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photo: SYSCOM field trial, India, Roman Grüter

Mercator Research Program | Call 2

Zinc Biofortification of Wheat through Organic Matter Management in Sustainable Agriculture

Background

Zinc (Zn) deficiency is a global human nutrition problem, while low soil Zn availability often limits crop production. By increasing the density of a nutrient, such as Zn, in a cereal crop like wheat, biofortification can address both problems simultaneously. Increasing soil organic matter (OM) inputs has a strong potential to increase Zn accumulation by wheat grains from soil with low Zn availability. However there is a legacy of pollution from the toxic trace metal cadmium (Cd) in many agricultural soils and wheat consumption also contributes substantially to human Cd levels. So far, there are no studies systematically investigating short and long-term OM effects on soil-grain transfer of Zn, relating them to soil solution chemistry and soil microbial activities and also taking account of simultaneous effects on Cd uptake.

Objective

The overall research objectives are to understand how organic matter inputs into soil affect Zn and Cd accumulation in wheat grains and how OM management in organic and conventional farming systems can be optimized to increase grain Zn density without increasing the accumulation of Cd and compromising on soil fertility and yield.

Research Approach

Field experiments on three long-term experimental sites; pot experiments; on farm surveys; field work in Switzerland and India.

Relevance and Expected Outcomes

This project will (1) increase understanding of how different types of OM inputs into agricultural soil with different management practices affect the solubility and soil-to-grain transfer of Zn and Cd; and (2) separate long-term from short-term effects of OM management on the solubility and soil-to-grain transfer of Zn and Cd. The results will inform recommendations for improved OM management practices which enable farmers to produce safe biofortified wheat grains without compromising income.

Food System Challenges Addressed

Nutrition security, food quality, soil health, human health

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