Top Soil Field Mapping for Precision Agriculture

Name of the Organisations Involved

- SoilOptix®. United States / International

Challenges Identified

Agricultural growers encounter various challenges with traditional soil sampling methods. These challenges include:

- **Inaccuracy and Variability:** Traditional sampling methods often result in soil samples that may not accurately represent the variability present in the entire field. This can lead to imprecise nutrient assessments and recommendations.
- **Labor-Intensive Process:** Collecting soil samples manually is a labour-intensive process, requiring significant time and effort. This can be impractical, especially for large fields or farms with limited manpower.
- **Limited Spatial Resolution:** Traditional sampling may not provide a high spatial resolution, meaning that variations in soil composition within small areas may go undetected. This lack of detail can hinder precision agriculture practices.
- **Frequency and Timing:** Traditional methods are often limited in terms of how frequently and at what times soil samples can be collected. This limitation may result in incomplete or outdated information for decision-making.
- **Accessibility of Remote Areas:** In some cases, reaching remote or difficult-to-access areas for soil sampling may be challenging using traditional methods. This can leave certain parts of the field underrepresented in soil analysis.
- **Subjectivity in Sample Collection:** Human subjectivity in sample collection, such as the depth and location of samples, can introduce variability and inconsistency in the results obtained through traditional methods.

Goals and Solution

The solution is SoilOptix®, a unique, high-end top soil analysis technology that establishes the benchmark for precision and accuracy in agriculture; it's a value-added layer that integrates into the regular management choices farmers make for their fields.

"Now, we can define where the specific issues are in a field, being a nutrient or soil property and can now create a plan to address those issues. And it's the only system that gives us a full texture profile across a field. We know sand, silt and clay are different. However, we could not measure them to this detail before. Now, we can use this in our Variable Rate program to fine tune where we put our fertilizer applications with more precision. Why sample the average when we can sample the variability?" (Trevor Thornton, CCA, P.Ag. Crop Care Consulting Ltd.- SoilOptix® Service Provider Since 2016)

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The **SoilOptix® process** from in field collection to a final data layer involves a standard four step process in which the gamma radiation-based sensor data is combined with strategically located physical soil samples as calibration, providing with soil mapping results in high resolution top soil property layers. The survey data and subsequent lab analysis results of the soil samples are submitted to SoilOptix® data analysis team for processing to be completed. SoilOptix® results are accessible for providers and growers through the SoilOptix® customer data portal, where fields can be visually assessed or download spatial files such as a shapefile or csv which can be loaded into GIS specific programs/platforms. The resulting data from SoilOptix® can be used for multiple purposes including variable rate application of fertilizer or seed, precise management of water, or more informed practices around field scouting.
The figure below illustrates this four-step process where each is important to the resulting SoilOptix® high resolution soil data information.

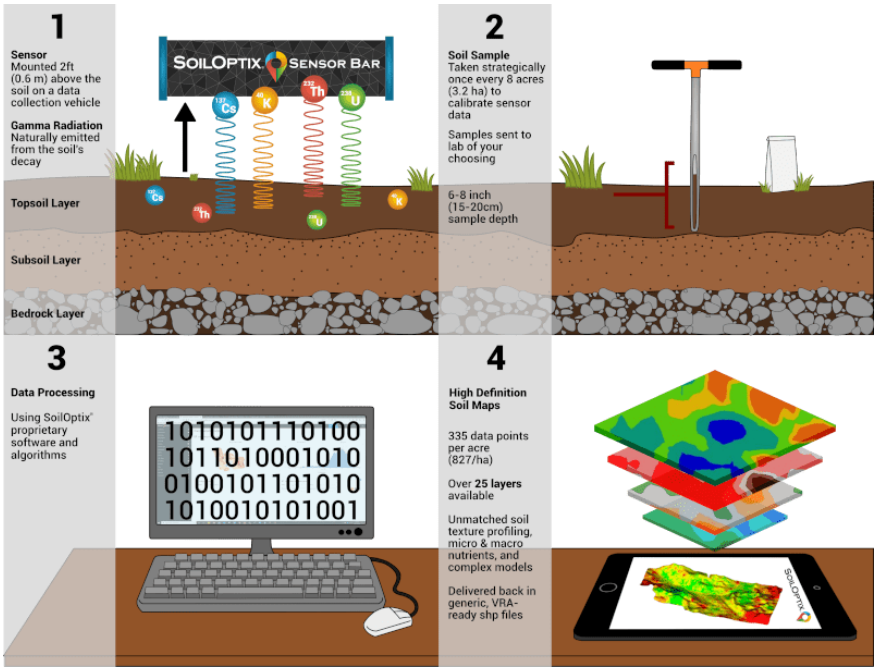

Figure: SoilOptix® Step-By-Step Infographic (Source: SoilOptix.com, link: here)

Actions Taken

The use of gamma radiation in agriculture, previously limited to the geological mining sector, became the subject of research initiated in Europe in 2003.

In 2010, the technological opportunity presented by SoilOptix® was introduced, prompting Practical Precision Inc., founded in 2009, to explore its implementation in North America.

By 2013, Practical Precision brought the SoilOptix® technology to market, offering it as a service to growers in Ontario, Canada, after three years of dedicated research and development.

As of 2021, the company celebrates eight years of operation and provides services in over twelve countries, including Morocco. SoilOptix® continues to uphold its mission by expanding research and development efforts to address spatial measuring challenges in field soils.

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For the European market, Syngenta Europe was established through an exclusive contract with Hutchinsons Crop Production Specialists, a UK partner. It is now the authorized supplier of SoilOptix® services for all 51 European nations. The operations, initially launched under the Interra Scan brand, are set to expand, beginning in Hungary, Poland, France, and Ukraine.

Benefits and Impact

- SoilOptix® provides growers with soil analysis results that allow them to make the most informed on-farm decisions.
- In the past few decades, data from remote sensing (RS) has become a promising secondary source for enhancing digital soil mapping at all scales. Remotely sensed data sources produce consistent and comprehensive data in both time and space; have a sizable spatial coverage that allows mapping of inaccessible areas; contain extractable information, such as spectral reflectance; and present opportunities to augment or replace traditional soil sampling in soil surveys.
- Remote sensing can be used to monitor and track crops, and to detect pests, weather, and other environmental factors that can affect the health of crops.
- Soil layer observation is crucial for precision agriculture. Soil organic matter, soil texture, pH level, moisture content, and other factors can be monitored via remote sensing technologies.

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Application Area
☒ Soil

Digital Technology in the Value Chain
☒ Agronomic Services

Digital Technologies
☒ Sensor Technology

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