

## Crop Fertilization Helps Stabilize Carbon in the Soil

**T**he primary role of crop fertilization has been and will continue to be that of increasing crop yield and quality. An additional benefit is improved environmental protection. It has been shown that proper fertilization results in fast growing, vigorous plants that rapidly close their above-ground canopy to protect the soil from the effects of wind and water—and thus runoff and erosion. Also, healthy crops develop massive root systems that help to hold the soil in place. A secondary benefit is the indirect provision of ecosystem services through preservation and protection of natural areas: forests, grasslands, and wetlands. Protection and preservation of these natural areas prevents loss of the soil carbon (C) that would occur if such areas were converted to cultivated croplands.

**Crop fertilization provides additional benefits by enabling crops to capture more carbon dioxide (CO<sub>2</sub>) from the air.** Carbon dioxide is one of the three primary global warming gases. Increased crop capture of CO<sub>2</sub>, and soil storage of C that can occur with appropriate conservation tillage practices, help reduce the human impacts on global warming and climate change.

**There is strong evidence that there is a relatively stable sink of CO<sub>2</sub> in North America.** For example, the net annual C sequestration in the U.S. associated with land use, land use change, and forestry increased by about 18% between 1990 and 2009, primarily due to an increase in the rate of net C accumulation in forests. This annual net C sequestration exceeds one million metric tons of CO<sub>2</sub> and represents an offset of about 15% of the total annual U.S. CO<sub>2</sub> emissions.

**A proper nutrient management system considers existing soil fertility and the need for supplemental fertilization, and aids in the capture of atmospheric CO<sub>2</sub>, improves photosynthesis, enhances the release of oxygen into the atmosphere, and restores and/or increases soil organic C.** For example, research conducted by the U.S. Department of Agriculture (USDA), several Land Grant universities, and scientists at international research institutions has shown that nitrogen (N) fertilization and proper soil management can increase both soil organic C and the soil's productivity.

**Extensive reports from long-term research indicate that whenever N fertilization results in higher crop yields (and dry matter), the accumulation of C in soil organic matter**



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*Combining high residue crops with conservation tillage and sound crop fertilization contributes to the maintenance and increase of soil carbon.*

**can also increase.** Nitrogen is a component of soil organic matter and involved in the formation of humus; considered the more stable form of soil organic matter. Other long-term studies have shown that soil organic C levels are highest when conservation tillage is combined with rotations of high residue crops and adequate fertilization to increase yields.

**The role of appropriate crop fertilization in helping protect the environment is undeniable.** A sound soil fertility program is fundamental to crop nutrition—for crop yield and quality increases, sustainable soil productivity, and environmental protection. **Proper nutrient management should be an integral part of every farmer's overall crop management program.**

### FOR FURTHER READING:

- Campbell et al. 2000. Canadian Journal of Soil Science 80: 179-192.
- Grove et al. 2009. Better Crops with Plant Food 93(4): 6-8.
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- Raun et al. 1998. Soil and Tillage Research 47: 323-330.