North Dakota State University
NDSU Extension Service

Irrigation BMPs for Groundwater Protection from Pesticides

AE-1116, July 1996

Bruce Seelig, Water Quality Specialist
Tom Scherer, Agricultural Engineer -- Water Quality/Irrigation

Irrigation often occurs on coarse textured soils with shallow water tables, where the potential for groundwater contamination is relatively high. As with dryland agriculture, these natural conditions can present challenges to groundwater protection.

Most management practices recommended for groundwater protection on nonirrigated fields also apply to irrigated fields. However, irrigation presents management opportunities and needs that are unique and require additional management recommendations with respect to crop production and groundwater protection.

Detailed discussion of best management practice (BMP) implementation for irrigation is found in the references listed at the end of this fact sheet. Each reference title includes the source of information and the related BMP numbers.

BMPs

1. Schedule irrigations appropriately by accounting for the soil moisture and crop water use. Regular measurement of soil moisture is an accurate way of determining when to irrigate. An indirect method used to estimate soil-water balance, commonly called the "checkbook method," is based on

knowledge of the soil moisture holding capacity, daily crop water use, and daily rainfall measurements. Soil water content determined using the checkbook method should be verified occasionally with field measurements. It is critical that the determination of the water budget is done systematically and accurately so water needs of the crop are met without over-application.

2. Time water applications to avoid water movement beyond the rooting zone.
Weather patterns should be assessed before each irrigation. Irrigation should not fill the soil to field capacity. Deficit irrigation techniques that leave room in the rooting zone for additional moisture from rainfall have been demonstrated to protect groundwater without yield reductions. The soil profile should never be used to store irrigation water through the winter. To the contrary, irrigation water should be managed so that stored soil water is at a minimum in the fall.

3. Adjust water application amounts to meet varying crop demands at different growth stages.
Irrigation has the potential to meet these variable demands more readily than dryland agriculture, thus maintaining a stable environment for plant growth. Large amounts of unused residual chemicals are not likely to be left in the soil if management results in vigorous plant growth throughout the year. The potential for chemical leaching and ground-water contamination is diminished.

4. Irrigation water must be applied uniformly and accurately.
A functional flow meter and accurate pressure gauge, either at the pump or on the pipeline near the point of discharge, is essential for accurate application of irrigation water and chemicals.

5. When injecting chemicals into an irrigation system, use chemigation equipment which protects the water supply.
State regulations regarding the proper chemigation equipment required to protect the water source from back-siphonage must be followed. In addition, the pesticide used for chemigation **must** have the crop and irrigation system specified on its label. However, chemigation can provide excellent control of pesticide application timing and coverage, which can result in an overall reduction in the total amount of applied pesticides.

6. The chemigation unit must be calibrated with each use to ensure accurate application of chemicals.
An accurate way of measuring the amount of chemical being injected into the irrigation system is essential to good irrigation management. Accurate measurement of the amount of applied chemical not only optimizes chemical usage but also ensures a uniform application over the entire irrigated field.

7. Use a secondary containment structure where pesticides are stored near the irrigation well when chemigation is practiced.
Secondary containment made of impermeable material reduces the risk of contamination in the case of a leak or spill.

Further Information

This circular is one of seven **GROUNDWATER/PESTICIDE FACT SHEETS**. Please refer to the following fact sheets for additional information.

- AE-1110 What is the BMP Selection Process for Groundwater Protection from Pesticides?
- AE-1111 How is the Assessment Process for Ground-water Contamination from Pesticides Used for BMP Selection?
- AE-1112 Farmstead BMP Recommendations for Groundwater Protection from Pesticides
- AE-1113 Improved Pesticide Application BMPs for Groundwater Protection from Pesticides
- AE-1114 Integrated Pest Management (IPM) BMPs for Groundwater Protection from Pesticides
- AE-1115 Soil and Water Conservation BMPs for Groundwater Protection from Pesticides
- AE-1116 Irrigation BMPs for Groundwater Protection from Pesticides

---

References

Soil, Water and Plant Characteristics Important to Irrigation NDSU Extension Bulletin EB-66 **BMP1**
Tensiometers -- Their Use, Installation, and Maintenance NDSU Extension Bulletin AE-100 **BMP1**
Irrigation Scheduling by the Checkbook Method NDSU Extension Bulletin AE-792 **BMP1**
Irrigation of Small Grains NDSU Extension Bulletin S&F-101 **BMP1**
Irrigated Corn Production NDSU Extension Bulletin AE-99 **BMP1**
Growing Irrigated Potatoes NDSU Extension Bulletin AE-1040 **BMP1**
Chemigation -- Calibrating Systems for Center Pivot Irrigation SDSU Extension Circular FS-863 **BMP4**
Best Management Practices Manual for the Oakes Irrigation Test Area NDSU Agricultural Experiment Station **BMP1-5**
Chemigation Regulations Article 7-09 NDAC ND Department of Agriculture **BMP6**

AE-1116, July 1996

NDSU Extension Service, North Dakota State University of Agriculture and Applied Science, and U.S. Department of Agriculture cooperating. Sharon D. Anderson, Director, Fargo, North Dakota. Distributed

in furtherance of the Acts of Congress of May 8 and June 30, 1914. We offer our programs and facilities to all persons regardless of race, color, national origin, religion, sex, disability, age, Vietnam era veterans status, or sexual orientation; and are an equal opportunity employer.

This publication will be made available in alternative format upon request to people with disabilities (701) 231-7881.

North Dakota State University

NDSU Extension Service