Chapter 7

Fertilizer Nitrogen Management

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In the past, the primary goal of N management in agriculture was to improve agronomic effectiveness and economic return. But passage of the Federal Water Pollution Control Act in 1965 broadened the scope of interest in N management by introducing environmental concerns. More recent legislation passed during the 1970s and early 1980s reflects increased concern about possible groundwater contamination with nitrate. Since 1975, considerable agronomic research has dealt with improving N-use efficiency and quantifying N losses from agricultural land (Hauck, 1984; Hergert, 1986; Smika et al., 1977; Stevenson, 1982; Timmons & Dylla, 1981; The Fertilizer Institute, 1985). A major theme in today's agriculture is concern about environmental ethics of fertilizer use as well as its impact on food production (Aldrich, 1984). Clearly, a balance between food production, profit, and environmental quality must be maintained.

Proper management of N fertilizer requires a step-wise process for determining the N rate required. Previous chapters in this book have discussed proper accounting for N relative to yield goal of various crops and contributions from residual soil nitrate, mineralization and immobilization, legume credits, and manure credits. Nitrogen budgets based on these factors give a good first approximation of potential for N losses to groundwater.

High N-use efficiency, or using fertilizer N in a most effective manner, is the main goal of a "best management practice" approach. An increase in crop use of applied N fertilizer, the same or a larger increase in yield with a reduced application of N fertilizer, and reduced N losses due to a shift in time or method of application are some of the ways to improve N-use efficiency. Research has established the importance of N in crop production (Olson, 1978). The following sections will show the importance of N rate and timing in relationship to crop need for improving N-use efficiency. Improved N-use efficiency can reduce in-season N losses or produce lower amounts of residual nitrate following the cropping season. These improvements can ultimately reduce the amount of N that leaches to groundwater.