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Managing the Mineral Nutrition of Plants and People

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Food security is defined as having sufficient, safe and nutritious food to meet the dietary needs of an active and healthy life. This presentation will discuss the role of plant mineral nutrition in crop production and the dietary delivery of mineral elements essential to human wellbeing.

Plants require at least 14 mineral elements. These include the macronutrients nitrogen, phosphorus, potassium, calcium, magnesium and sulphur, and the micronutrients chlorine (Cl), boron (B), iron (Fe), manganese (Mn), copper, zinc (Zn), nickel and molybdenum. Fertilisers containing these elements are often applied to crops to maximise yields. However, the application of fertilisers has both economic and environmental costs. Current research is directed towards agronomic strategies that improve the efficiency of fertiliser use by crops, and genetic approaches to develop crops with improved acquisition and physiological use of mineral elements. These efforts are contributing both to food security and to the economic and environmental sustainability of agriculture.

The presence of excessive concentrations of potentially toxic mineral elements also compromises crop production. For example, toxicities of Mn and aluminium occur on acid soils and toxicities of sodium (Na), B or Cl occur on sodic or saline soils, throughout the world. Agronomic strategies to address mineral toxicities are often costly and only partially or temporarily successful. For this reason, plant scientists are developing crops that are tolerant to problem soils through species selection, conventional breeding and genetic engineering, with some success.

Ultimately, plant products provide humans with the $\geq$ 22 mineral elements required for their wellbeing. Unfortunately, the diets of over two-thirds of the world's population lack one or more essential mineral element. In particular, over 60

In conclusion, ongoing research in plant mineral nutrition, soil science, agronomy and crop breeding is contributing to food security through the optimization of fertilizer applications for sustainable crop production, addressing the problems of mineral toxicities to increase crop production in agricultural soils, and developing strategies to biofortify edible crops with essential mineral elements to address malnutrition in humans and other animals.