

Fertilizer Use and Human Health

Once again, food prices have been climbing. A growing human family seeks more and better food. Farmers, already under pressure to reduce impact on the environment, are pushed to produce more. Responsible stewardship of plant nutrition has never been more important.

The issue of food security comprises more than just quantity. Quality is just as crucial. Plant nutrition impacts both, ensuring that plant products nourish people. To meet the nutritional needs of expected population growth, global cereal production is forecast to increase by 70% by 2050. Important components of these nutritional needs include carbohydrates, proteins, oils, vitamins, and minerals. Plant nutrition affects them all.

Many of the healthful components of food are boosted by the application of nutrients. Since most farmers already fertilize for optimum yields, these benefits are easily overlooked. Applying N to cereals adds to the protein they produce, as well as their yields. Phosphorus, K, and S can all enhance the biological value of the protein in potatoes. Trace elements important to human nutrition, especially zinc, selenium, and iodine, can be optimized in the diet by applying them to food crops. Plant nutrition can impact the plant diseases that cause degradation of food products and mycotoxin risks.



Photo by Dr. K. Majumdar

The World Health Organization defines human health as a state of complete physical, mental, and social well-being and not merely the absence of disease or infirmity.

Where rice is the most common staple and where intake of milk products is low, Ca deficiency can be quite common. Broccoli and soybeans are examples of plants that can contribute Ca and Mg to the human diet. When crops like these are grown in acid soils of limited fertility, applying lime can boost the levels of these minerals. Applying K can increase the K concentration of fruits and vegetables, along with qualities like sweetness, texture, color, vitamin C, beta-carotene, lycopene, and folic acid contents.

Fertilizer use may also be associated with a number of negative factors that need to be properly understood

Abbreviations and notes: N = nitrogen; P = phosphorus; K = potassium; S = sulfur; Ca = calcium; Mg = magnesium.




USDA-ARS photo/Peggy Greb (D1448-2)

Applied with responsible nutrient stewardship, fertilizer contributes to the production of healthful food.

and managed. For decades, nitrate in drinking water has been a concern. While new evidence shows a positive role for nitrate in cardiovascular health, and the occurrence of methemoglobinemia has been rare in developed countries, questions remain regarding its potential relation to carcinogenic nitrosamines. More recent questions have arisen as to whether ammonia emissions from fertilizer could contribute to the formation of unhealthy levels of smog. Eutrophication leading to harmful algal blooms has been attributed in many places to losses of agricultural nutrients.

Even though questions remain regarding the degree to which agricultural nutrients are responsible, it must be acknowledged that the perturbations arising from the globally unprecedented, large-scale increase in the use of fertilizer in the past 50 to 100 years are worthy of careful attention and study. Those engaged in research and development for cropping systems recognize the multiple benefits of increasing nutrient use efficiency, and have already made considerable progress in reducing surpluses and losses of nutrients. Continued progress is needed to ensure optimum human health on both sides of the equation: the provision of adequate quantities of nutritious food, and the avoidance of harm to the environment upon which all life depends.

Responsible nutrient stewardship, based on the 4R concept (right source, rate, time, and place), has great potential to continue providing benefits to the health of humanity. The International Fertilizer Industry Association (IFA) and IPNI are working on a scientific publication on fertilizer and human health. It will provide details on the impacts mentioned above, and more. The intent is to inform the industry and others interested in fertilizer use impacts, correct misperceptions with a credible science-based approach, and to invite constructive contributions from science toward enhancing the benefits and resolving the issues. 

This topic is adapted from a Plant Nutrition TODAY article written by Dr. Tom Bruulsema, IPNI Northeast Region Director, located at Guelph, Ontario; e-mail: tom.bruulsema@ipni.net.