IMPROVING NUTRITIONAL QUALITY AND LIMITING RISK FROM TOXIC TRACE ELEMENTS IN CROPS BY GENETIC AND AGRONOMIC BIOFORTIFICATION

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The world's population is estimated to increase from 6 billion to about 10 billion by 2050 mainly in developing countries. To meet the food demand of the growing world population, a large increase in food production is required. To meet the further demand of food, more crop production must be achieved per unit of the presently available arable land. "Green Revolution" targeted higher crop production but resulted in incidence of micronutrient deficiency in soils and plants. There are several reports indicating widespread of micronutrient elements (i.e., Fe, Zn) deficiency throughout the world. As a limiting factor for crop productivity in many agricultural lands, correcting micronutrients deficiencies is necessary to approach genetic potential yields of crops. On the other side, nutrient output of farming systems has never been a goal of either agriculture or of public policy. Therefore, the increase in crop yield accompanied with reduced micronutrients contents in the edible crops. Already, many food systems in developing countries can not provide sufficient micronutrient contents to meet the demands of their people especially low-income families. Micronutrient malnutrition or hidden hunger now affects more than 40% of the world's population. Agronomic practices and genetic or breeding engineering have been considered in "biofortification" programs to improve micronutrient status in the food chain. The possibility of combining high yield with better nutritional quality is important in the developing micronutrient-efficient genotypes breeding staple food crops which are more efficient in the uptake of trace minerals from the soil and which load more trace minerals into their seeds: results in extremely high benefit-cost ratios for investments in agricultural research. Biofortification would be more valuable and cost-effective by estimating the costs paid to heal micronutrient malnutrition in developing countries. But there are still certain challenges in programs for selecting or breeding micronutrient-efficient genotypes. In contrast with the essential nutrients, toxic trace metals i.e., Cd and As in soils can be accumulated to levels in rice and some other crops that are dangerous to consumers. Breeding micronutrient improved crops should consider the potential for toxic metal accumulation. Cultivars vary in Cd and As accumulation due to genetic variation; normal breeding practices can produce higher Cd and As progenies by chance alone. Breeding programs to improve grain Zn and Fe should check to assure that Cd is not being increased along with Zn.