

Precision agriculture research at Niagara College puts technology to work for Ontario's farmers

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Maintaining a healthy respect for the fact that farming is a business, Dr. Mike Duncan and his team of students and collaborators are examining questions that will establish the seeds of sustainability and efficiency in agriculture, not only for our local community, but with the possibility of affecting growing practices around the world.

Dr. Duncan conducts research at Niagara College as the Industrial Research Chair in Precision Agriculture and Environmental Technologies, as awarded by the Natural Sciences and Engineering Research Council of Canada (NSERC).

He carries with this weighty title a five-year mission that may seem just as onerous: develop technology-based tools to enhance one of the world's most fundamental but often taken-for-granted professions: farming. Dr. Duncan is working with the farming community, Ontario government researchers, University of Guelph researchers and a number of farm consulting SMEs to develop a standardized approach to precision agricultural practices for Ontario farmers.

Dr. Duncan has been building technology for agriculture since 2006

when his research interests switched back to that of his graduate student days at McGill. The term PrAgMatic (Precision Agriculture automatic) was coined around 2006 as a catchall for the technology being developed, which included sensor networks to measure temperature and humidity across a vineyard; Digital Soil Mapping (DSM) technology to assess why parts of a vineyard yield better wine than other parts; and a web-based portal that scraped Canadian and U.S. weather radar and weather data sites to build up insights on how weather was affecting crops.

Out of all this work, the most promising elements were the ideas related to how topography affects crop quality. A fortunate meeting with government researcher Doug Aspinall in 2007 put the research focus onto the idea that farm field topography affects crop yield. Aspinall became a mentor to nearly a dozen students who have worked with the group since that year.

While the promise of this technology is great, the sheer complexity of the problem will take some years to sort out. Another chance meeting, with Rick Willemse of Yellow-Gold Farms, further focused the effort onto grain yields and the idea of variable rate fertilizer technology. Around that time Dr. Duncan did a TEDx talk called "Seeing double green,"



In this photo illustration, modern farm machinery captures data on the field's yield while harvesting corn. /PHOTO NIAGARA COLLEGE

which outlines the promise of variable rate technology being able to increase farm profits while greatly reducing the environmental impact of farming.

Other recent work for the research team, which includes students, graduates and grower collaborators and partnerships with OMAFRA, has involved establishing and employing the information gleaned from decades of farm yield data collected by farmers who adopted GPS capable farm equipment early on. Data sets from

as early as 1996 are providing insight on farming practice today.

"As fate would have it, I accidentally invented a new way of looking at things which turned out to be really powerful," Duncan recently noted of his research into how to classify management zones within farm fields based on the historical yield data.

Another piece of the technology puzzle is called LandMapR, which works with digital elevation maps to determine

hydrology and landform classes to help farmers new to precision agriculture adopt precision practices. Dr. Duncan's group found that the deep historical yield data matched well with the farm field topography data processed through LandMapR.

If you are thinking you haven't seen any of this fancy gadgetry when travelling past the farmers' fields, orchards or vineyards that are still plentiful in Niagara, think again.

Most modern tractors are equipped with RTK/GIS/GPS technology and several fields in locations throughout the peninsula contain remote sensors for field-specific weather inputs like rain and heat units.

One of the next major steps for the team is the development of an online portal for grain farmers, which will eventually be made available via the Grain Farmers of Ontario. The science and products will continue to evolve as the portal will play the double role of production portal (making maps) and research portal (using the incoming data to gain new insights).

For more information on Dr. Duncan's work as part of Niagara College's Agriculture & Innovation Centre, visit NiagaraCollege.ca/Research.



Agriculture & Environment Innovation Centre

Solutions for Industry

Niagara College's Agriculture & Environment Innovation team specializes in working with private sector partners to develop innovative solutions to address today's environmental and ecological challenges. Hosted at the Niagara-on-the-Lake Campus, a Precision Agriculture Data Portal has been developed to support farmers looking to use management zones and practise variable rate farming.

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