



Empowering Agriculture: Enhanced GHG Emissions Modeling

Team Introduction

Leveraging data science for a greener future

Team member

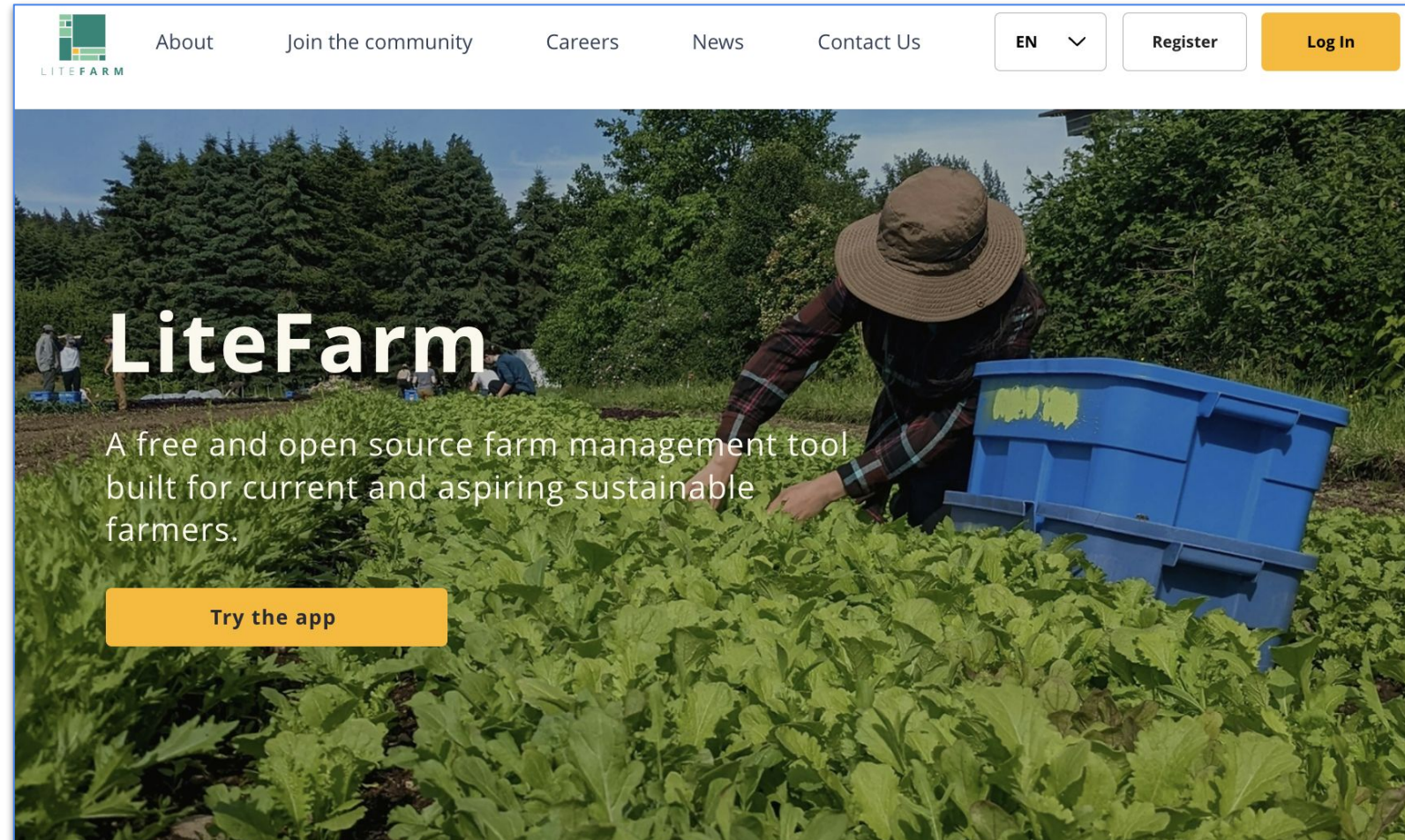
- ❖ He Ma
- ❖ Hancheng Qin
- ❖ Yi Han

Mentor

- ❖ Simon Goring

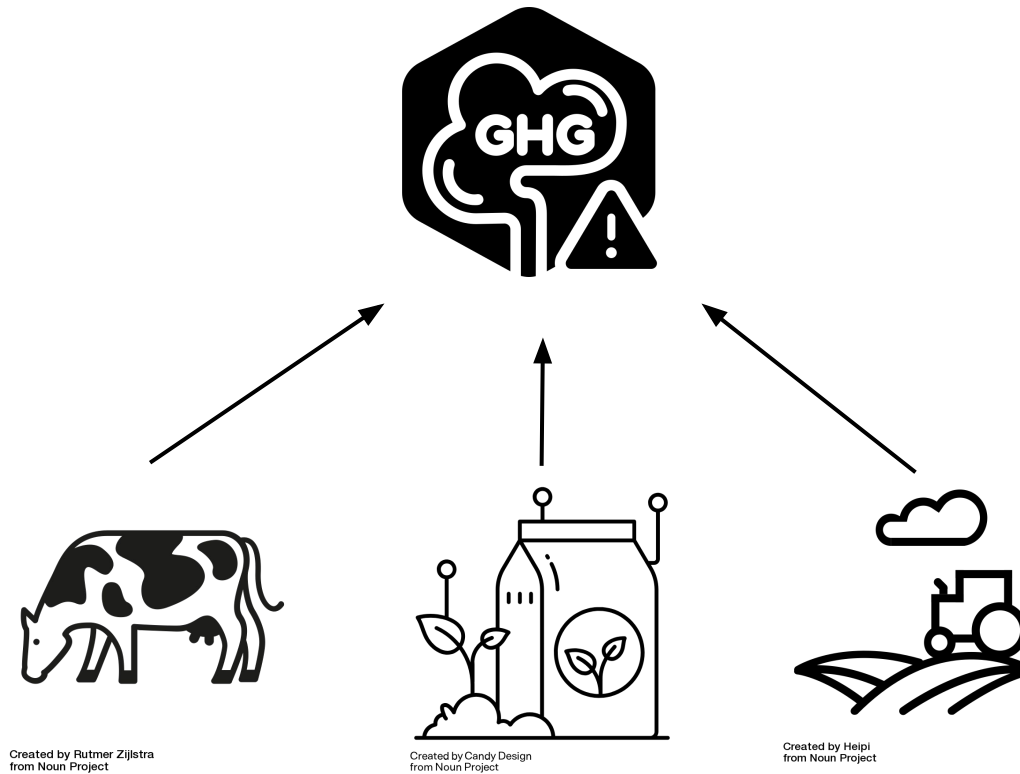
Partner

- ❖ LiteFarm/UBC
 - Dr. Khanh Dao Duc



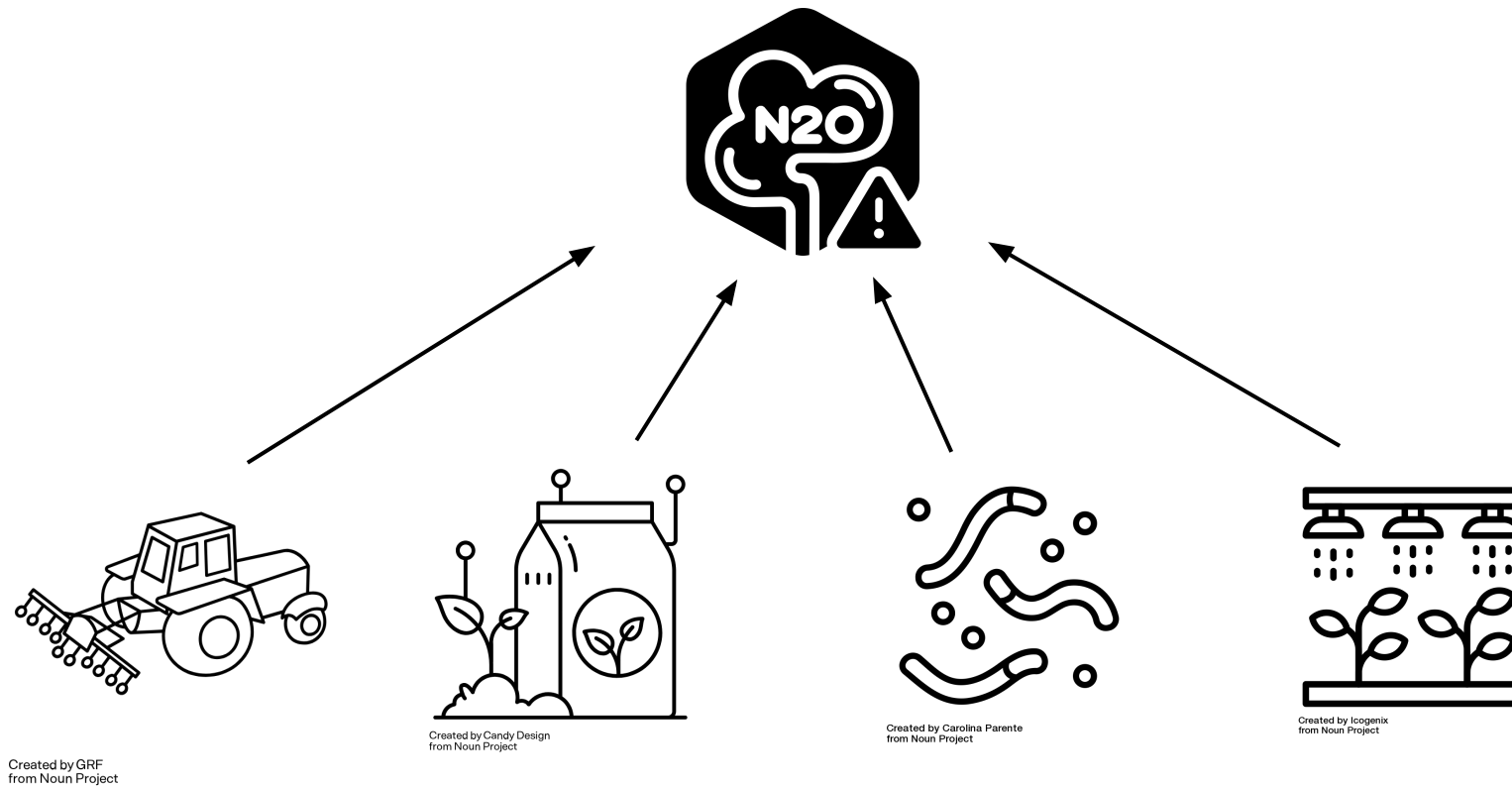
Climate Change and GHG Emissions

Agriculture as a significant player



Climate Change and GHG Emissions

Agriculture as a significant player



Sustainable Farming with LiteFarm

Calculating GHG Emissions: Our Critical Contribution

GHG Emissions



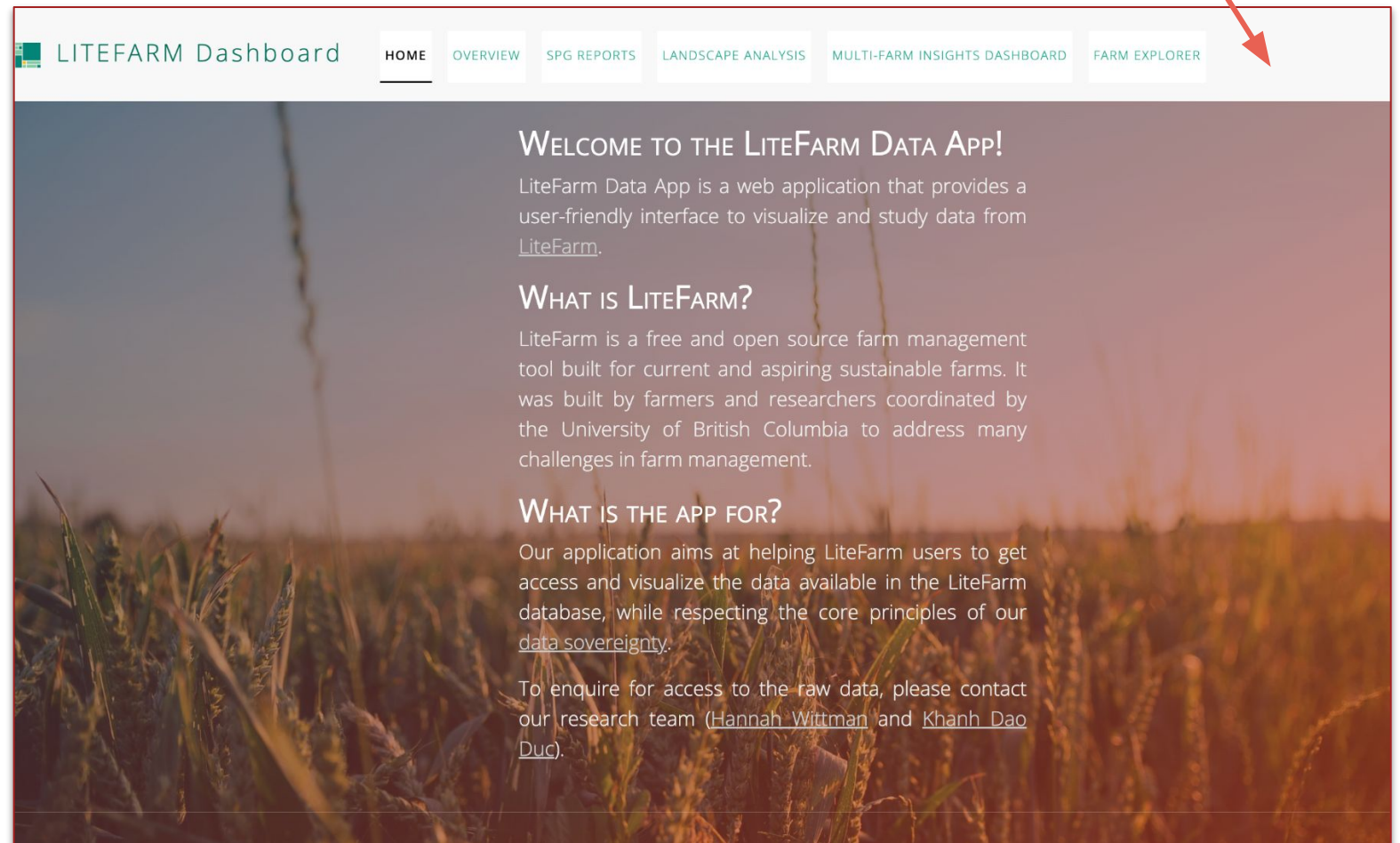
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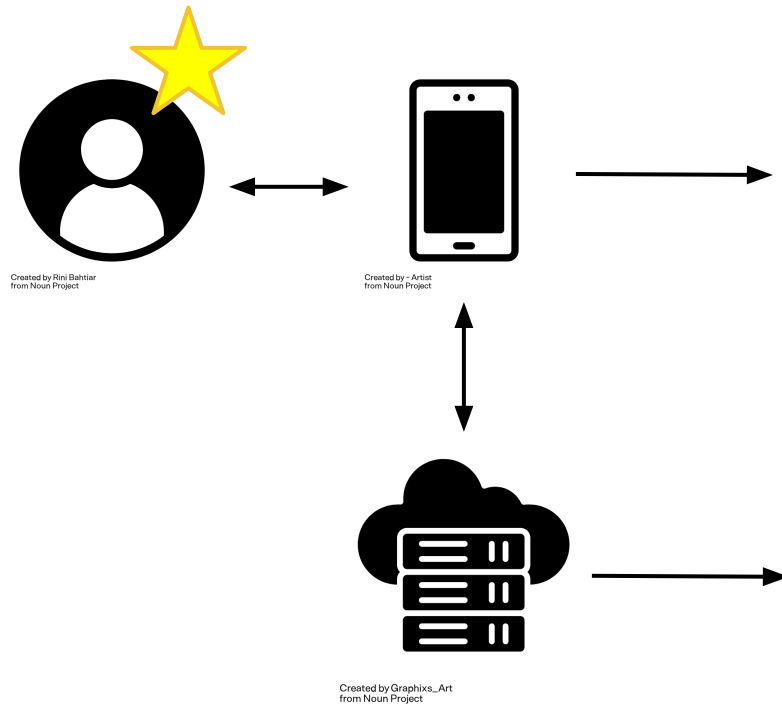


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Sustainable Farming with LiteFarm

Main objective: Empowering farmers, researchers and policy-makers



GHG Emissions

LITEFARM Dashboard

- HOME
- OVERVIEW
- SPG REPORTS
- LANDSCAPE ANALYSIS
- MULTI-FARM INSIGHTS DASHBOARD
- FARM EXPLORER

WELCOME TO THE LITEFARM DATA APP!

LiteFarm Data App is a web application that provides a user-friendly interface to visualize and study data from [LiteFarm](#).

WHAT IS LITEFARM?

LiteFarm is a free and open source farm management tool built for current and aspiring sustainable farms. It was built by farmers and researchers coordinated by the University of British Columbia to address many challenges in farm management.

WHAT IS THE APP FOR?

Our application aims at helping LiteFarm users to get access and visualize the data available in the LiteFarm database, while respecting the core principles of our [data sovereignty](#).

To enquire for access to the raw data, please contact our research team ([Hannah Wittman](#) and [Khanh Dao Duc](#)).

Objectives

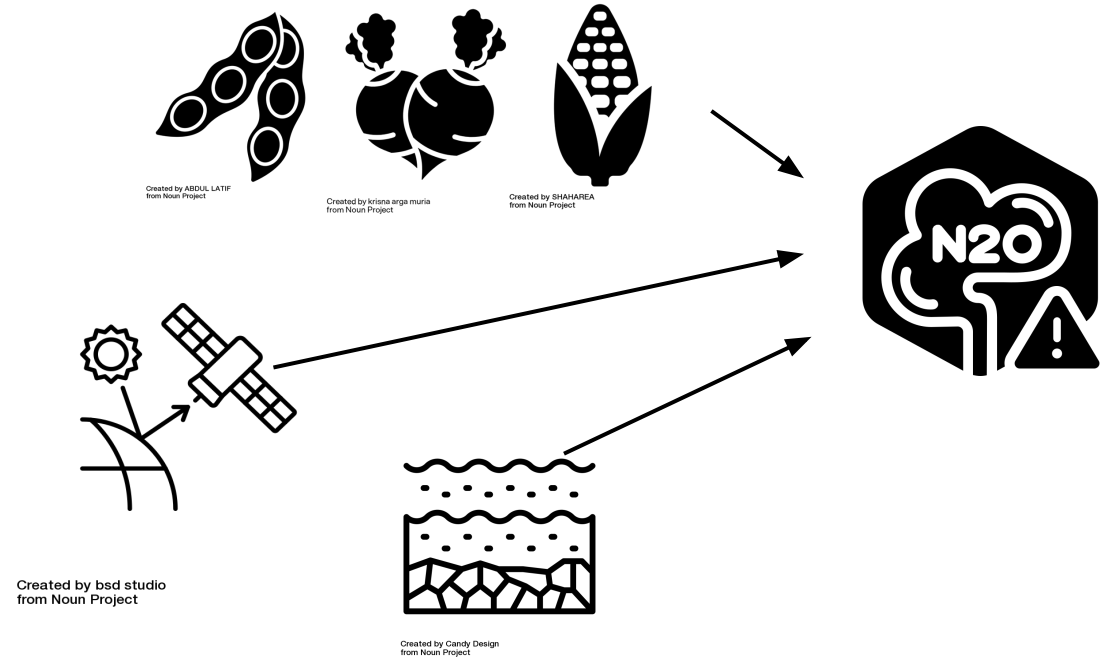
GHG Emissions Modeling

- **Confront existing models with high quality global scale data**
- **Enhance GHG Emission Modeling**

Objectives

GHG Emissions Modeling

- **Confront existing models with high quality global scale data**
 - Soil
 - Climate
 - Crops
- **Enhance GHG Emission Modeling**



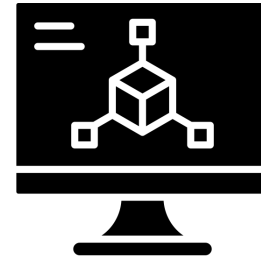
Objectives

GHG Emissions Modeling

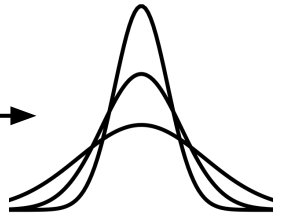
- Confront existing models with high quality global scale data
- Enhance GHG Emission Modeling
 - Investigating influencing parameters
 - Improving accuracy and robustness



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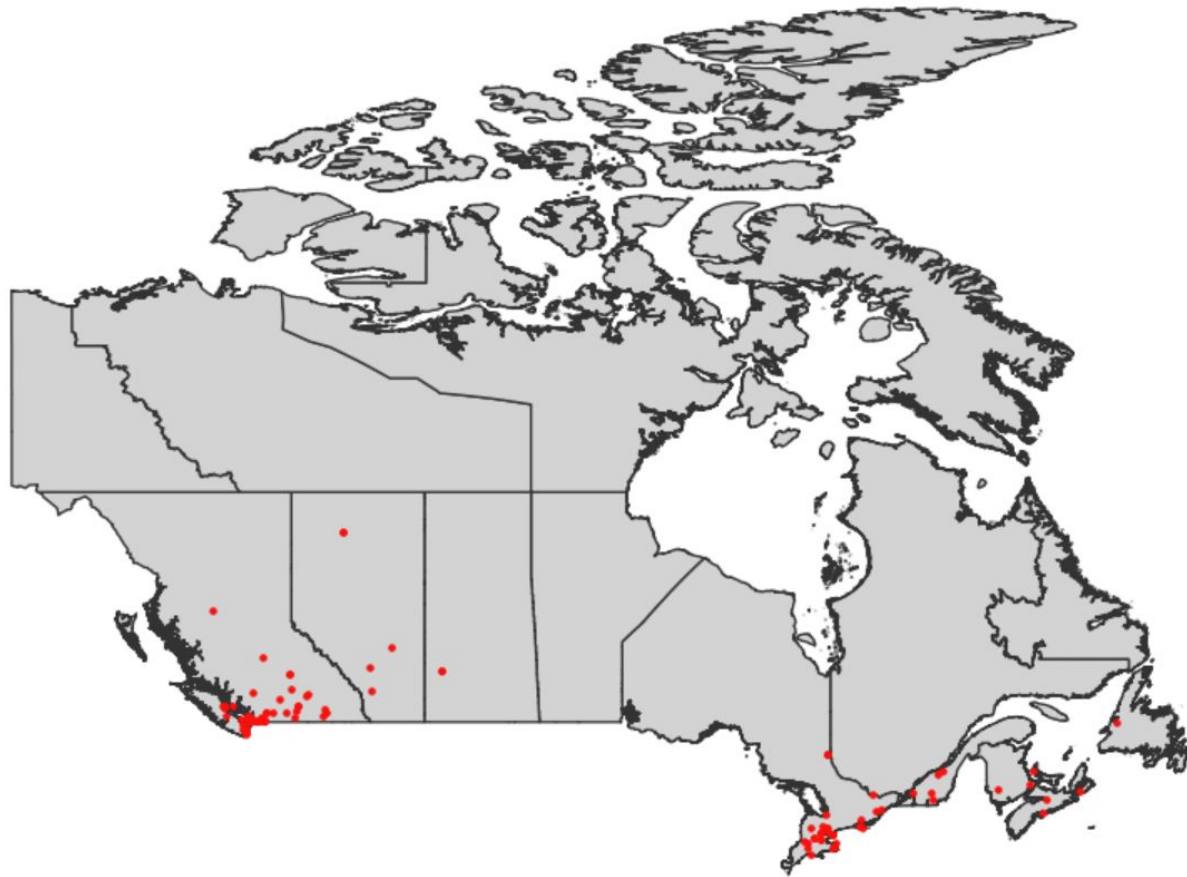


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LiteFarm Data



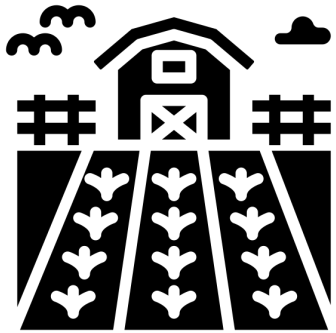
Farm Data



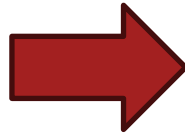
124 farms across Canada

- Farm id
- Location: lat/lon
- Area
- Crop types
- ...

LiteFarm Database



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Soil Data

Soil texture
Great group
...



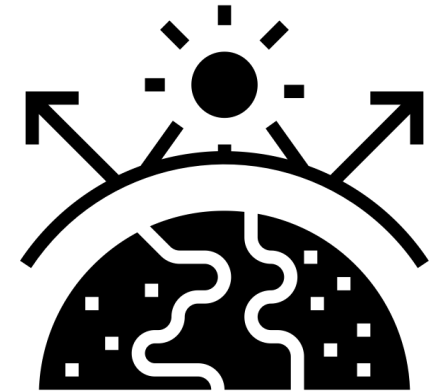
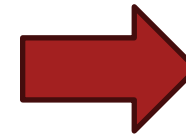
Climate Data

Precipitation
Evaporation
...



Crop Data

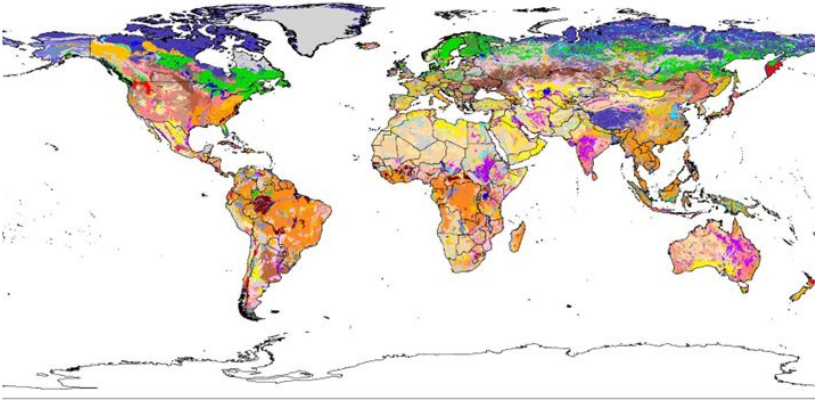
Moisture content of product
Nitrogen contents
Lifecycle
...



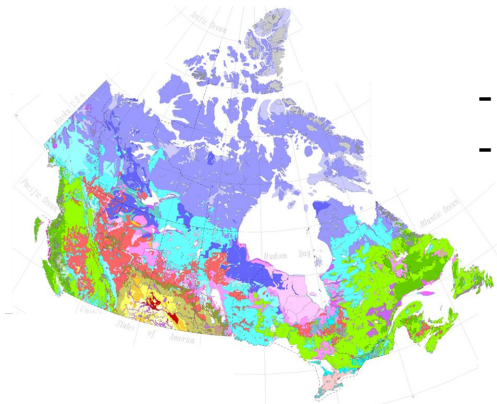
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GHG Estimation

Sources of External Data

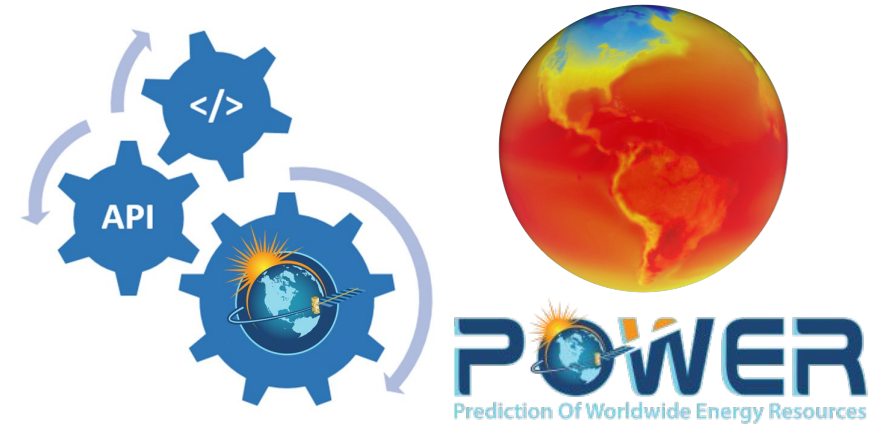


Soil data: FAO Harmonized World Soil Database

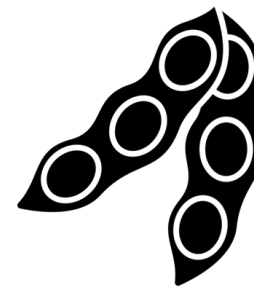


- open source
- can be downloaded

Soil data: The Soil Landscapes of Canada (SLC)



Climate data: NASA POWER Project database



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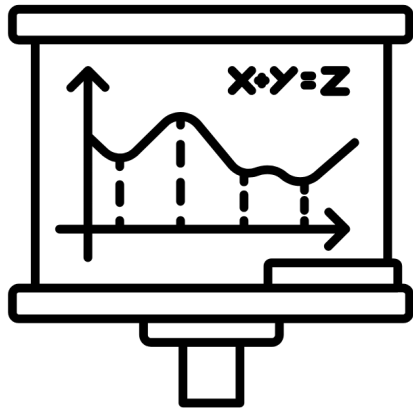
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Crop data: Peer-reviewed articles and government reports

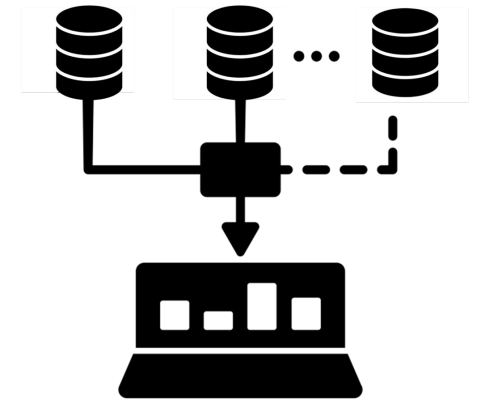
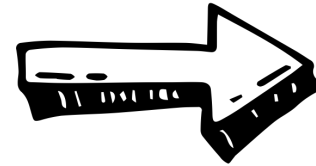
Enhanced GHG Emissions Modeling



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rate = 10%
factor = 0.5



Identify and resolve discrepancies
Existing Models vs **Python Implementation**

Hard coding → **Adaptable datasets**
Improve accuracy / Influencing parameters

Method and techniques

GHG Model

- Validating the current model
- Developing and modularizing GHG calculation

Sensitivity Analysis

- Multiple runs across farms / years, to identify key drivers of farm GHG emission

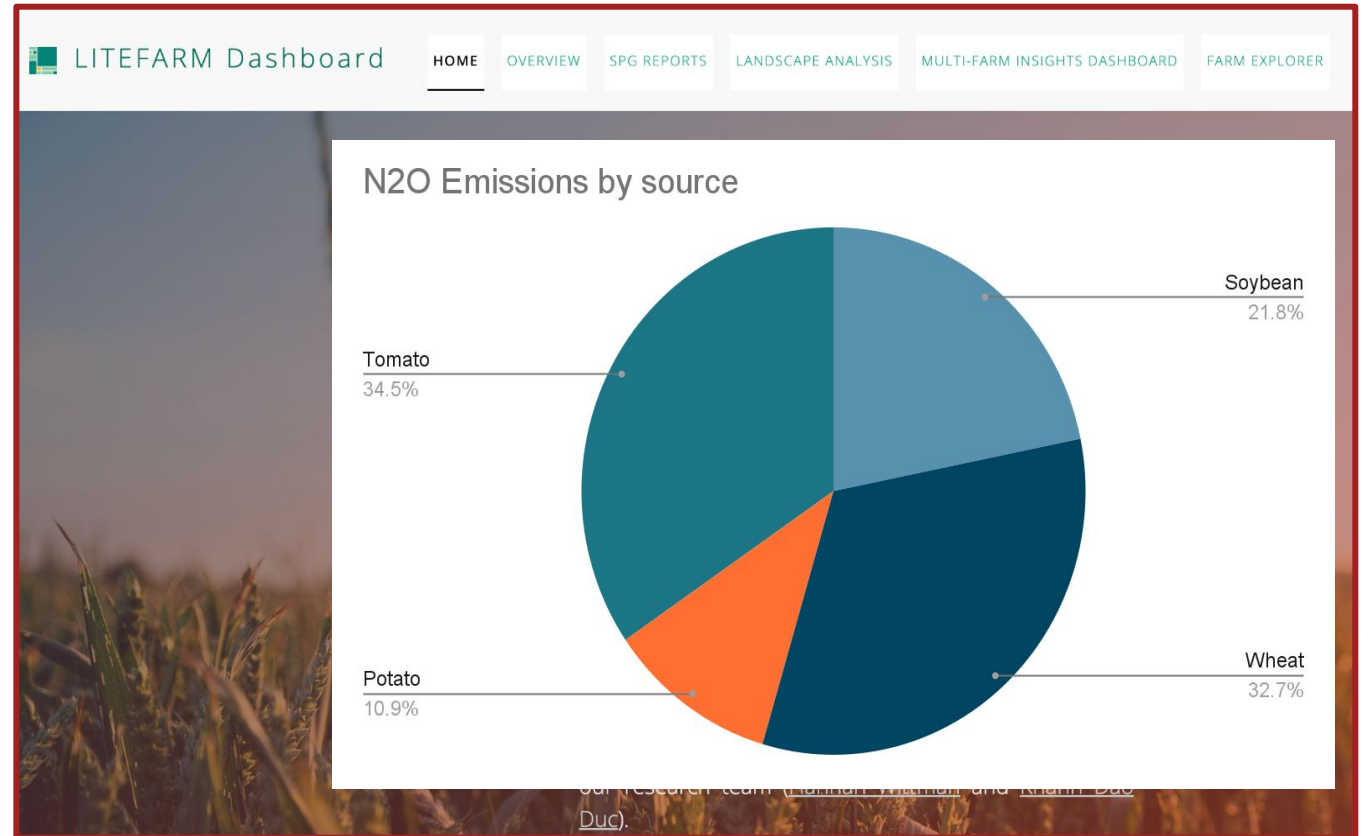
Dashboard Design

- Two new tabs: Farmer tab for farm-specific emission data; Scientist tab for result from sensitivity analysis

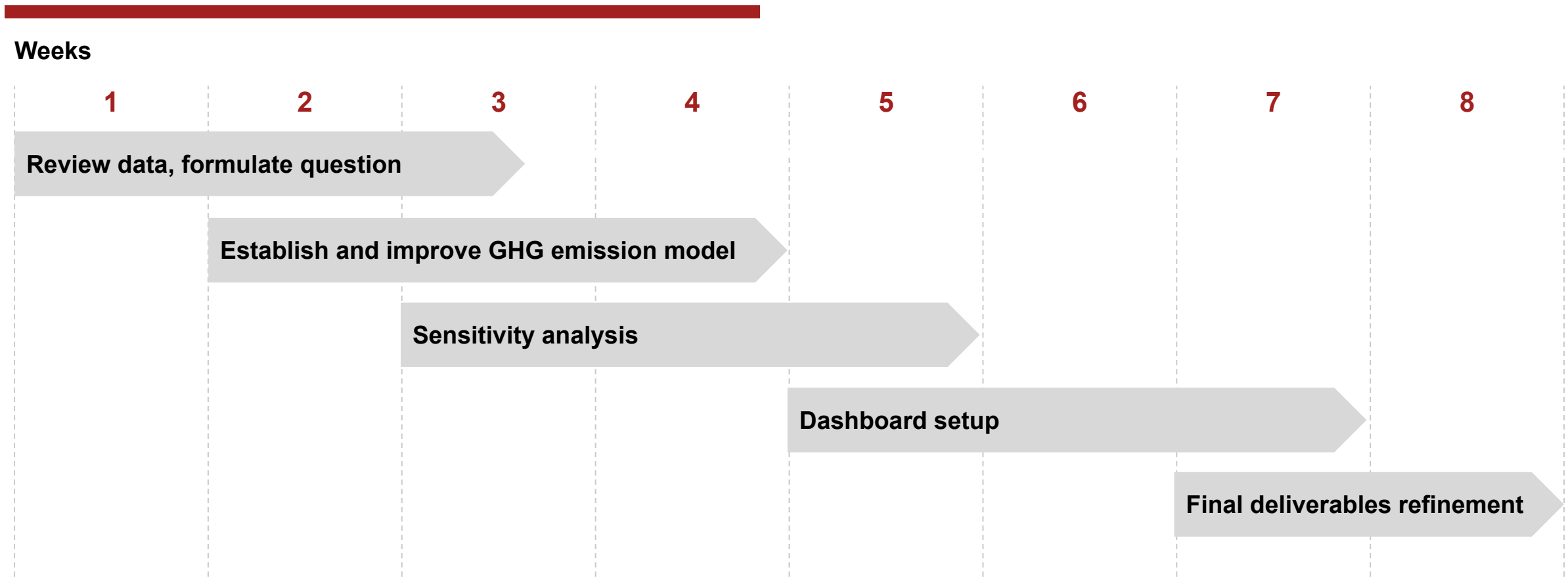
Success criteria

Success criteria

- Achieve a more precise GHG estimation model
- Allowing range input to provide more flexible calculation
- Provide output with uncertainty
- Establish Farmer and Scientist tabs on dashboard
- Implement new features with the results of sensitivity analysis and visualize influential variables for the GHG calculation



Timeline



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Q&A

Team member

- ❖ He Ma
- ❖ Hancheng Qin
- ❖ Yi Han

Mentor

- ❖ Simon Goring

Partner

- ❖ LiteFarm/UBC
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