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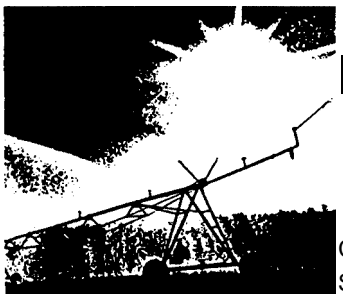
FS 861



IRRIGATION FACTS

Cooperative Extension Service
South Dakota State University

Chemigation Is it for you?

by Hal Werner
Extension irrigation engineer

Chemigation is the application of any agricultural chemical through the irrigation system along with the irrigation water. Chemigation has been practiced since the 1950's and has expanded nationwide to several million acres.

Most chemigation is used with sprinkler irrigation systems such as center pivots, but it's also common with drip/trickle irrigation.

The biggest use of chemigation is to apply liquid nitrogen fertilizer with the water. Insecticides, herbicides, nematicides, fungicides, growth regulators, and other fertilizer products also can be applied through the irrigation system.

Factors to consider before deciding to chemigate

Type of irrigation system and its suitability to the task
The system should apply water and chemical uniformly and it should be reliable and not subject to breakdown.

What chemicals will be applied?
Are the pesticides labeled for application in water with the irrigation system? Consider whether the chemicals are to be soil or foliar applied.

Location of the Irrigation system
Where is the system in relation to dwellings, water sources, neighboring crops, roadways, and other non-target sites? Regulations and local zoning ordinances may restrict chemical application and storage, for example, near municipal water supplies.

Drift and runoff potential
During strong wind, drift of chemicals to nontarget sites may delay or prevent desired chemical application. Chemigation is not appropriate if the chemical/water mixture could run off to surface water.

Soil type and topography
These influence the uniformity of chemigation and the management required.

Economics
Compare chemigation to other methods of application. Cost of chemigation applications often will be less than one half of conventional methods, especially when multiple applications of chemicals are needed during the growing season.

Management
Chemigation requires a high level of management. It is essential that the chemigation operator calibrates the injection equipment and makes sure all safety equipment is installed and functional. Fact sheets FS 860 Chemigation Safety Equipment and FS 863 Chemigation Calibration have more information.

Benefits and advantages of chemigation

Possible lower chemical application rates

Research and field trials with numerous chemicals have shown that chemigation gives good results with lower rates of chemicals than other application methods. This has been proven with nitrogen fertilizer where the nitrogen can be "spoon fed" when the crop needs it rather than risking leaching with early-season ground applications.

Uniform chemical application
The uniformity of chemicals applied using sprinkler irrigation such as center pivots can be better than with other methods.

Timely application
Chemicals can be applied under a broader range of weather conditions using chemigation. There is also no wait for a commercial applicator to come to do the job.

Prescription application of chemicals
Since chemigation can apply chemicals nearly any time during the growing season, chemical use and application can be prescriptive rather than preventative. Chemicals are not applied if they are not needed.

Reduced soil compaction
Since tractors and other application equipment are not used, soil compaction should be minimized.

Less crop damage
Operation of tractors and sprayers can cause considerable crop damage, especially for repeated applications.

Chemical incorporation and activation
Applying chemicals with the desired amount of water provides uniform incorporation that far exceeds other application methods. Certain chemicals that plants uptake with the water such as fertilizer are readily available for use. Chemigation also will activate any chemical that requires rainfall for activation.

Effectiveness
The effectiveness of chemigation has been proven over several years of research and field trials using many chemicals on a wide variety of crops. Today's newer center pivots and chemigation equipment are able to apply precise amounts of foliar chemical with small amounts of water for improved effectiveness.

Potential reduction of environmental hazards
Lower rates and dilution of the chemical in the irrigation water minimize the potential for chemical contamination. Wind drift problems also are reduced since the chemical is carried by larger water droplets than with conventional application methods.

Reduced operator hazards
Chemigation is designed for unattended operation. The operator only needs to calibrate the equipment and then make periodic checks to insure that the operation is correct. In addition the chemicals are much more dilute in the irrigation water than with conventional application methods. Concentrations of chemicals are 1/100 to 1/1000 as much.

Economics
The cost of chemigation application versus ground or aerial application of agricultural chemicals depends on several factors. How many chemical applications are needed each year? For multiple applications of the same chemical, chemigation is often less than one-half the cost of conventional methods.

Consider both the fixed and variable costs for any alternative. Normally the cost of energy to pump the water would be included as a variable cost for chemigation. However, where the crop needs the water anyway, chemigation costs may only include chemical costs and the fixed costs of the chemigation equipment.

Disadvantages and risks of chemigation

Management requirements
Like other methods of chemical application, chemigation requires training and skills in handling chemicals and calibrating equipment. The applicator must understand the irrigation system as well as the safety equipment required including the check valves, anti-siphon valves, and injection system. Calibration may be more complex for chemigation applications.

Cost of additional equipment
Additional capital costs for chemigation are the required safety equipment and injection system including injection pumps and storage tanks. It may be possible to use portable equipment so that costs can be shared by more than one irrigation system. There may be other costs for required modifications

or equipment, for example, converting to high-speed drive systems on the center pivot.

Increased application time
Applying pesticides through the irrigation system may take many hours while aerial application could be completed more quickly, if an aerial operator is available. Using chemigation equipment on multiple systems would further delay chemical applications. Changing weather conditions such as wind or rain may also complicate the process.

Unnecessary irrigation
Early in the growing season or during periods of rainfall, chemigation may be required when more water is not needed by the crop. A high-speed irrigation system and large-capacity injection equipment minimize overwatering and potential leaching and runoff problems, however.

Equipment malfunction while unattended
Even though the chemigation application system is designed for unattended operation, it is possible that a malfunction could occur. The result could be misapplication of chemical or creation of an environmental hazard.

Chemical costs may be higher
Choice of pesticides may be limited for chemigation. A lower cost pesticide may be labeled only for other methods of application. Certain soluble formulations also may be more expensive. For example, liquid nitrogen fertilizer may cost more per unit than anhydrous or dry.

Potential environment hazards
Since the irrigation and chemigation system is connected directly to a water supply, it is crucial that all safety equipment be installed and maintained properly. As with any method of chemical application, there is always the potential for wind drift or exposure to non-target areas and species.

Perceived environmental hazards
Chemigation may be judged "guilty by association," simply because chemicals are being applied and water is being used. It is the responsibility of the operator to insure that all precautions are taken to prevent a real environmental hazard.

Conclusion

Chemigation has been shown to be a safe, effective way to apply many agricultural chemicals. Used properly, it not only makes good economic sense, but it also can be best for the environment.

Chemigation is part of the total management program of an irrigation farmer. It is similar, in many respects, to other methods of chemical application, but it can be more complex because water and chemical applications are combined. Good management takes advantage of chemigation's good points and minimizes its bad points.

Be sure to consider all the advantages and disadvantages of chemigation before making any chemical application decision.

For a copy of S.D. chemigation rules or for answers to questions about chemigation, write or call:

Water Rights Division
Joe Foss Building
523 E. Capitol
Pierre, SD 57501

(605) 773-3352

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