IPNI Plant Nutrition TODAY
Better Crops, Better Environment...through Science

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HUMAN HEALTH DEPENDS ON SOIL FERTILITY

2015 is the International Year of Soils. Organizations around the world are drawing attention to the critical role that soils play in sustaining human health. Most of our food is grown on soil. The soil's fertility determines a large part of the nutritional value of that food.

Human nutrition remains in crisis. While world hunger has declined by 21 percent since 1990, at least 805 million people still go hungry. Among children under five, 161 million are estimated to be stunted, having low height for their age. Micronutrient deficiencies due to lack of dietary vitamins and minerals affect around 2 billion people, with multiple adverse health impacts, often impairing both physical and mental development of children.

Plants play an important role in concentrating nutrients that are sparse in soils. They do this for many nutrient elements important to living organisms, including nitrogen (N), sulfur (S), phosphorus (P), potassium (K), selenium (Se), iodine (I), zinc (Zn), and boron. Most plant nutrients are human nutrients too.

Fertilizing crops can boost the nutritive value of food. The nutrients Zn, I, S, and Se increase in concentration and availability in edible plant parts when they are applied as fertilizers, and they can play important roles in human health. Field experiments have shown that soil-applied Zn can increase the Zn concentration in wheat grain by 80 percent, and combinations of soil and foliar applications can increase it more than three-fold. Adding I to irrigation water in China and Mongolia led to dramatic gains in human health, including a 50% decrease in infant mortality.

In the more humid parts of sub-Saharan Africa, there are large areas where the human diet is deficient in the S-containing amino acids. This deficiency arises from a low protein intake, which may also be due to soil S deficiency. A survey of Zambian maize grain conducted in 2012 revealed a median S concentration equivalent to only 60% of critical deficiency levels. Plant-available Se is also very low in many soils in Zambia, Malawi, Rwanda, Burundi, and other sub-Saharan African countries. In programs addressing the N, P and K shortages of the soils of sub-Saharan Africa, S and Se need strong additional consideration.

Decades of experience and research in Finland have documented strong benefits to human Se status from programs of enrichment of fertilizers with Se starting in the 1980s. Outcomes included a doubling of the human serum Se levels, and, while other factors were also involved, the mortality rates from heart disease decreased by about two-thirds from 1982 to 1997.

Adding lime to acid soils can increase the calcium and magnesium content of foods. These two nutrients are involved in protection against diseases like rickets.

Diversity in cropping systems is also important. Pulses provide more micronutrients than cereal grains. In many areas, increases in the yields and production of pulses have not kept pace with the increases in cereals. A notable exception is the growth of soybean cultivation in Bangladesh, expanding from near zero in 1980 to over 100,000 acres in 2010. As crop advisers and crop managers, we need to continue asking ourselves whether our cropping systems are meeting the nutritional needs of our ultimate customers, the whole human family.

The composition of soils influences the composition of crops, in turn influencing the quality of food and its contribution to human nutrition, and ultimately, human health. Many opportunities remain to improve human nutrition by fertilizing crops responsibly, and by promoting diversity in crop rotations.

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