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# Improving nutritional outcomes through Crop Selection and Land Suitability: Global Iron and Zinc Deficiencies

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## Abstract

Global efforts to combat micronutrient deficiencies have often focused on assessing nutrient intakes and supplies[1,2], yet no studies have explored the role of crop selection and land suitability to tackle these deficiencies. This study aims to bridge this gap using existing estimates of global prevalence of iron[3] and zinc[4] deficiencies to identify crops with the highest potential to mitigate these deficiencies. Using the USDA food composition database, we established nutrient profiles for 37 widely cultivated crops, focusing on their iron and zinc content per 100 grams. To evaluate these crops' effectiveness to meet nutrient requirements, we compared compositions to Harmonized Average Requirements (H-ARs) for women of reproductive age (WRA), a group particularly vulnerable to micronutrient deficiencies. The H-ARs account for variations in nutrient absorption and bioavailability[5]. For each crop, we calculated the percentage of the H-AR met by 100 grams of iron and zinc content. This percentage was adjusted for the global prevalence of iron and zinc deficiencies by introducing deficiency weighting—multiplying each crop's nutrient contributions by the global prevalence of iron and zinc deficiencies. The result was a deficiency-weighted nutrient score for each crop. Soybeans scored highest at 61.67, followed by cowpeas (50.30), pearl millet (33.69), and Phaseolus beans (31.33), indicating their strong potential to address global iron and zinc deficiencies. Next, we integrated these nutrient scores with global land suitability and yield potential data from the Global Agro-Ecological Zones (GAEZ) database to map regions most suited for growing these nutrient-dense crops. On average, our findings show that *Tonga* is the most suitable country for soybean cultivation, with a potential yield of 3.77 tons per hectare (tons/ha), *Uruguay* for cowpeas (2.82 tons/ha), *Lithuania* for Phaseolus beans (3.93 tons/ha), and *Guinea-Bissau* for pearl millet (3.87 tons/ha). Through multivariate clustering, we linked global deficiency patterns with yield potential across various regions. Countries such as those in the Caribbean, Eastern, Western, and Middle Africa, and Southern and Southeastern Asia emerged as priority regions where the production of these crops would be most beneficial to combat iron and zinc deficiencies. The results provide valuable insights to align agricultural land use practice with nutritional requirements, particularly in regions with high iron and zinc deficiency prevalence.

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**Ethics Declaration:** Yes

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