Relay Cropping for Improved Air and Water Quality

James S. Schepers*, Dennis D. Francis, and John F. Shanahan

USDA-Agricultural Research Service, Lincoln, Nebraska, USA. E-mail: jschepers1@unl.edu

* Author for correspondence and reprint requests

Z. Naturforsch. **60 c**, 186–189 (2005)

Using plants to extract excess nitrate from soil is important in protecting against eutrophication of standing water, hypoxic conditions in lakes and oceans, or elevated nitrate concentrations in domestic water supplies. Global climate change issues have raised new concerns about nitrogen (N) management as it relates to crop production even though there may not be an immediate threat to water quality. Carbon dioxide (CO_2) emissions are frequently considered the primary cause of global climate change, but under anaerobic conditions, animals can contribute by expelling methane (CH_4) as do soil microbes. In terms of the potential for global climate change, CH_4 is ~ 25 times more harmful than CO_2. This differential effect is minuscule compared to when nitrous oxide (N_2O) is released into the atmosphere because it is ~ 300 times more harmful than CO_2. N_2O losses from soil have been positively correlated with residual N (nitrate, NO_3^-) concentrations in soil. It stands to reason that phytoremediation via nitrate scavenger crops is one approach to help protect air quality, as well as soil and water quality. Winter wheat was inserted into a seed corn/soybean rotation to utilize soil nitrate and thereby reduce the potential for nitrate leaching and N_2O emissions. The net effect of the 2001–2003 relay cropping sequence was to produce three crops in two years, scavenge 130 kg N/ha from the root zone, produce an extra 2 Mg residue/ha, and increase producer profitability by ~ $ 250/ha.

Key words: Agriculture, Air Quality, Nitrogen Management