ALBERTA INNOVATES

CLEAN RESOURCES

AGRI-FOOD INNOVATION

DATA AND DIGITAL SOLUTIONS

Mapping and Validating Soil-Based Carbon Through Automated Use of Mobile Inelastic Neutron Scattering Technologies to Incent Regenerative Agriculture

The Mobile Inelastic Neutron Scattering (MINS) technology measures changes in soil carbon concentration at the atomic level across wide areas and can be used to generate accurate and cost-effective soil carbon maps. Farmers can use field-level carbon maps to adopt management practices that increase the amount of soil carbon through regenerative agriculture and to obtain carbon credits for sale on global markets. The MINS device is the size of a small suitcase and is housed in a trailer. This project will identify the trailer's durability requirements for large-area carbon measurement. This includes identifying and deploying autonomous vehicle options and benchmarking the MINS technology to soil characteristics in central Alberta.

FUNDING DETAILS

RECIPIENT:
Carbon Asset Solutions (CAS) Ltd.
PI: Jason Bradley

PARTNERS:
Olds College
PAMI

TOTAL BUDGET:
$924,000

AI FUNDING:
$350,000

PROJECT DATES:
JAN 2022 – DEC 2023

PROJECT TRL:
Start: 7
End: 9

APPLICATION

MINS uses a pulsed low-energy neutron beam to stimulate carbon atoms in the soil to reflect gamma spectra which are detected and analyzed to produce a measure of carbon and other minerals in the soil. MINS traverses a field to collect data from a continuous 1.5m wide path and a GPS device records geographic coordinates where gamma spectra are detected to produce a C-weight map. When combined with a soil density measure, the total carbon content is created.

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PROJECT GOALS

- Create incentive for farmers to adopt regenerative agriculture practices (increase soil carbon, become carbon farmers and participate in the global effort against climate change).
- Evaluate the durability and usability of the MINS carrier vehicle under different operating conditions.
- Examine the potential for and configurations of alternative carrier methods like autonomous ground vehicles that are capable of safely pulling a MINS unit across Alberta fields/grassland.
- Validate MINS processing and mapping capabilities including data analysis for carbon levels from the MINS scanner and composite soil sampling; recommend system design for commercialization and scaling.
- Confirm full value chain of CAS measurement, recording and validation (MRV) process across the entire CAS platform.

BENEFITS TO ALBERTA

- Incents significant carbon sequestration in Alberta's soils and across all farm and ranch lands enrolled in the CAS program (Alberta, Western Canada and beyond).
- Deliver carbon credits to global markets faster and more cost effectively than any other method.
- Key component of transitioning farmers and ranchers from carbon emitters to carbon "sequesterers".
- Enable and encourage farmers to increase functional soil health across Western Canada.
- Enhances farmer profitability; delivers real financial gain to the farm and ranch sector as the price of CO2/carbon credits increase.

1 New Product/Service

3 Publications

70 Future Jobs

50,000 kT/yr Future GHGs Reduced

CURRENT STATUS

MAY 2022

Work has begun on the MINS carrier unit durability assessment and improvements, as well as identification of stress points and data parameters for in-field use that can be used for accelerated stress testing. Additionally, temperature chamber testing is being undertaken providing an understanding of the ability to control temperatures within the carrier chamber. These tests will result in a baseline for carrier parameters that can be used for further testing.