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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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In Senegal, a large part of women of childbearing age (over 35%) and children under 5 years of age (over 40%) suffer from malnutrition by iron and zinc deficiencies. These deficiencies result from low iron and zinc levels in crop products. The low solubilization and mobility of iron and zinc in Senegalese soils can contribute largely to this problem. Among the potential causes are high concentrations of calcium carbonates of iron oxides and zinc oxides, of low levels of moisture and of organic matter.

Agrobiofortification through agroecological systems using the application of organic soil amendments rich in micronutrients is now considered one of the best ways to transfer micronutrients from the soil to the plant.

This study aims to evaluate different agroecological systems established with a combination of: (i) existing agricultural practices that can improve the nutritional quality of crop products, (ii) organic residual products (ORPs) selected according to their availability in time and space and their micronutrient content, (iii) effective microorganisms (EM) according to their level of efficiency in the mineralization of the ORPs and the solubilization of iron and zinc, and (iv) crop species according to their natural richness in micronutrients.

Existing agricultural practices were selected by a territorial diagnosis. The study zone highlighted the good performance of monoculture and associated crops, with field application of cow dung and poultry manure.

ORP and EM were selected by incubation under controlled conditions for 28 days at 28°C of the soil-ORP-EM mixtures (collected in the study area). Poultry droppings and sewage sludge, and the EM designated as groundnut-South Groundnut Basin were selected.

Crop species were selected by crushing and chemical analysis of frequently consumed local harvest products. Two varieties of cowpea (Lisard and Yacine) and sweet potato (Cri Apomudem and Beauregard) with a natural richness in iron and zinc were selected.

The evaluation of the agronomic impact of the cropping systems established from the different components selected will be exemplified, together with the description of the elementary options. An assessment of the environmental impact of the ORPs will be outlined.