Project Summary

EMILI Agi3

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Agi3 Crop Sentry system

About the technology

The Agi3 Crop Sentry system is an AI-driven platform that provides 24/7 crop monitoring and analytics. It uses long-range LiDAR and high-resolution multispectral cameras established in the field to collect detailed agronomic data and environmental conditions to predict yield. This technology is pre-commercial.



A Crop Sentry station monitoring a field (Photo credit: AIRM).

EMILI objectives

From 2023 to 2026, EMILI installed Crop Sentry stations across Innovation Farms to:

- Validate their ability to monitor and provide insight into crop performance.
- Test the capability of yield predictions that reflect in-season changes, such as amount of fertilizer applied.
- Provide data to improve machine learning yield prediction algorithms.

What we learned

Constant monitoring in field

The Crop Sentry stations stay in the field through the growing season so the crop can be monitored remotely. While this does create an obstruction in the field, this sensor is unique in that it provides daily 360° imagery, direct plant height and growth measurements, and more comprehensive data extrapolated from the sensors on a daily basis.

Yield estimation and insurance

The Crop Sentry system aims to estimate yield throughout the growing season, allowing producers to make informed decisions about field management. Agi3 is using Crop Sentry as a technology for tailored crop insurance solutions. Crop monitoring will unlock the ability to customize insurance based on measured crop performance and may be used for future developments such as in-season insurance adjustments.

Web application

The Crop Sentry team developed a new web application that was made available to EMILI for beta testing. The app provides daily updates from fields across the farm including panoramic pictures and weather conditions. It also enables remote monitoring of distant fields in Gypsumville, Manitoba and the potato site in MacGregor, Manitoba.



(Photo credit: AIRM)

What this technology could unlock

Crop Sentry's 24/7 crop scouting analytics provides the detail needed to unlock field level risk management for farmers. There is potential for this technology to support crop insurance and allow producers to customize their coverage. Crop Sentry was recently used in a pilot project to detect flooding and assess crop damage with rainfall data, field imagery, and remote sensing data.

EMILI INNOVATION FARMS powered by AgExpert

EMILI's Innovation Farms powered by AgExpert provides innovators with access to leading-edge equipment, technology, and production practices to increase productivity, sustainability, and profitability across the agriculture and agri-food sector.

Summary of analyses

Materials and methods

After seeding in the spring, Crop Sentry stations are installed across 10-15 fields of various crop types. Each week the EMILI team collects agronomic data about the crops near the stations. The data collected includes plant height, crop stage, number of heads/pods, insect and disease pressures, and general observations.

Multispectral images are taken at key growth stages throughout the growing season with a DJI Matrice 300 RTK drone equipped with a MicaSense RedEdge-P camera. This is shared with Agi3 and the data is used to confirm and improve their modelling of the crop.

In a subset of fields, there is one strip of increased fertilizer rate and one strip of decreased fertilizer rate close to the station so that it can be captured in the imagery along with the typical fertilizer rate across the rest of the field. The EMILI team takes weekly height measurements in these areas.



Figure 1. Images from the same field on June 9, 2026 (top) and June 10, 2026 (bottom) after an extreme rain event.

Results

Over the years of testing at EMILI's Innovation Farms, Agi3 has collected data in many crop types and expanded into potatoes in 2025. The station design has been modified over the years and has a new precipitation measurement capability for 2026, which adds a layer of critical data on top of the images and scans of the crop growth.

New AI features were tested at Innovation Farms including automatic daily crop phenological stage detection at all test sites. EMILI staff provided ground truth measurements to validate these models. A new multispectral solar radiation sensor was prototyped and tested across all Innovation Farms test fields. This sensor provides field specific information on solar energy available to the crop and is also used to calibrate Normalized Difference Vegetation Index (NDVI) measurements under varying atmospheric conditions that correlate to plant health.

In June 2026, there was an extremely large rain event with over 200 mm in one day at Grosse Isle, which resulted in flooding of many fields (Figure 1), some for several weeks. With the Crop Sentry web application we were able to see how much water was still in the fields and how the crop looked in the weeks following without having to enter the fields. This data also provides a record of weather events that may be able to assist with crop insurance claims.

Next steps

EMILI will continue to test Crop Sentry stations at Innovation Farms in 2027. In addition, we will collaborate on a separate project to test a quadruped robot to scout crops. This could save time and labour as well as increasing the coverage of the field to better identify crop pests.



Summary of analyses

Station data

The web application provides users with a lot of important information about weather and soil moisture conditions. This includes daily temperature, precipitation, growing degree days (Figure 2), modelled available soil water (Figure 3), soil texture, and soil properties.

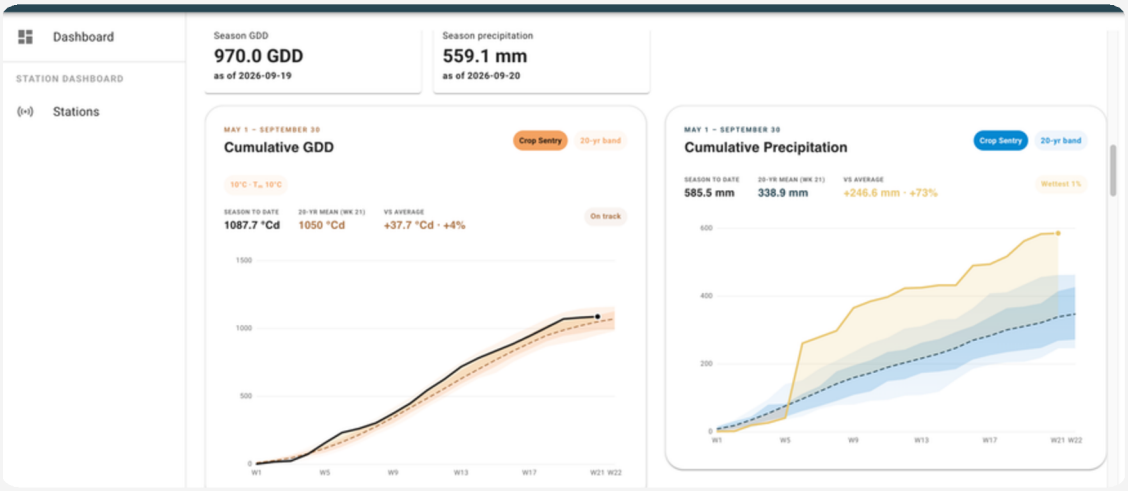


Figure 2. Cumulative GDD and precipitation graphs from the web app.

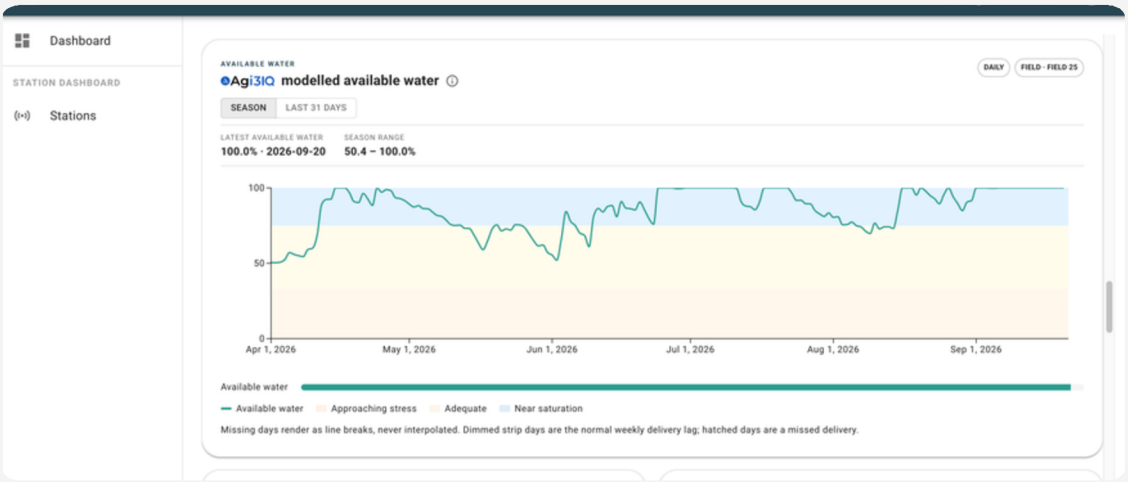


Figure 3. Available soil water graph from web app.

Crop Types

Since 2023, Agi3 has deployed 10-15 Crop Sentry stations across Innovations Farms each year in canola, wheat, oats, soybeans, corn, peas, and potatoes.



Staff conducting agronomy measurements for Crop Sentry systems in canola, potatoes, and corn.