ENVIRO-BRIEFS

No. 9

Managing Nitrogen to Protect Water

Nitrogen (N) is usually the first limiting essential nutrient for non-legume crops such as corn, wheat, and cotton. These and other high yielding grasses commonly require much more N than is supplied by the soil. Thus, it is necessary to make up the difference with fertilizer N. Mineral fertilizers are preferred for several reasons, including ease of management. Organic materials can also be used successfully when they are available, provided they are handled properly.

One of the advantages of mineral fertilizers is that they can be managed more precisely than organic sources, resulting in less potential for N entering groundwater. Following are some of the techniques scientists have developed, and today's farmers use, to control the fate of fertilizer N when it is placed in the soil.

- **Application of N source that provides N when the crop needs it.** Nitrate-N…the form used in greatest amounts by plants...is highly water soluble and moves freely through the soil. It is critical that N be applied as near to the time the crop uses it as is possible. Otherwise, significant amounts might be leached out of the soil, possibly affecting groundwater quality.
- **Application of N rates that match plant requirements.** By applying N at rates near those levels required by the growing crop, the potential for N loss by leaching is minimized or eliminated. Research has shown that when N is applied according to crop need, subsoil nitrate-N levels are similar to those where no N is applied.
- **Split N use into several applications to give the crop time to use it before it can be lost from the crop's rooting zone.** Dividing the crop's total N requirement into several applications rather than one large application is an effective way of increasing N use efficiency. The results are higher yields and less N left in the soil.
- **Application of ammonium forms of N.** These N forms are stable in the soil and can be taken up and used by the crop before being converted to nitrate-N. After conversion to nitrate, the N can still be used by the crop before it has a chance to leach from the root zone. There are N stabilizers available that will keep N in the ammonium form until the crop needs it.
- **Use a balanced fertilizer program.** One of the best methods of increasing N use efficiency—maximizing N uptake by the crop and minimizing soil losses—is to implement a balanced nutrient management program. Balancing N with other essential nutrients such as phosphorus (P) and potassium (K) results in higher, more profitable crop yields and improved environmental protection.

Nitrogen fertilization is essential to crop production. Farmers can't grow enough food to meet ever increasing world demands without it. The good news is that with proper management of available N fertilizer sources, farmers can achieve their yield goals and sustain water quality at the same time. In the long run, N fertilization is a win-win situation… more food for people and protection for our water resources. EB

Nitrogen-deficient areas in fields may appear yellow or unhealthy, with poor growth (as shown in the plot at right in this photo). Best management practices assure that N is available when needed by crops, and that the nutrient won't be lost from fields.

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