(Above) *UNSW PhD student Ehsan Zare setting up the gamma-ray spectrometer.* ***(Middle right)*** *Associate Professor John Triantafilis in the field as part of the* Seeing is Believing *project.* ***(Far right)*** *Students are a vital part of the project. Here, Xuyue Zhao and Mahi Mousavifarde are using soil cores to help validate and ground truth the digital soil maps being created as part of the project.*

UNDERSTANDING THE SOIL THROUGH DIGITAL MAPPING

A UNSW RESEARCH PROJECT IS WORKING IN MULTIPLE CANE-GROWING REGIONS TO CREATE LOCAL DATA BASES ON THE USE OF TECHNOLOGY SUCH AS GAMMA-RAY SPECTROMETERS AND EM INSTRUMENTS, TO HELP THE INDUSTRY BETTER UNDERSTAND OUR SOILS.

sugarcane SOIL

Put your smartphone's camera over this symbol to take you straight to a video explaining this project.

HOW MANY SOIL TYPES DO YOU HAVE ON YOUR FARM?

HOW MUCH VARIATION IS THERE WITHIN A SINGLE BLOCK?

Depending on where you are and the size of your blocks, there's a fair chance you have several different soil types and they change several times within just a few hundred metres.

So the answers to these questions could easily be a big number – and also a number that is difficult to know with 100 percent accuracy.

Most of the time, soil sampling and testing is the answer, and for about two decades parts of the industry have been using electromagnetic (EM) mapping to better understand soil types and more efficiently manage their inputs.

However, the use of this technology is not widespread, and there are opportunities to use new and emerging technology to accelerate the potential for growers around digital soil mapping (DSM).

Current research is underway that is examining the latest advances in DSM technology, and working with industry to make this technology more accessible for the industry and manage their farming practices according to soil types and properties.

This research is led by Associate Professor John Triantafilis from UNSW Sydney through an SRA-funded project called "*Seeing is believing: managing soil variability, improving crop yield and minimising off-site impacts in sugarcane using digital soil mapping*".

The project has been working in multiple cane-growing regions to create local databases on the use of technology such as gamma-ray spectrometers and EM instruments. As well as using these sensing instruments, the research team also uses in-field verification via soil coring to validate their work.

When CaneConnection caught up with the project team, which included multiple PhD students and staff from Herbert Cane Productivity Services Limited (HCPSL), they were mapping a field at Lannercost Extension.

The sensors attached to a ute as it drives over the field. They are being used to collect data across multiple paddocks, and to predict cation exchange capacity, exchangeable calcium, and exchangeable magnesium, among other soil chemical properties.

John Triantafilis said that these sensors could be used to make as many as 10,000 points within the 40ha area, creating maps of the soil variation that are much more detailed than could be achieved with manual sampling. When calibrated against soil cores – say about 50 in a paddock – this allows them to create a digital soil map of the paddock.

"There have been previous soil surveys done in the past, so part of our research is comparing the new digital soil maps with the traditional soil maps," he said.

He explained that these traditional soil maps were generally simple and developed based on limited soil data, and then this data was extended to larger areas using aerial photographs and interpretation to create maps.

"Clearly, while these maps weren't designed for precision agriculture, this project aims to test these maps and compare them to the accuracy of the digital soil maps. While it may not seem like a fair comparison, the traditional soil maps may be of sufficient accuracy and provide farmers with some confidence to allow them to be used and therefore serve as a stop-gap until digital soil maps can be created."

However, he said the real prize was developing local capacity, such as within productivity services organisations, to extend advanced digital soil mapping technology within each region.

This is already occurring in parts of the industry, including the Herbert, where HCPSL have been collaborating with UNSW on this project. HCPSL also offer fee-for-service for EM mapping for growers but not yet the creation of digital soil maps. A similar service is offered by other providers in some other regions.

Michael Sefton from HCPSL said EM mapping was particularly important for the southern area of the Herbert district, which did not have detailed soil maps.

"For some of those growers, in conjunction with soil tests, they have taken the next leap in the farming system and have gone to variable rate lime and gypsum application to remediate problems, in particular on sodic soils," Michael said. "There are costs savings with the variable rate application, and we are still to quantify the benefits in yield.

"Moreover, the ongoing collaborative work with UNSW gave HCPSL the confidence to purchase our own instrument and proceed with our own EM mapping projects."

John said there was significant potential for using the maps for precision agriculture.

"Through our work, we hope to show that variable rate applications are efficient, more economically sound, and potentially provide industry case studies which show that we are continuing to demonstrate there's no excess fertiliser getting into groundwater, streams and rivers," he said. "It is foremost a potential tool that could help farmers more accurately apply the SIX EASY STEPS nutrient management guidelines."

He said ground-truthing was important, which was why they had worked extensively over the last two years in Proserpine, the Burdekin, the Herbert and Mossman.

"The project is called 'seeing is believing' because we know it is important for growers to be able to see something working in their own region to ensure the results are meaningful." ■

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To see a video of this project at work in the field, visit the media section of *sugarresearch.com.au*