Fertilizing Crops to Improve Human Health

16 macro and micronutrients are needed by crops, animals and humans

**MACRONUTRIENTS**

- Nitrogen (N)
  - Essential in plant growth and gaining acceptance as an essential element for animals and humans.
  - Deficiency weakens the immune system. Due to the central role of zinc in cell division, protein synthesis and growth, zinc is particularly important for young children, adolescents and pregnant women.
  - Percentage of soils deficient: 85%

- Phosphorus (P)
  - Second most abundant mineral in the body, after calcium. Found in almost every food, and as such, deficiencies are rare. Required for proper cell functioning, regulation of calcium, strong bones and teeth, and to provide energy to our cells.
  - Percentage of soils deficient: 73%

- Potassium (K)
  - An activator or cofactor in enzymatic reactions. Potassium deficiency only occurs during prolonged fasting. Adverse effects with deficiency include cardiac arrhythmias, muscle weakness, and glucose intolerance.
  - Percentage of soils deficient: 55%

**MICRONUTRIENTS**

- Zinc (Zn)
  - Essential in plant growth and gaining acceptance as an essential element for animals and humans.
  - Percentage of soils deficient: 49%
  - Deficiency weakens the immune system. Due to the central role of zinc in cell division, protein synthesis and growth, zinc is particularly important for young children, adolescents and pregnant women.

- Iron (Fe)
  - A lack of iron is the most common nutritional disorder in human worldwide and is most prevalent in the developing world. Symptoms of iron deficiency include anemia, poor growth and labored breathing after mild exercise.
  - Percentage of soils deficient: 23%

- Copper (Cu)
  - An antioxidant for humans, copper is essential for the immune and nervous system, skeletal health, for iron metabolism and for the formation of red blood cells.
  - Percentage of soils deficient: 15%

- Manganese (Mn)
  - Mn deficiency has not been reported for humans. However, symptoms observed in livestock are impaired reproductive performance, skeletal deformities and shortened tendons.
  - Percentage of soils deficient: 10%

- Molybdenum (Mo)
  - Though a rare genetic disorder, a deficiency of the molybdenum co-factor usually results in premature death in early childhood.
  - Percentage of soils deficient: 15%

- Selenium (Se)
  - Essential for the prevention of hyperthyroidism (goitre).
  - For humans, selenium has antioxidant, anti-inflammatory, anti-cancer, anti-viral and anti-ageing benefits.
  - Percentage of soils deficient: 14%

- Iodine (I)
  - Iodine deficiency disorders are cause of the mental impairment of nearly 20 million babies annually during pregnancy and the development of hyperthyroidism (goitre).
  - Iodine and selenium are only beneficial to animals and humans.
  - Percentage of soils deficient: 14%