

the sensors performed well in terms of identifying the differences in yield potential among the treatments. The top-dress N rates prescribed at this site-year did not optimize yields. A top-dress rate of 16 lb N/A was generated for Treatment 3, that received 20 lb N/A pre-plant application, compared to a top-dress rate of 17 lb N/A for treatment 6 that received 80 lb N/A pre-plant N application. Treatment 6 was one of the highest yielding treatments (**Table 1**).

Results indicated that both sensors performed well and were useful in predicting mid-season spring wheat grain yield potential. In addition, algorithms developed in other regions did not provide the appropriate top-dress N rates for Montana spring wheat varieties and growing conditions. Lastly, because there were no substantial differences in grain yields associated with top-dress fertilizer N source (urea vs. UAN) at any of 5 site-years, fertilizer rates do not need to be adjusted based on

N fertilizer source, urea or UAN.

Currently, additional research is being conducted state-wide in Montana to develop improved sensor-based N optimization algorithms for both spring wheat and winter wheat varieties for Montana growing conditions. **DC**

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Fertilizing Crops to Improve Human Health

The importance of fertilizer in boosting agricultural production is well known. It is estimated that at least half of the world's population now depends on fertilizer inputs for growing their food supply. The tremendous increase in agricultural productivity during the last 50 years has contributed to the goal of global food security and raising standards of living.

However, large areas of the world suffer from chronic hunger and still require additional support to overcome persistent shortages. Over 30 million people die each year of malnutrition, making it by far the leading cause of death globally.

In addition to an adequate amount of food (calories), it is also necessary to have adequate nutrition (vitamins and minerals). The Green Revolution focused on boosting the yields of staple cereal crops (such as rice and wheat), but not on the micronutrient-rich crops (such as beans and vegetables). Additionally, plant-breeding efforts tend to focus on traits such as high yields and pest resistance more than the crop nutritional content for human diets.

Trace elements in crops reflect the soil properties the plants are grown on. Crop fertilization with appropriate micronutrients offers a simple and cost effective method of improving the nutritional value of food, especially in regions where pernicious malnutrition has had devastating impacts.

Biofortification of food by using micronutrient-fortified fertilizer can improve the nutritional content of the staple foods that people already eat. This simple technique provides a relatively inexpensive and long-term means of delivering micronutrients to people in need. In some areas, micronutrient fertilizers may also increase crop yields.

This scientific publication covers other important health aspects related to fertilizer practices such as:

- Proper fertilizer management can increase the health-promoting properties (phytonutrients) of many fruit and vegetables.
- Damage done by plant diseases and pests are reduced through proper plant nutrition. Careful fertilization can improve the quantity, quality, and safety of food crops.
- A scientific review concludes that there is no evidence

IPNI and partners have recently published a comprehensive scientific review on this topic with 11 chapters (290 pages) written by global experts. Details on obtaining this publication either in hard copy format or as a free download are available at: <http://info.ipni.net/FCIHH>



that organically grown crops are of superior quality. However, supplying appropriate plant nutrients in mineral form enables improvement of crop quality compared with nutrient-deficient crops.

- Calcium (Ca), magnesium (Mg), and potassium (K) are essential for humans. Properly fertilized legumes (beans) and nuts are good sources of Ca. Leafy green vegetables and legumes are rich sources of Mg. Fruits and vegetables are important sources of K. A nutrient-rich soil provides the source of these elements for crops.
- Nutrient management influences the protein, carbohydrate, and oil composition of plants. Fertilizing for optimal yields does not differ greatly from fertilizing for optimum quality for most of the world's major food crops.
- A variety of health-promoting plant substances are enhanced with proper fertilization, such as flavonoids in apples, lycopene in tomatoes, isoflavones in soybeans, sulfur-compounds in plants such as cabbage and broccoli as examples.
- Global food security remains one of the great challenges of the century. Proper plant nutrition (using both inorganic and organic sources) will play a central role in efforts to produce an adequate supply of nutritious food. **DC**