RESEARCH & INNOVATION

SoilOptix® attaining global reach thanks in part to collaboration with NC research team

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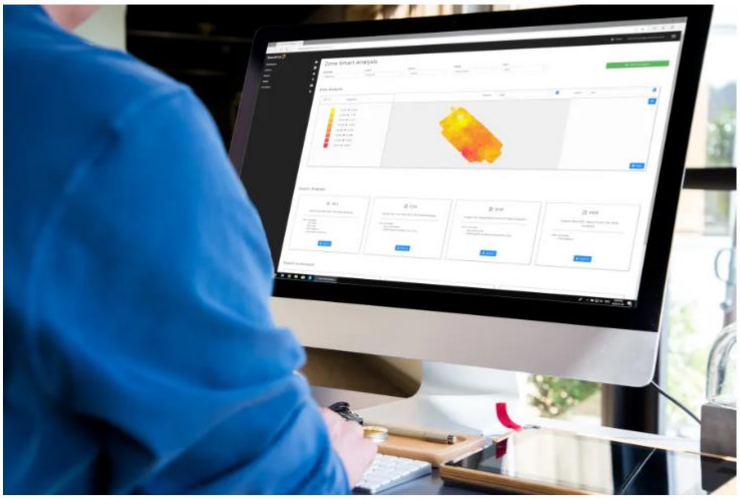

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SoilOptix® is now in a position of obtaining global reach with their technology, in part due to their collaboration with the NC research team through precision agriculture, GIS tech and data automation, which created process efficiencies of immense proportions and a user-friendly interface for customers.

The Tavistock company came to Niagara College's Research & Innovation (R&I) division in 2017 as an industry partner needing support on an applied research project. One project with the Horticultural & Environmental Sciences Innovation Centre (HESIC) has evolved into a long-standing collaboration that benefits SoilOptix®, NC students, and the greater agriculture industry.

SoilOptix® provides soil-mapping technology to farmers, giving them a deeper understanding of the variability in fertility and textural-based properties of their soil. SoilOptix® produces amazingly detailed, high-definition soil-mapping sensors (licensed under an exclusive arrangement with the Medusa Institute in the Netherlands) that can accurately map over 25 different topsoil layers, including macro- and micro-nutrients, pH, organic matter, physical properties, texture, plant available water, and carbon.

With a resolution of 335 points per acre and data that is easily implemented into variable-rate applications, SoilOptix® gives growers a deeper understanding of the variability in nutrients and textural-based properties of their field's soil, which results in better optimization of input (fertilizer, seed, etc.) placement for economic and environmental gain.

However, this thorough data analysis and processing work uses multiple pieces of software and was taking a significant amount of time, creating a bottleneck in service.

The HESIC team, led by Mike Duncan, PhD, the Natural Sciences and Engineering Research Council Industrial Research Chair for Colleges in Precision Agriculture & Environmental Technologies, streamlined the data process and programmed the primary production into a single, efficient system. The User Interface (UI) makes this process much faster by automating much of the work. With the UI, the SoilOptix® data analysts are realizing an eight-fold increase in their ability to process a field.

In addition, the next piece of the collaboration has NC students working on two components for SoilOptix®. The first is a fully automated process that has a new improved system that will continue to improve any bottlenecks and have far less issues in terms of data access. Secondly, NC students are working on an external interface for customers use – a customer portal where they can log in and grab their data and interact with the company.

Students who have an opportunity to work on a SoilOptix® project with HESIC have received first-hand, real-world experience, which helps them become innovative, forward-thinking employees who in several cases have been hired with the company. Alternatively, wherever they end up, if it's creating their own company or working for industry, they are innovators and have a leg up on their competition when entering the work force.

Students can learn about new software, which challenges them and applies what they are learning in the classroom to an industry partner's real-world challenges. This type of student work experience, with true budgets, deadlines, and deliverables, is what makes their learning innovative and beyond in-classroom learning alone.

The real value of this project is that leaders such as SoilOptix® co-founder and President Paul Raymer and the rest of his leadership team understand the value of always trying to improve.

Paul's team was able to identify the gap in their resources, which was technology and data automation. They connected with the HESIC team to work on a data processing portal and have been working together in an ongoing capacity since.

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> **– Paul Raymer, SoilOptix® co-founder and president**

Once joining the HESIC team, students are taken under Mike's wing. He patiently trains the students as research assistants and supports them when they eventually become graduates working in their respective fields. Mike is always proud when another NC grad is hired to join the SoilOptix® team, because he knows the former student will understand their business model and how to make the company successful.

"It's been a real pleasure for me to get to work so closely with the SoilOptix® team, and most importantly our NC students. Getting to see these students join the project with basic knowledge and then grow to become near experts in their field is amazing," says Mike.

The software that the students learn to build these systems are often new to them when they start. The mentoring that senior students provide to junior students is an understanding of the structure and tools. They begin to grow on their own and explore the various components of the system.

"After about six months of working through simple bug fixing and modifications to the existing system, they generally get an idea of where they might fit in the project and we accommodate their interests and assign them to an area where they are most comfortable and likely to be productive," notes Mike.

When they graduate and begin working, they already know where they can be most effective. "We're constantly watching and looking to take advantage of a student's abilities to put them in the right place to move the (SoilOptix®) project forward as fast as possible."

His focus is to enable students to work on projects where they are going to learn and grow and become a better student and eventually, working professional. He encourages the more senior Research Assistants to help teach, challenge, and grow the new students' skills and knowledge, which gives the senior students a leadership role within the team. He also stresses the importance of communication and being able to speak

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Another key leadership piece is that the SoilOptix® leadership team is always agile and willing to put the time and resources into the project with Niagara College to ensure their product is always getting better and better. They increasingly invest in the people and expertise required to get the business where it is today.

"One of our best-kept secrets to our success has been this working relationship with Niagara College. We have found it very rewarding, not only from the sophisticated systems that the student teams have developed, but to the extent of the real-life working opportunities and experiences we have provided them. The success has been so strong that it has carried through to the opportunity to hiring several students full-time," says Paul.

The collaboration allows students the opportunity to gain real-world experience while still in school.

Before working with HESIC's experts, SoilOptix®'s previous process took a data analyst about eight hours of work. Now, it takes less than an hour, increasing their efficiency by a factor of eight. The HESIC team is helping to get this down to seconds while expanding the technology and data automation abilities. The College partnership has enabled the company to grow rapidly in several directions. For example, in 2019, they were able to map about 110,000 acres; in 2022, they increased that to over 500,000 acres, with 2023 targets set at approximately 800,000 acres. SoilOptix® has been able to double the company year-over-year by a factor of two, or 5.6 per cent growth by month – an uncommon growth pattern for many businesses.

Growing on an international scale

The collaboration between SoilOptix® and HESIC started locally in Ontario, but now has sustainability impacts with an international reach.

Further, this technology development and company growth means the process will be made available beyond Canada, adding major crop-growing regions internationally. A new partnership between Hutchinsons and Syngenta now makes the SoilOptix® system available under the Interra® Scan brand across 51 countries in Europe. The rollout of Interra® Scan SoilOptix® sensors will begin in Eastern Europe with Ukraine and Poland and gradually move into western Europe over the next several years.

Rising costs and tight margins, combined with growing societal pressure around sustainability, mean it's more important than ever to give the soil what it needs by applying inputs precisely and accurately. This is what makes the technology and data automation projects in this collaboration so important.

Beyond NC graduates directly benefitting (6 have been hired by SoilOptix® so far), the College continues to benefit as well, securing direct funds from SoilOptix® in a 5-year agreement worth $50,000 per year, to have the HESIC team continue working on the above-noted improvements. This allows more students to become experienced grads ready to tackle the agricultural challenges of food supply issues of the future.

The future of this project is automation. The team will be using a mixed bag of technologies, including Artificial Intelligence, to automate as closely as possible the current map making methods that SoilOptix® analysts use. While it will be a challenge, the team is getting very close.

The benefit is at least a thousand-fold increase in the rate of production of maps (hours to seconds). Once automated, the process will be run in parallel so that they can scale the map-making rate to hundreds of maps being created simultaneously.

"This increased capacity will give SoilOptix® the potential to grow exponentially as the market demands," says Mike.

No doubt, the future for SoilOptix® and Niagara College is an exciting one.