Evaluation of cropping system prototypes combining naturally nutrient-rich crop species, organic residues, and effective microorganisms to agrobiofortify local foods in iron and zinc in Senegal

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or4food Organic Residual Products for biofortified Food for Africa

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BACKGROUND

- In Senegal, a large part of women of child-bearing age (over 35%) and children under 5 years of age (over 40%) suffer from malnutrition by iron and zinc deficiencies (COSFAM, 2010)
- The low solubilization and mobility of Fe and Zn in soils can contribute substantially to the low Fe and Zn levels in crop products (Cakmak, 2008)

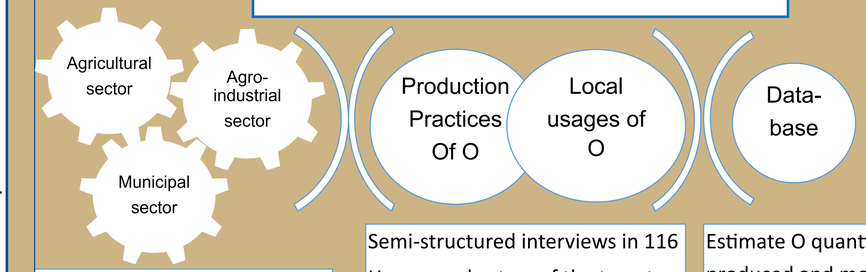
OBJECTIVES

Biofortifying daily consumed African food in micronutrients using agroecological practices with farmers in the groundnut area, Central Senegal

1. Select organic residues (O) according to their availability in the target area and their Fe and Zn content
2. Find the best combination of O and effective microorganisms (M) with the highest quantity of Fe and Zn solubilized
3. Quantify the gain of Fe and Zn content in local food fertilized by the selected O x M combination under controlled field conditions

METHODS

1. SELECTION OF ORGANIC RESIDUAL PRODUCTS



Collect + compile baseline data from different sectors

Semi-structured interviews in 116 Homes and actors of the target Area to complete baseline data

Estimate O quantities produced and mobilisable for fertilisation

Estimate agronomic potential and biofortification potential in Fe and Zn of O

2. SELECTION OF BEST COMBINATION OF O AND M

DGT deployment on tested combinations after 0, 7, 14 and 28 days mineralization at 28 °C

Recuperation of DGT after 24 hrs incubation at 28 °C

Determination of iron and zinc solubilized content using ICP-MS

S = soil; O1 = cow dung; O2 = poultry litter; O3 = sewage sludge; M1 = groundnut + millet (Saint Louis); M2 = groundnut (groundnut area); M3 = rice (groundnut area)

Extraction of resin binding gel from DGT

Elution of resin binding gel in HNO_3

RESULTS

1. SELECTION OF ORGANIC RESIDUAL PRODUCTS

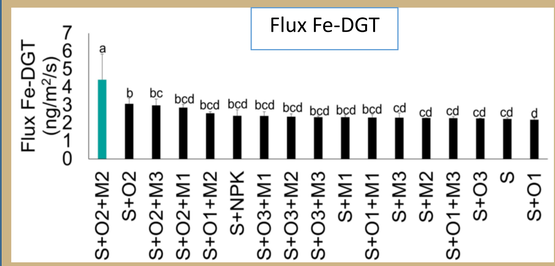
- O availability in the target area

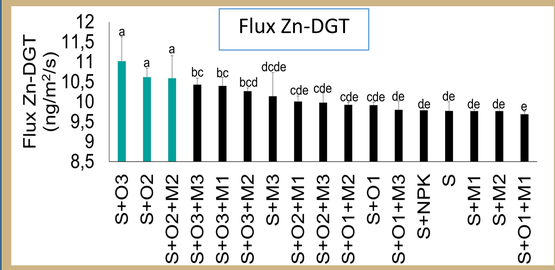
Agricultural organic residual product	Agro-industrial organic residual product
Cow dung	Poultry litter

- Total iron and zinc content of different O

Organic residual product	Fe (mg/kg)	Zn (mg/kg)
Sewage sludge	15723	363
Poultry litter	6210	325
Cow dung	5403	102
soil	4700	50

2. SELECTION OF BEST COMBINATION OF O AND M





CONCLUSION

- Cow dung and poultry litter are the organic residual products available in the target area
- O2 x M2 combination has the highest quantity of iron solubilized in lab
- Effective microorganisms have no significant effect on soluble zinc

UPCOMING

O2 x M2 will be tested under experimental field conditions to assess their impact on iron and zinc content of local foods

REFERENCES

1.Cakmak I., 2008. Enrichment of cereal grains with zinc: Agronomic or genetic biofortification? Plant Soil, 302:1–17.

2. COSFAM, 2010. Senegalese Committee for the Fortification of Foods in Micronutrients

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