MSEA
Management Systems
Evaluation Areas

ATRAZINE:

MIDWEST STUDIES PROVIDE SOME ANSWERS

Farmers in the Midwest produce approximately 80 percent of the nation's corn and soybean crops. The impact of practices to produce these crops, specifically the use of fertilizers and herbicides, has created concerns about the quality of our water resources. To address these concerns, the United States Department of Agriculture (USDA) initiated a comprehensive regional project in the Midwest to evaluate and develop profitable cropping systems to safeguard our water resources. The project study sites are known as Management Systems Evaluation Areas (MSEA).

The cornerstone of the MSEA program is the close integration of research and Extension education activities. This integration exists not only within each project, but also among the five states coordinating project efforts.

Management Systems Evaluation Areas

The USDA initiated five MSEA projects to evaluate and develop profitable cropping systems to safeguard our water resources. The main study sites were established in Iowa, Minnesota, Missouri, Nebraska, and Ohio. The sites, shown above, located in North and South Dakota, and in Wisconsin are coordinated through the Minnesota project.

Some Research Results

- Leaching of atrazine to ground water does occur, but much less than was suggested by 1980s studies. MSEA research results indicate that atrazine was detected in the ground water at some sites, but almost all concentrations of atrazine were well below the established drinking water standard.
- Ground water is less vulnerable to atrazine contamination than surface water. Most of the atrazine applied was found to remain in the top 15 cm of soil in production areas until it is degraded.
- Atrazine appears to degrade faster in soils with a history of past use because populations of soil bacteria that help decompose atrazine have increased.
- Atrazine seldom reached the water table in the ridge-tillage corn-soybean farming system that was common to many of the study sites.
- Proper selection of farming practices can reduce the concentration of atrazine in both ground water and surface water.
- Atrazine has the potential to move rapidly in sandy soils with low organic matter content, especially when these soils are irrigated.
- Research in the Northern Cornbelt Sand Plains has shown that, with careful management, sandy soils can be cropped while minimizing degradation to water resources.
- Herbicide banding, which reduces the amount of atrazine applied, can reduce leaching and decrease the potential for atrazine movement.
- Atrazine levels in surface waters are a major concern in certain locations.
- Decreasing application rates for atrazine may have the greatest effect on reducing the potential for ground water contamination.
- Careful water management and special techniques such as split N applications and banding herbicides over the row can reduce leaching of certain agricultural pesticides and fertilizers.

Future Directions

As a result of the MSEA investigations, a number of issues have emerged which are critical to addressing nonpoint source pollution, enhancing natural resources, and promoting a more sustainable agroecosystem. These emerging issues are studies of:

- the effects of atrazine levels in surface waters;
- the significance of atrazine metabolites in both surface and ground water;
- the movement, degradation patterns, and environmental impact of postemergence and new generation herbicides that may replace atrazine;
- the full application of precision farming practices and their potential impact on environmental quality and transferability among locations;
- the role of buffer strips and other riparian systems in herbicide removal from shallow subsurface and surface water flows;
- the role and benefits of subsurface drainage water management to address herbicide and nitrate losses in drainage waters. (For more information about subsurface drainage water management, see Bulletin 871, *Agricultural Drainage: Water Quality Impacts and Drainage Studies in the Midwest*. This publication is available at: http://ohioline.ag.ohio-state.edu/b871/index.htm)

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The corn-soybean cropping system, typical of Iowa's Northeast Research Center at Nashua, can be an excellent system for environmental protection.

The Northern Cornbelt Sand Plain MSEA features sandy soils over shallow aquifers. (Courtesy of *Agricultural Nitrogen to Protect Water Quality*, *IDEA* No. 4)

The Missouri MSEA site has claypan soils with large volumes of surface runoff. (Courtesy of *Agricultural Nitrogen to Protect Water Quality*, *IDEA* No. 4)

The Nebraska MSEA has sprinkler and furrow irrigated lands on medium-textured soils above a shallow, nitrate-contaminated aquifer. (Courtesy of *Agricultural Nitrogen to Protect Water Quality*, *IDEA* No. 4)

The Ohio MSEA features rainfed production on medium to fine-textured soils over a buried valley aquifer. (Courtesy of *Agricultural Nitrogen to Protect Water Quality*, *IDEA* No. 4)

Strip intercropping at Iowa's Northeast Research Center at Nashua slows surface runoff and reduces soil and chemical loads, improving water quality.

For more in-depth information about atrazine studies at the MSEA sites, look for the publication *Atrazine: Midwest Studies Provide Some Answers.* The publication *(IDEA* No.5), to be published in May 1999, can be ordered from Extension Distribution, Iowa State University, 119 Printing and Publications Building, Ames, IA, 50011-3171 or by calling (515) 294-6606.

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