

# Minding the weeds

## Computer program targets easier, more effective weed management

By Katie Savage

Selecting a herbicide is never easy. Farmers must balance information from many research sources and weed management publications to get the right match that will help them optimize crop yields and maximize profits, while being mindful of the environment.

Now, University of Guelph researchers are helping to make the decision easier by compiling weed science information in one convenient program.

Mike Cowbrough, weed management lead for the Ontario Ministry of Agriculture, Food and Rural Affairs, is developing a four-step computer program based on 20 years of weed science research at Guelph. When complete, it will put that research into a useable package for crop consultants and growers.

"This program will allow growers to select the parameters that are most profitable for their production," Cowbrough says.

To generate a recommendation on the ideal herbicide to use, the program will ask users to input information such as field size, density and weed types. Then the program will factor in commodity price, potential yield, yield loss and cost of herbicide. It will also include a weed threshold that calculates what kind of damage a

given number of weeds, emerging at a particular stage, will have on crop.

By using weed thresholds as part of the calculation, the program will be able to evaluate what solution will be most profitable. In some cases, the option chosen may not give the farmer the cleanest field, but it should still achieve the highest profit, Cowbrough says.

In the third step, herbicide treatments will be ranked based on their environmental impact, using an environmental quotient that considers the effect on soil, land, the applicator and the public. This will give growers a chance to make the most environmentally friendly decisions for herbicide application.

The program will list each weed species the grower specified and show what the potential yield loss is for each weed and what impact each chemical will have. The grower can click on each weed for further details, including a picture to ensure it's the weed in the grower's field. There will also be a section showing any precautions, such as pH effect and potential recropping restrictions.


The final step of the program will allow growers to select the treatment to use in their field and will give a printout with the rates and

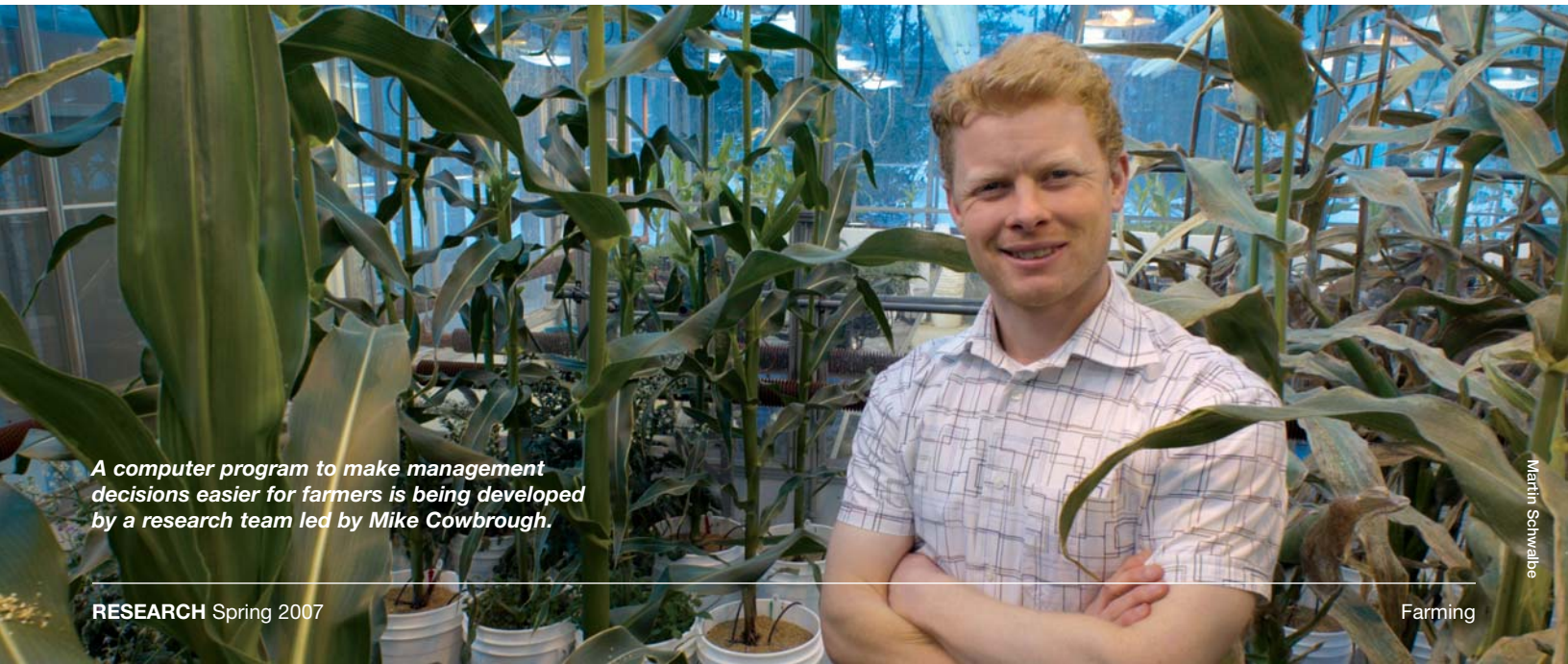
products needed. This will promote better record keeping, Cowbrough says.

The program currently being designed centres on corn. It was piloted with a focus group of producers, and the feedback is being incorporated into the program before its anticipated release to all producers later this year. It will be available via the Internet and on compact disk.

Depending on the program's success, says Cowbrough, it will be expanded beyond corn to include recommendations for wheat and soybean growers, too.

Other researchers involved in this project are Profs. François Tardif and Clarence Swanton, Department of Plant Agriculture; Profs. Peter Sikkema and Laura Van Eerd of U of G's Ridgetown Campus; Greg Stewart of the Ontario Ministry of Agriculture, Food and Rural Affairs; and Susan Weaver of Agriculture and Agri-Food Canada.

This project is supported by the Ontario Corn Producers' Association. It is also funded in part by the Canada-Ontario Research and Development Program. 



*A computer program to make management decisions easier for farmers is being developed by a research team led by Mike Cowbrough.*

# When manure's on the move

## How does it travel through the soil most readily? This research aims to discover the answer

By Patricia Dickenson

Research starts this spring to develop more nutrient management practices farmers can use. Prof. Kari Dunfield and colleagues in the Department of Land Resource Science are beginning a study to determine how factors such as timing of manure application and its incorporation into soil influence the flow of nutrients and the ability of pathogens to survive in the environment.

“We hope to establish a set of best-management practices for simultaneous control of pathogens and excess nutrients,” says Dunfield. “These should give farmers more information that will help further protect the groundwater and soil.”

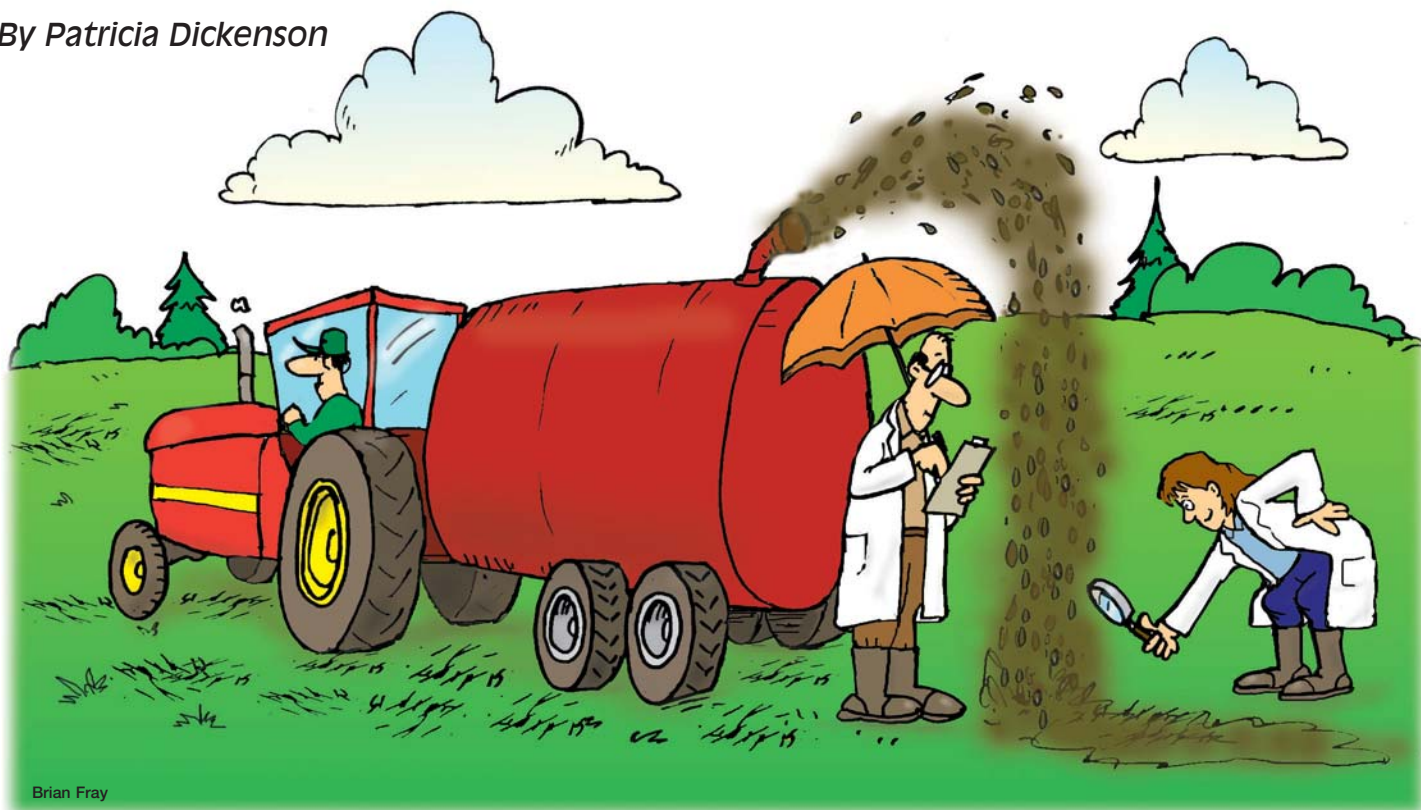
Trial plots in Elora and Ridgetown, Ont., will compare differences related to soil and climate. Manure will be applied at spring and fall timings to determine which method contributes less soil and water contamination. The manure applications will be combined with various tillage practices, including no-tillage, pre-application tillage and immediate incorporation of the manure after application. A control plot with no tillage or manure inputs will be used for comparison.

The researchers want to know how the manure nutrients travel most readily — via groundwater, surface water or in-field drainpipes. They also hope to learn how long pathogens survive in soil and if they, too, can flow through water channels.

The team will monitor soil, water and plant samples that will be collected before, during and after application. The samples will help in understanding flow patterns of manure and water. They'll also be examined for the presence of contaminants such as nitrates, ammonium, phosphorus and coliforms.

Others involved in this project are Profs. Susan Glasauer, John Lauzon and Gary Parkin of the Department of Land Resource Science and Prof. Ivan O'Halloran of the University of Guelph's Ridgeway Campus.

Funding is provided by Ontario Pork. Additional support has come from the Ontario Ministry of Agriculture, Food and Rural Affairs and the Ontario Ministry of the Environment's nutrient management joint research program. **R**



Brian Fray

# Talking in circles about the environment

## Inclusive aboriginal approach is applied to water-quality problems

By Arthur Churchyard

Complaints about nutrient overloading and soaring bacteria counts along the Great Lakes shoreline are growing trends across Ontario. As waterfront properties get eaten up, population pressures intensify and urban encroachment becomes chronic. Water quality deteriorates for all users, and cottagers and farmers point fingers at each other. Frustration escalates, and answers are elusive.

Against this backdrop, University of Guelph researchers are working to break down misunderstandings between rural groups and to encourage land stewardship on both sides. Prof. Wayne Caldwell of the School of Environmental Design and Rural Development (SEDRD) is developing a guide based on his studies of Huron County that could be used across Ontario to prompt landowners to take responsibility for their own contributions to water-quality problems.

Part of the study involves conciliatory aboriginal-like circle talks. They put all participants on an equal footing and promote discussion because, in this configuration, everyone's voice is heard.

"This project is about each of us as landowners, thinking about the daily decisions we make that contribute to water quality," says Caldwell, who is also director of the sustainable rural communities portion of the University of Guelph-Ontario Ministry of Agriculture, Food and Rural Affairs (OMAFRA) agreement. "We can't simply point fingers at a group such as farmers when our own actions are part of the problem."

Cottagers are often the most vocal about water-quality problems, he says. That's why the first part of his research considers the impact of cottagers on water quality, using a septic re-inspection program. Municipalities in Huron County can volunteer to participate in the septic re-inspection, which involves an expert from the Huron County Health Unit visiting area homes to look for potential water-quality factors such as outdated septic systems and leakage. The goal is to identify potential

problem areas and pinpoint what cottagers can do to prevent water pollution.

Caldwell is working with SEDRD colleague Prof. Karen Landman to produce the "Rural Landowner Stewardship Guide." It will help landowners identify approaches to environmental issues on their property, so they can reduce their contributions to water-quality problems.


The guide is based on workshops taking place this year and next. So far, more than 225 participants have provided feedback on what problems are in their area, where they think the problems are coming from and what they can do to help. News about the workshops is being spread by many local partners, including cottage associations.

Agricultural stakeholders are also taking part in the research. Meetings to enhance communication are conducted using the traditional First Nations style of circles. Caldwell says this approach has proven to be a great success so far because it ensures that

everyone (cottagers and farmers) can participate in the meeting and that all views are considered equally.

Circle-style meetings are of particular interest to Guelph PhD candidate Jennifer Ball, who has seen first-hand the conflict-dissolving potential of the circles. The criminal justice system in Canada and the United States uses circles in a number of contexts, but this is believed to be the first use of the technique in the context of land-use planning. Ball has observed the success of five circle meetings between rural landowners in Huron County.

Plans for 20 more workshops and circle meetings are under way, and the meeting results will be summarized for Ontario rural planners so they can be applied across the province.

Funding for this research is provided by OMAFRA, the Ontario Ministry of Natural Resources and many local groups and private organizations, including Friends of the Bayfield River. 

Alison Stieglitz



# Oil from the soil

## Building opportunities with biodiesel for Ontario farmers and processors

By Kyle Maw

Biodiesel is processed fuel made from biological sources, most often vegetable and animal fats, which are readily available. By keeping pace with technological advances,

Ontario biodiesel production is beginning to flourish. Now, University of Guelph researchers are working to position soybeans as an attractive and economical source of biodiesel.

They're trying to modify soybeans to produce oil that blends better than current biodiesel sources.

Prof. Gary Ablett and Istvan Rajcan and graduate student Golsa Saket of the Department of Plant Agriculture say using soybeans as a biodiesel source could provide economic advantages for both farmers and fuel processors, provided the soybean varieties selected for this application are bred to have a favourable combination of oil quality and quantity. The oil is what's needed to produce biodiesel.


"We're looking to create higher value for farmers and companies producing biodiesel by making soybeans more attractive as a raw commodity," says Ablett.

In the past, varieties were developed for protein content rather than high oil. These varieties have many uses because of their health benefits. Pushing for higher oil content means a trade-off for lower protein.

Typical soybean varieties have an oil content of 18 to 20 per cent. But the researchers hope to push this up to 23 to 25 per cent. This is considered a significant increase and is as high as they will aim. Otherwise, yield potential will be sacrificed.

To increase soybean oil content, the research team is breeding and then screening large numbers of soybeans to select only those that have high oil content, compared with their parental lines. Those varieties are then used for further breeding and are tested for other agronomic traits such as plant height and time to maturity.

This study began in 2005, and Ablett says it will take several years before some of the varieties they're developing will be available to farmers, but they could eventually develop into an identity-preserved market that garners premiums for growers. This program exemplifies why long-term research approaches are needed for activities such as new-variety development. Introducing a new variety into the sector can take eight to 10 years.

This project is funded by the Canada-Ontario Research and Development Program, the Ontario Soybean Growers and the Ontario Ministry of Agriculture, Food and Rural Affairs. 



*Soybeans may soon be a source for making biodiesel.*

# Irrigation and the Internet

Wise water use by agricultural operations is increasingly important in the face of heightened public concern about the environment. Now, new electronic technology being developed by University of Guelph plant agriculture professor John Cline may help farmers do their part to conserve water — and prevent crop losses.

He's developing a web-based, site-specific irrigation scheduling system. The technology uses soil sensors and local weather data delivered via the Internet to determine when to irrigate orchards, typically by drip irrigation.

There isn't one solution that will work for everyone in the province, says Cline, but this technology will give growers information relevant to their location and soil type. They could realize a significant benefit because many orchards are large, intensive operations with production costs approaching \$10,000 per hectare annually. Irrigation represents insurance against extreme weather effects, including droughts, he says.

"Irrigation is often overlooked because people think we have enough rainfall. And on average, we probably do, but nothing is ever average anymore."

# ENVIRONMENTAL EFFECTS KEPT IN CHECK ON FARMS

By Katharine Found

Environmental activists have long criticized pharmaceutical use by hog farmers and veterinarians in treating swine disease, saying pharmaceuticals are being overused and errantly contaminating the environment. But new research from the University of Guelph has shown that environmental contamination from antibiotics does not pose appreciable risks to soil and aquatic organisms.

Prof. Paul Sibley of the Department of Environmental Biology and Prof. Keith Solomon of the Centre for Toxicology have wrapped up six years of research examining the use of pharmaceuticals in the Canadian hog and cattle industry. They've determined that the pharmaceuticals represent negligible environmental risk if used as instructed.

"It's good news for producers, veterinarians and pharmaceutical companies," says Sibley. "We've found evidence that suggests there's little risk to soil and aquatic biota from using pharmaceutical products, so there's little need to be concerned."

Pharmaceuticals first raised concerns when they were detected in the environment more than a decade ago. It was thought they could cause contamination through simple routine practices such as manure spreading. Animals administered antibiotics excreted them through feces or urine, which was then applied to land and could cause damage to soil systems or migrate into nearby waterways.

But was this true? To find out, the research team simulated real-life scenarios in the laboratory and field to study pharmaceutical

toxicity. They applied pharmaceuticals directly to soil and water to simulate field exposure. This direct exposure would be similar to an actual worst-case scenario, making it a good test of potential risks, says Sibley. In toxicity, safety (or risk) is often measured as the difference

Sibley says the long duration of some of the studies helped to accurately assess changes in contamination levels and toxicity over time, ultimately leading to a stronger conclusion that supports environmental safety.


"It's comforting to know that levels of antibiotics in the environment don't seem to be posing a problem. We've tested aquatic, vertebrate, fish and soil communities, and the evidence clearly indicates little cause for concern."

He says there's been a strong push by consumers and activists over the last decade to reduce pharmaceutical use on pig farms. Programs such as the Canadian Quality Assurance are helping to inform farmers about proper protocols and how to manage the antibiotics given on the farm. The program also helps with traceability should contamination occur.

This study has found that farmers can be reassured that their practices are helping them be safe stewards of the land, says Sibley.

"I hope this research still encourages pharmaceutical companies, veterinarians and

producers to be more efficient with their antibiotic treatments but, at the same time, eases any thoughts of potential negative environmental effects."

This research was funded by the Canadian Pork Council through the Livestock Environmental Initiative, the Canadian Cattlemen's Association and the Canadian Network of Toxicology Centres. 



University of Guelph

**Pharmaceuticals used by hog farmers and veterinarians represent negligible environmental risk if used as instructed, Guelph researchers have found.**

between what is found in the environment and what the pharmaceutical's toxicity is known to be, he says.

In most experiments, he found that the toxicity effects of pharmaceuticals were in the milligram- to gram-per-litre range. That was significantly higher than the nanogram- to microgram-per-litre range typically detected in soil and water for pharmaceuticals.