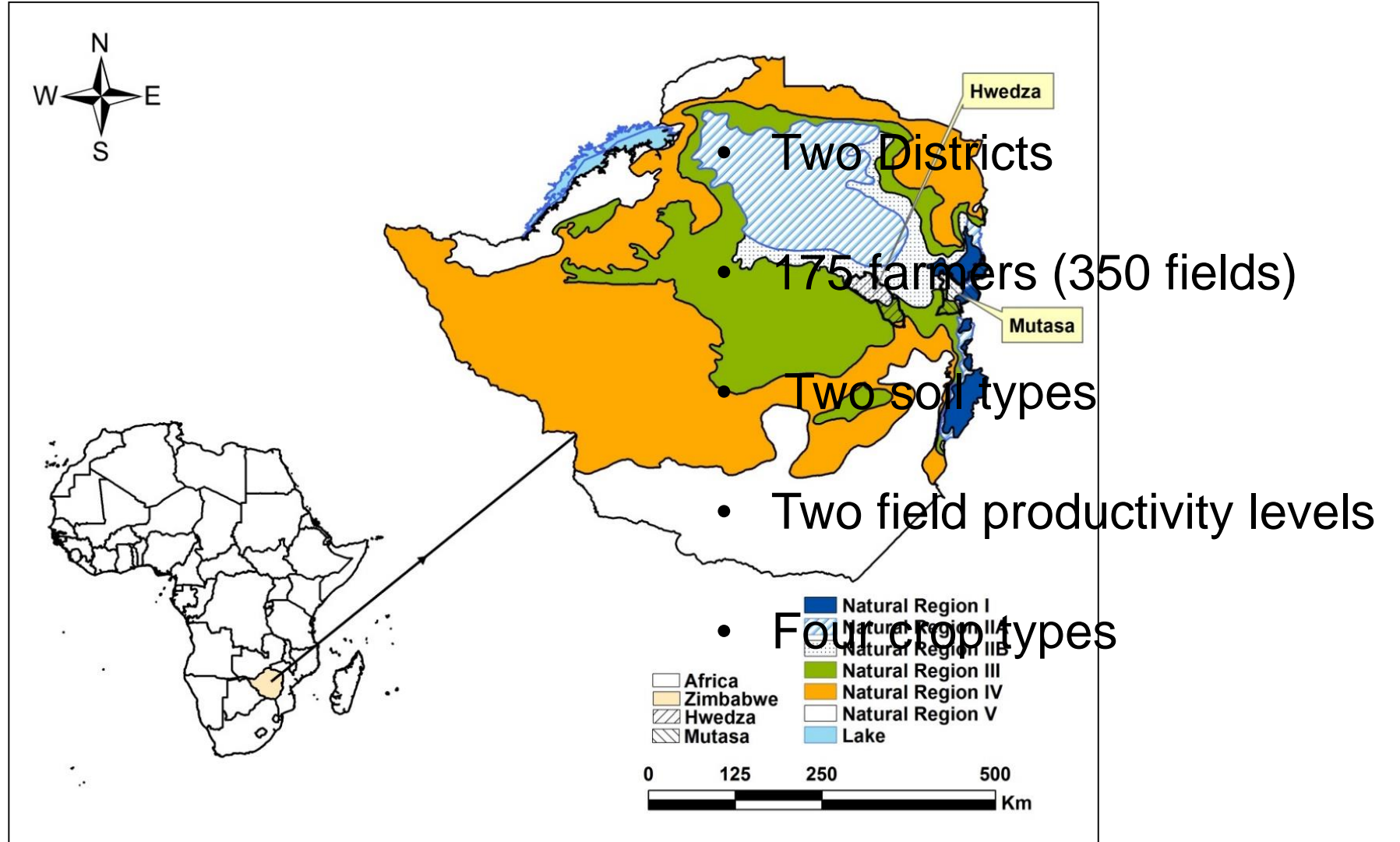


Micronutrient surveillance

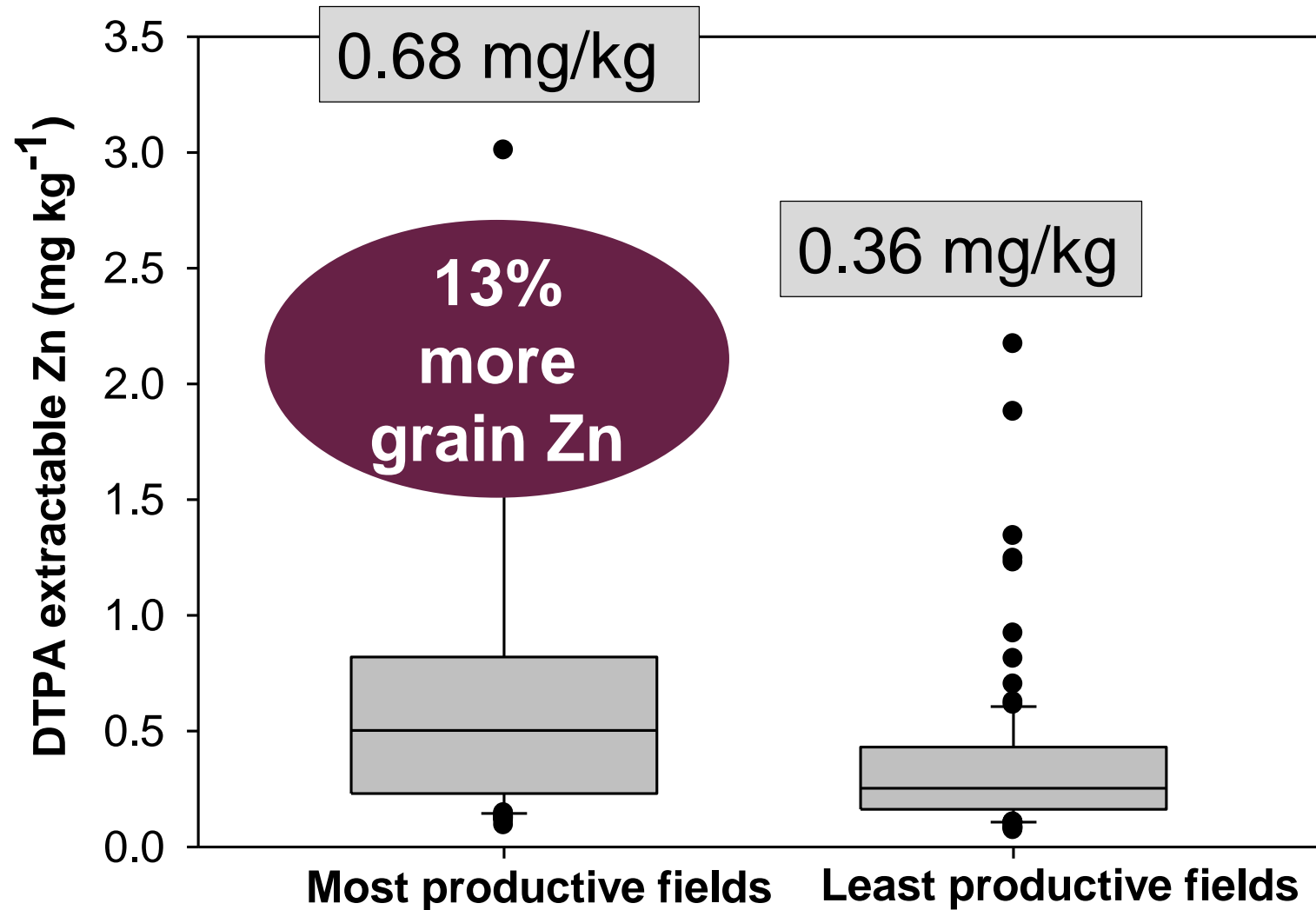


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Micronutrient surveillance

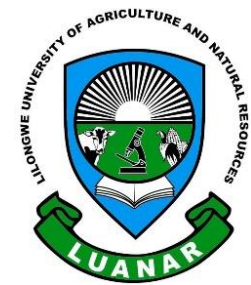


Soil organic matter effect on soil and grain Zn





BILL & MELINDA GATES foundation



LONDON SCHOOL OF HYGIENE & TROPICAL MEDICINE



The University of Nottingham



World Agroforestry Centre



UNIVERSITY OF MALAWI COLLEGE OF MEDICINE



British Geological Survey
NATURAL ENVIRONMENT RESEARCH COUNCIL



Ethiopia Soil and Grain Survey (2017/18)



Alem Arega

Wubie Mesfin

Hand-threshing *teff*

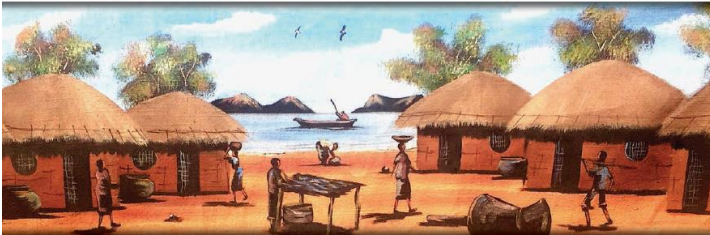
Malawi soil and grain survey (2018)



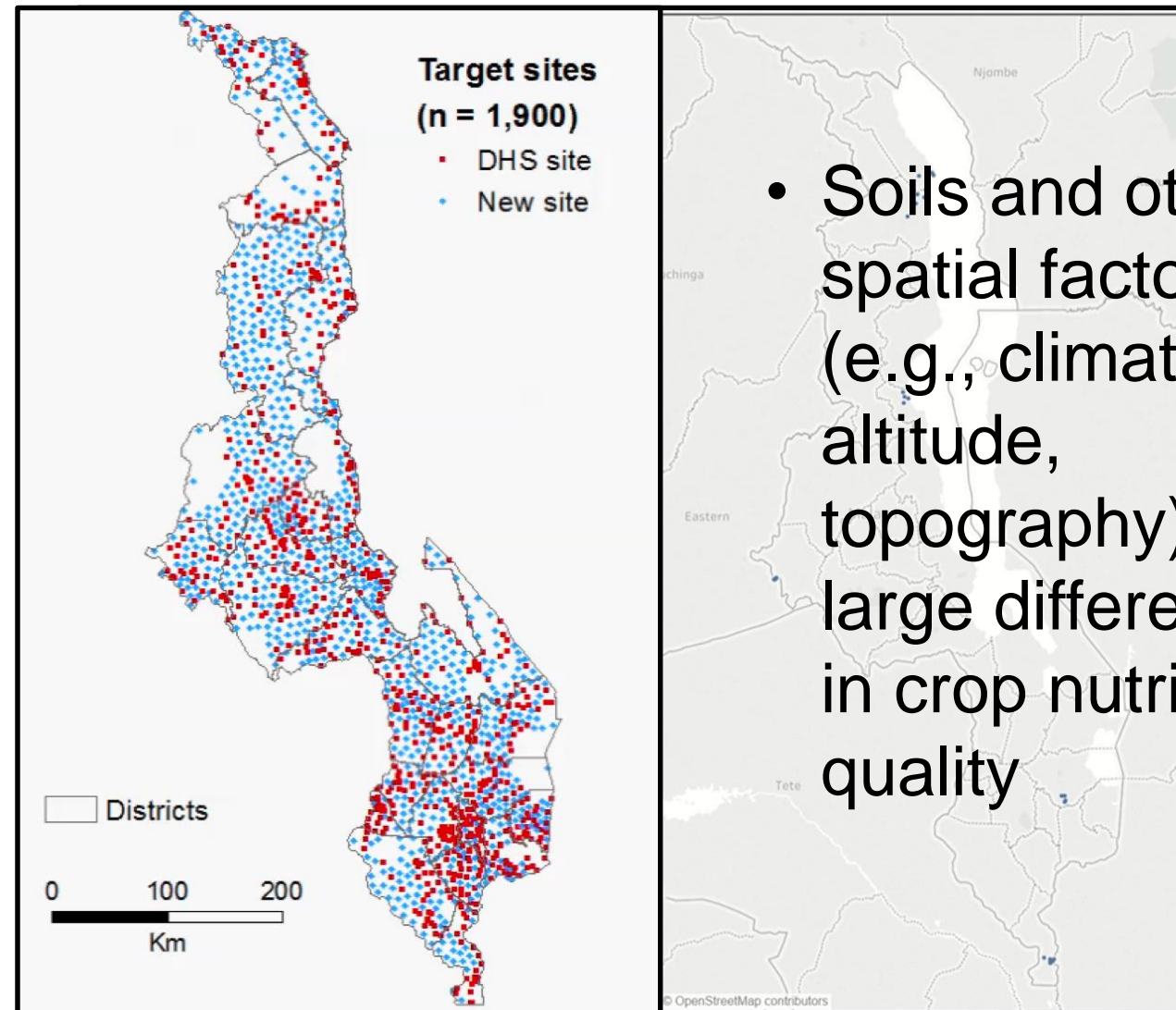
Malawi soil and grain survey (2018)



Malawi



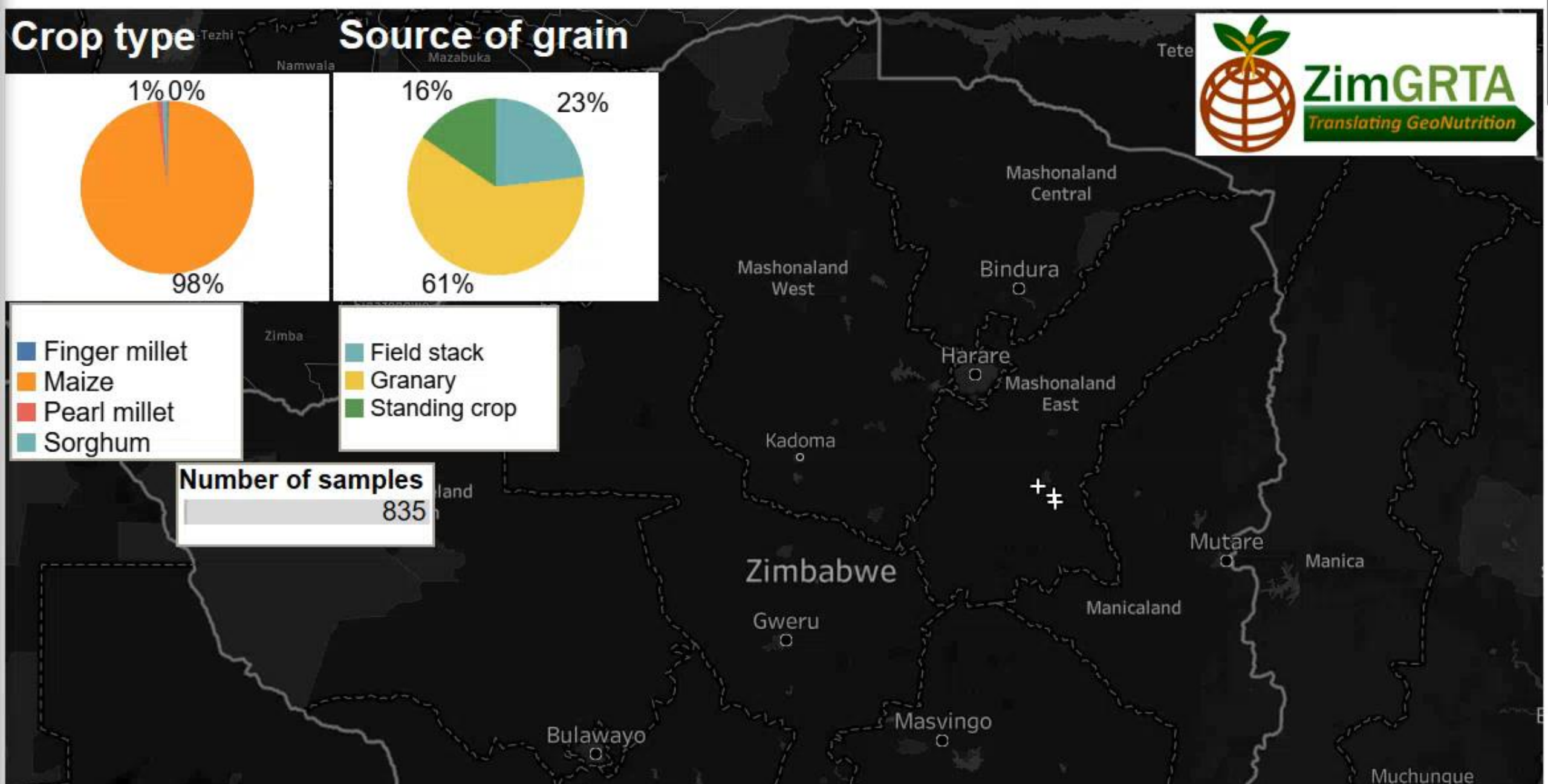
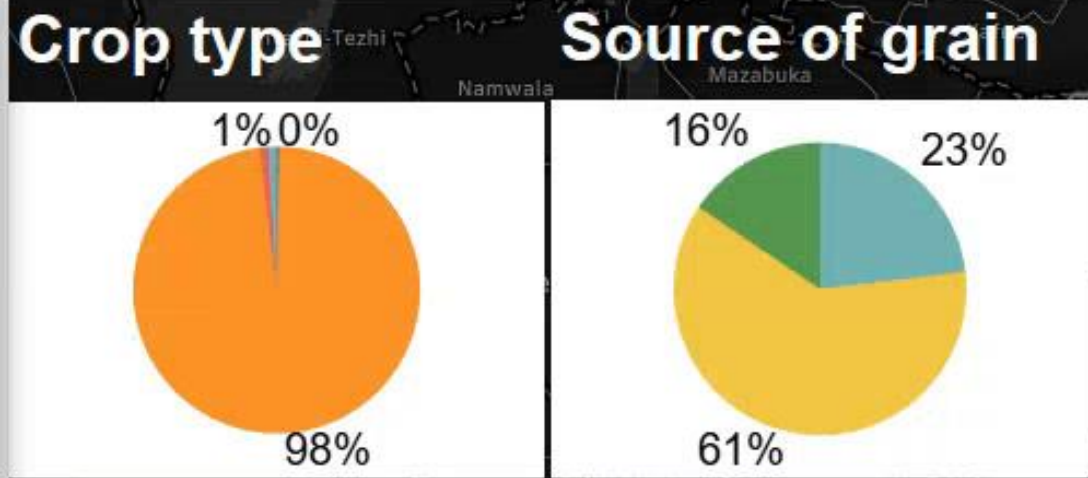
Demographic and Health Survey **2015-16**



- Soils and other spatial factors (e.g., climate, altitude, topography) cause large differences in crop nutritional quality

Translating GeoNutrition

3 May 2021



Agronomic biofortification





1. Interventions: Agronomy (Organic inputs)



2. Soil and foliar application



1. **Manzeke et al., 2017.**
2. **Manzeke et al., 2020.**
3. **Manzeke-Kangara et al., 2021a.**

3. Nitrogen management



4. Fertilizer and Landscape Effect



Key findings

- Zinc fertilization increases grain Zn concentration.
- Nitrogen increases grain Zn concentration in cereals, not in legumes.
- Integrated Soil Fertility Management with organic nutrient resources increases grain Zn concentration.
- Grain yield benefit of up to 22% reported from Zn fertilization.
- Landscape effect in wheat and tef micronutrient concentration.

Resilience

- Improved Soil Management
- Collaborative Research
- Policy Formulation





The “NewTritition” Revolution¹

Resilience

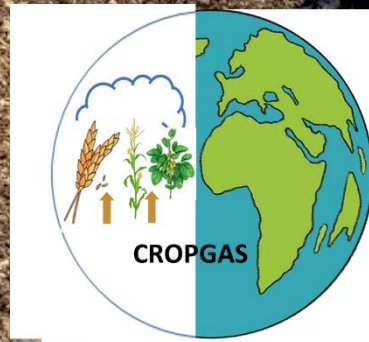
196 M
Children

¹ *Personal quote*

**Thank You Very Much For Your
Attention**

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