



MINISTRY OF AGRICULTURE
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Newsroom Story Ideas

Fireflies Lead Farmers to Gold

By Natalie Osborne



Corn crops thrive when nitrogen levels are properly monitored.

Nitrogen is an important component of plant growth and having the right soil nitrogen levels in your field is crucial. Not enough of it can prevent farmers from maximizing their crop yields - but too much of it can harm the environment if the over-application of nitrogen leaches into groundwater.

Knowing exactly where, when and how much fertilizer to apply is also important to the farmer's bottom line - because it can account for up to 20 per cent of energy costs on a farm.

Research underway by Manish Raizada of the University of Guelph could hold the potential to transform fertilizer practices around the world. Current soil nitrogen tests can cost \$10 dollars for a single soil sample and a farmer could spend as much as \$5,000 dollars for a one-time profile of their field's nitrogen requirements. Professor Raizada says his

"biosensor bacteria" tests could be performed quickly and easily for just one dollar a sample.

He and his graduate student, Michael Tessaro, have engineered nitrogen-sensing bacteria by inserting the glowing and fluorescent genes found in fireflies and deep water jelly fish into bacteria that respond to nitrogen in the environment.

The biosensor bacteria are more accurate than conventional tests because they only measure the nitrogen that can be taken up by living organisms, not the unusable forms bound up in soil particles. Because an expert technician is not required and most of the test's materials are re-usable, the biosensors could be ideal for agriculture in developing nations where the current testing cost of \$20 per sample is out of reach for millions of poor farmers who earn the equivalent of just \$300 per year.

"I think we can solve the nitrogen fertilizer problem around the world. There are excellent sources of fixed nitrogen out there, but we just have to find them, and local farmers have to find them. The reason they don't right now, in many places, is because you can't see fixed nitrogen. So, by using a colour change method, it's almost like telling farmers where the gold is," says Professor Raizada.

This research was funded in part by the Ontario Ministry of Agriculture, Food and Rural Affairs.

See this story's video [Saving Nitrogen Costs](#) by University of Guelph SPARK writer Natalie Osborne, on eHarvest.com

Find out more about [soil management](#), [fertilizer use and crop nutrition](#) from the Ontario Ministry of Agriculture, Food and Rural Affairs.

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