Empowering Agriculture: Enhanced GHG Emissions Modeling

Team Introduction

Leveraging data science for a greener future

Team member

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- Hancheng Qin
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Mentor

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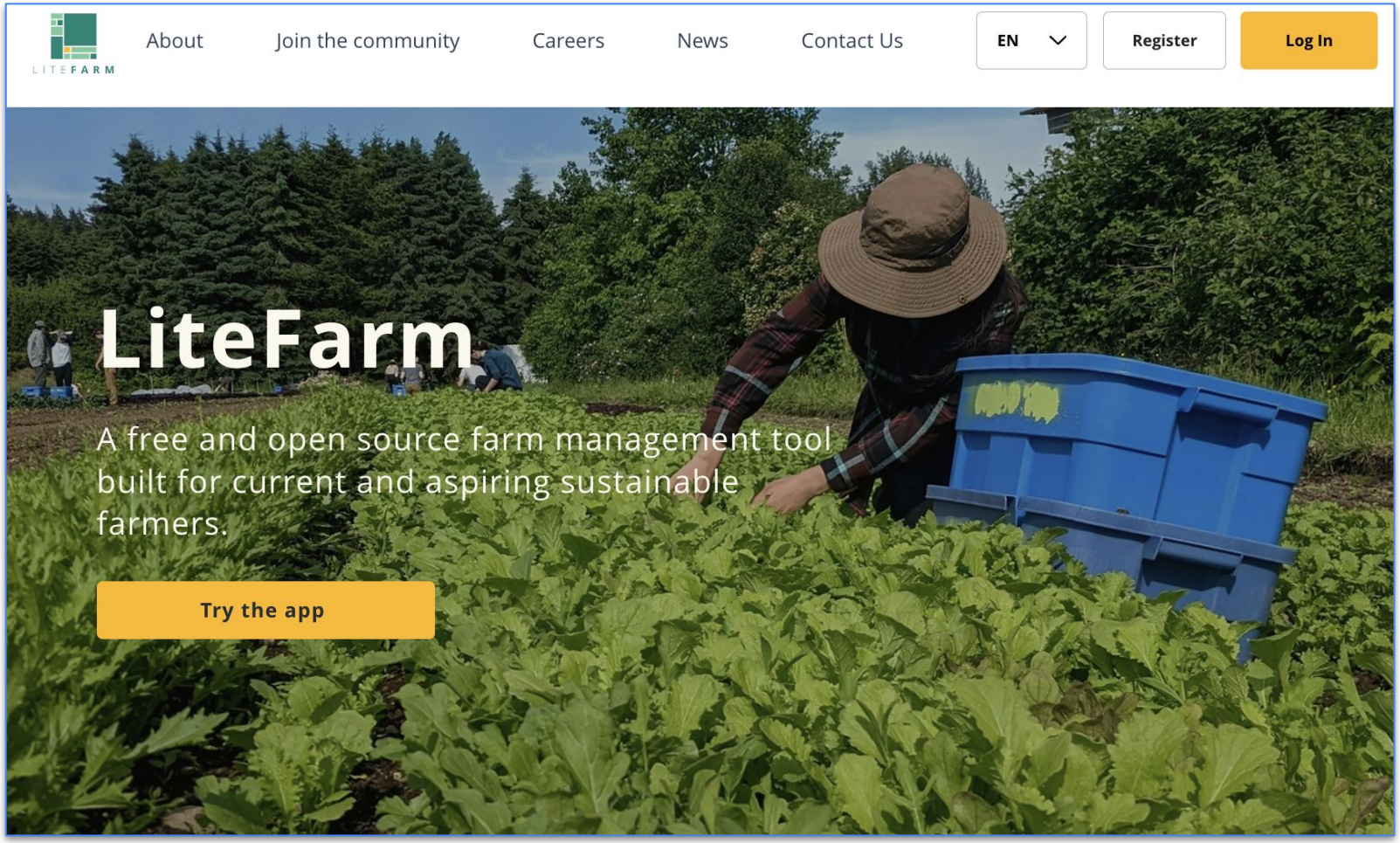
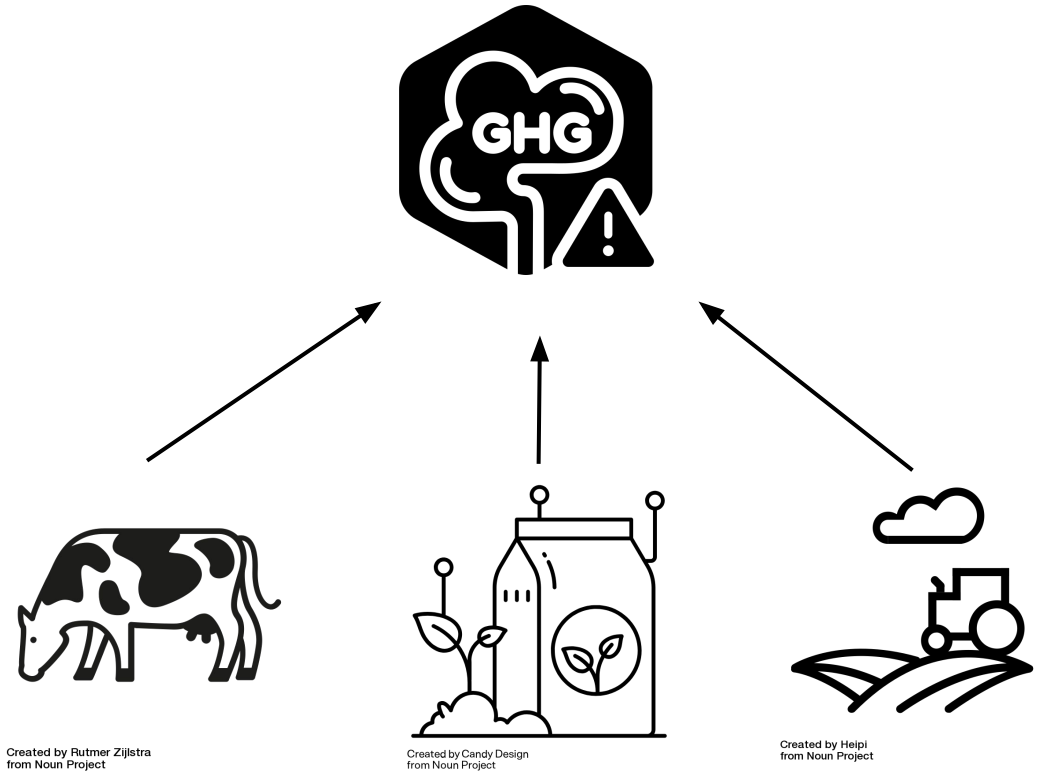
Partner

- LiteFarm/UBC
  - Dr. Khanh Dao Duc



Climate Change and GHG Emissions

Agriculture as a significant player



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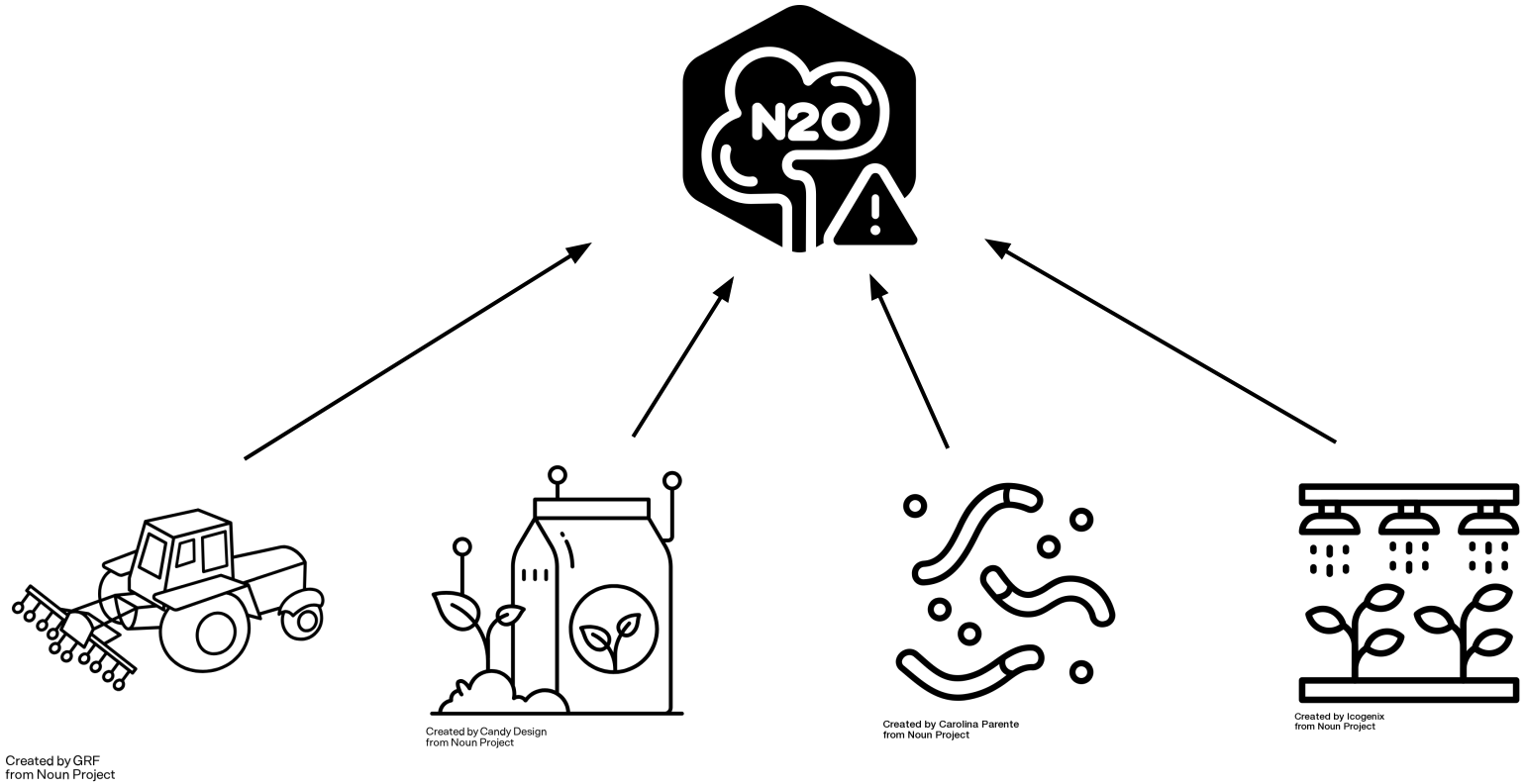
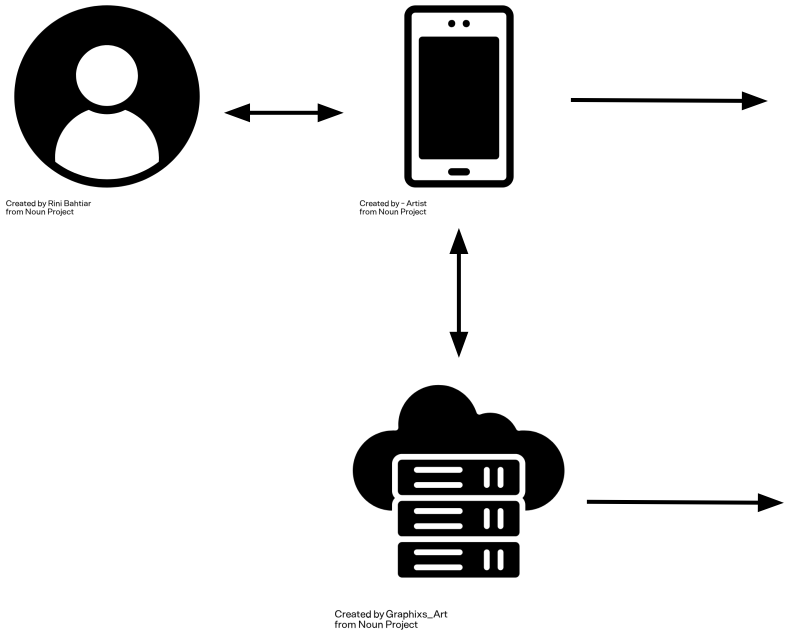
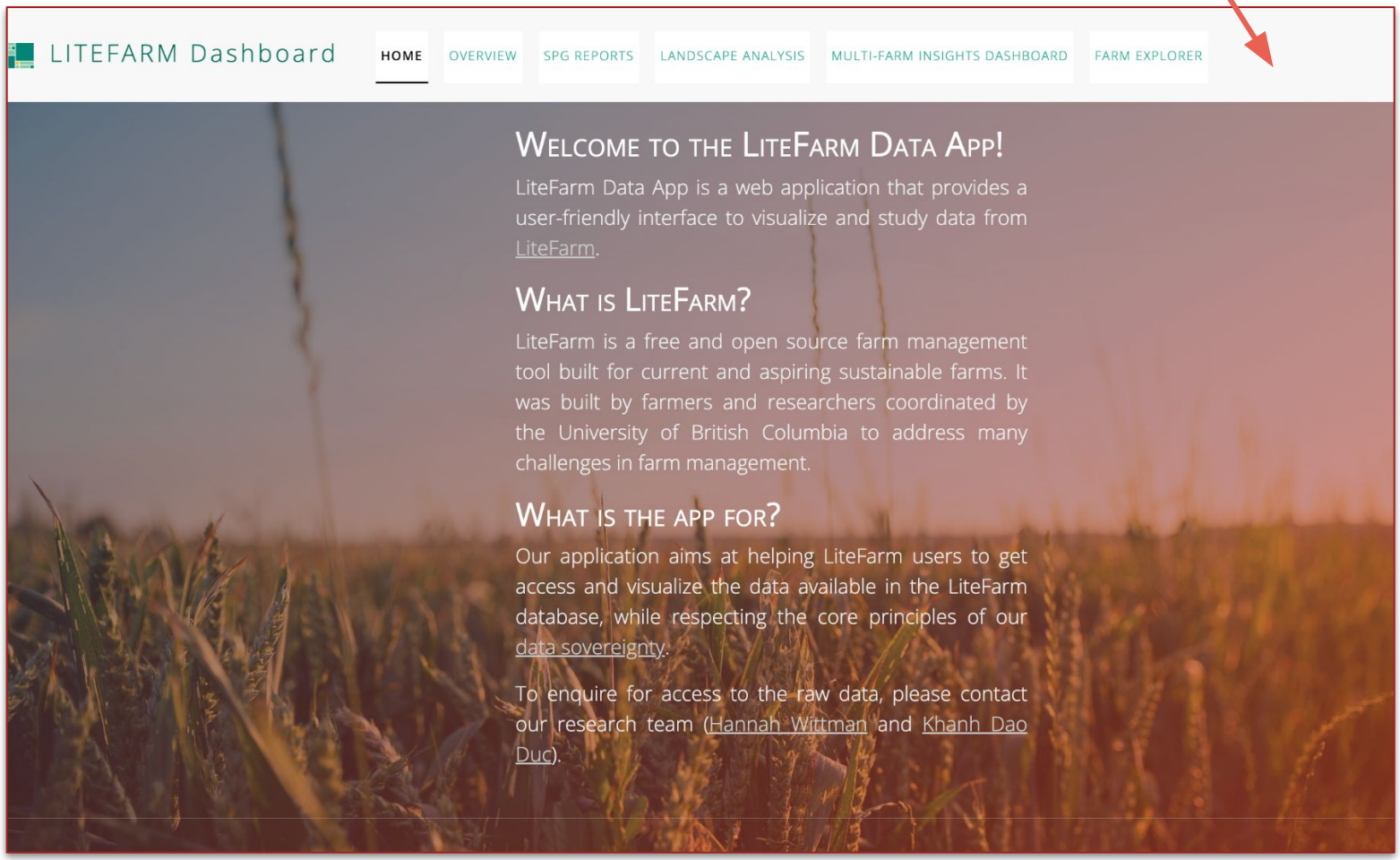


Sustainable Farming with LiteFarm

Calculating GHG Emissions: Our Critical Contribution

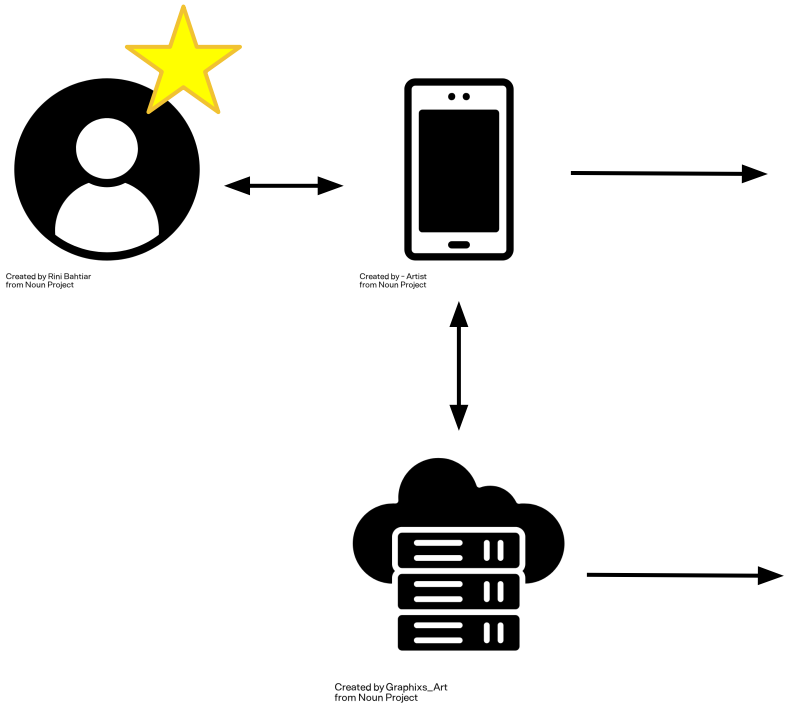


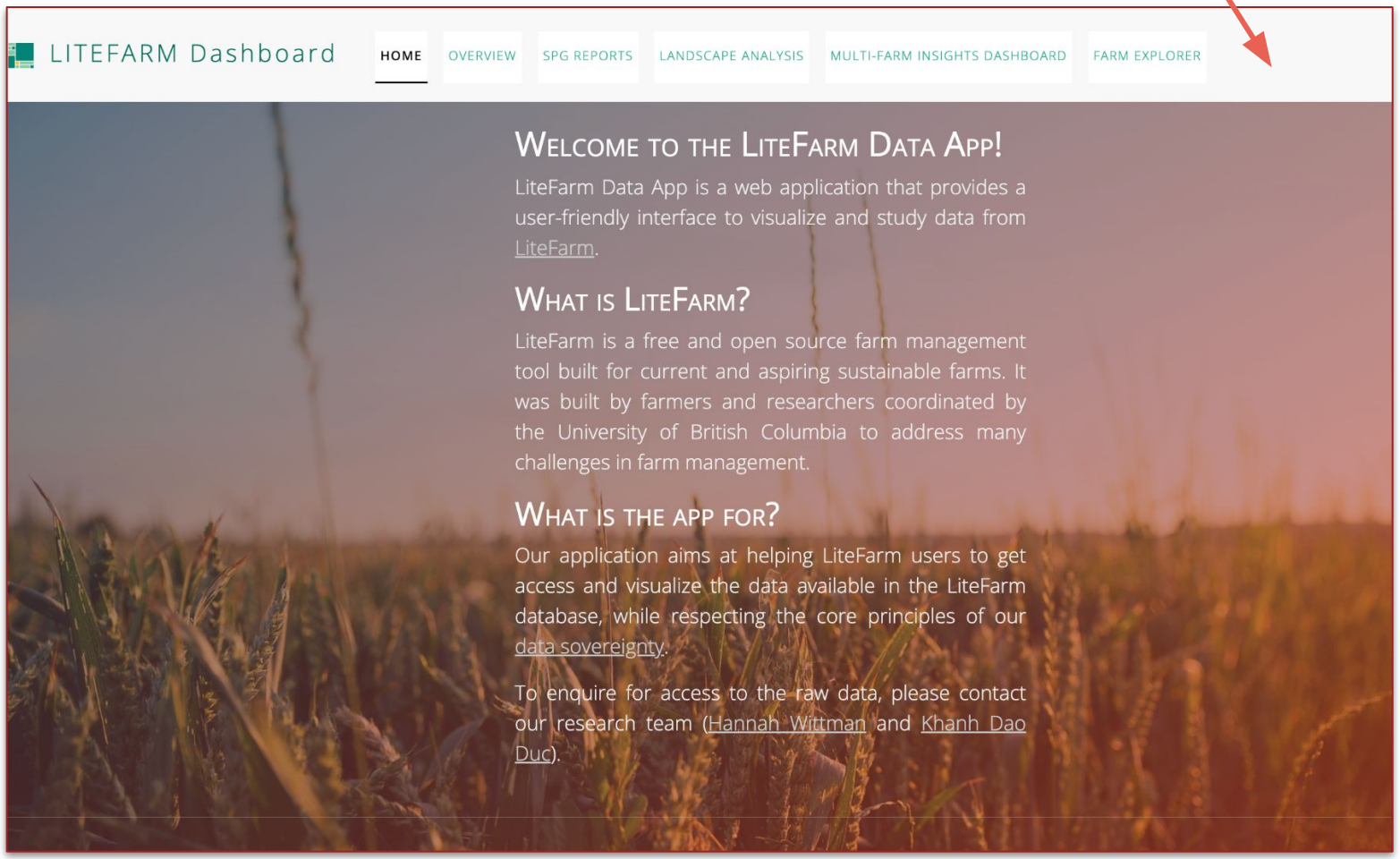
GHG Emissions



Sustainable Farming with LiteFarm

Main objective: Empowering farmers, researchers and policy-makers





Objectives

GHG Emissions Modeling

- **Confront existing models with high quality global scale data**

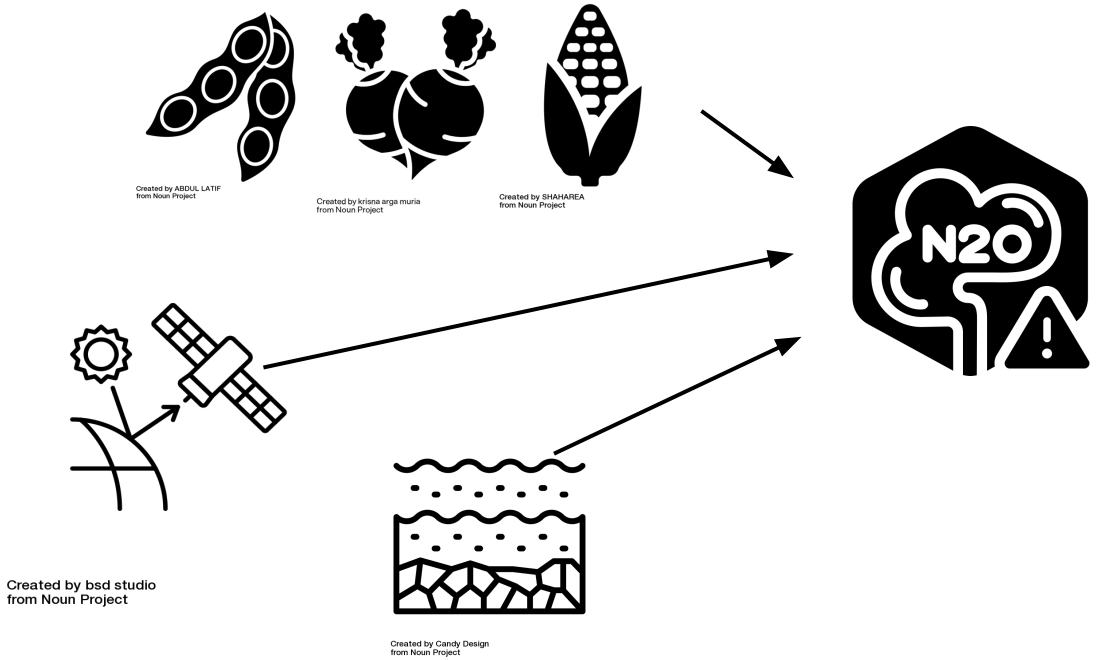
- **Enhance GHG Emission Modeling**

Objectives

GHG Emissions Modeling

- **Confront existing models with high quality global scale data**
  - Soil
  - Climate
  - Crops

- **Enhance GHG Emission Modeling**

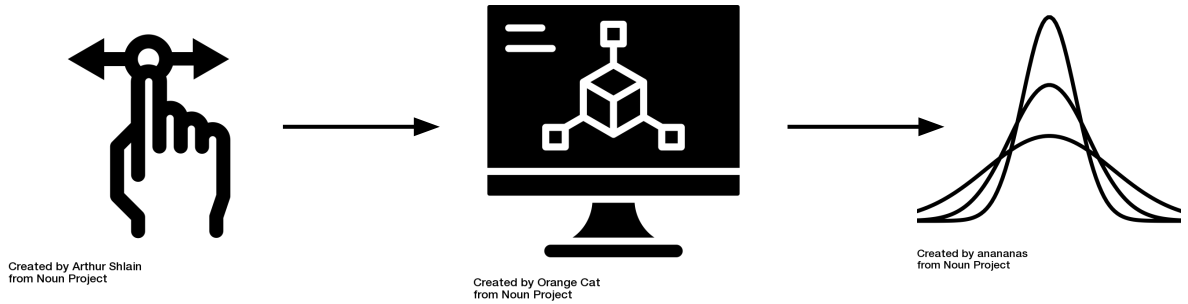


Objectives

GHG Emissions Modeling

- **Confront existing models with high quality global scale data**

- **Enhance GHG Emission Modeling**
  - Investigating influencing parameters
  - Improving accuracy and robustness



Created by Arthur Shlain from Noun Project

Created by Orange Cat from Noun Project

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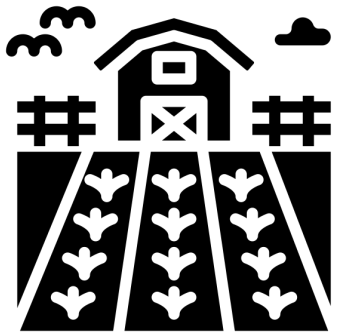
LiteFarm Data

Farm Data

124 farms across Canada

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

LiteFarm Database



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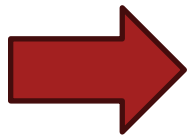
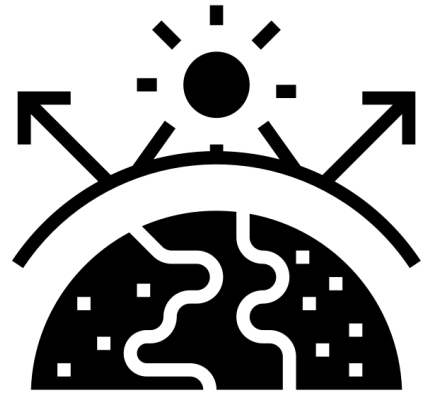
Soil Data
Soil texture
Great group
…

Climate Data
Precipitation
Evaporation
…

Crop Data
Moisture content of product
Nitrogen contents
Lifecycle
…





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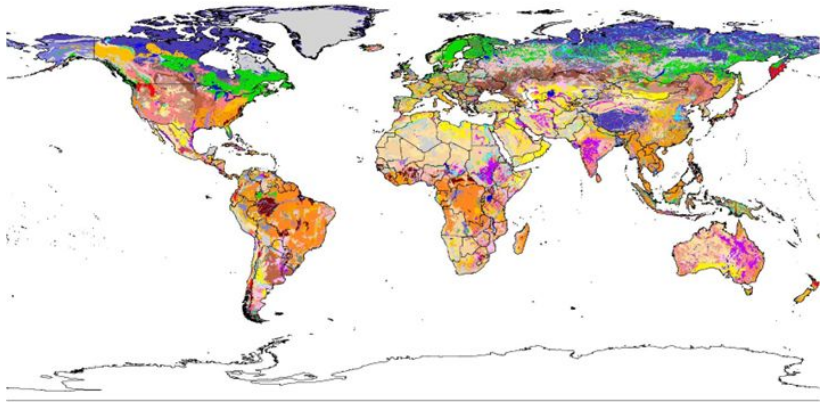
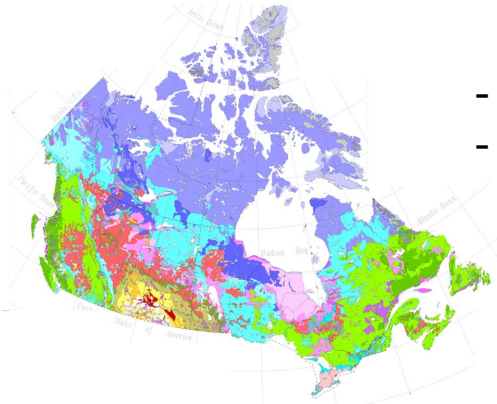
GHG Estimation

Sources of External Data

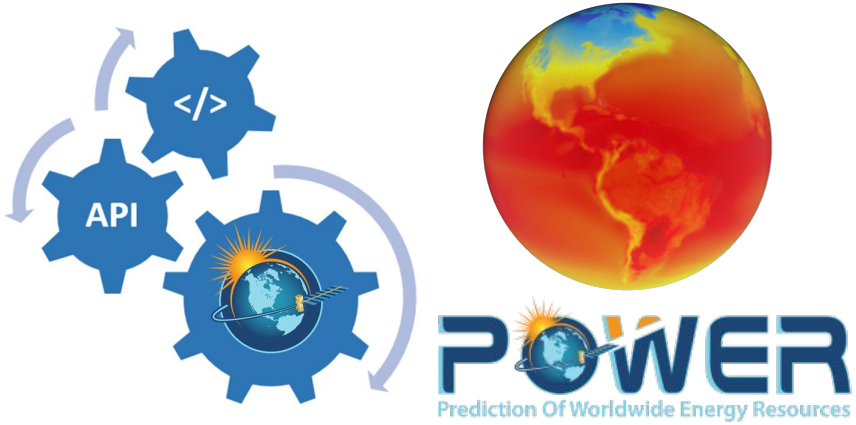


Soil data: FAO Harmonized World Soil Database



- open source
- can be downloaded

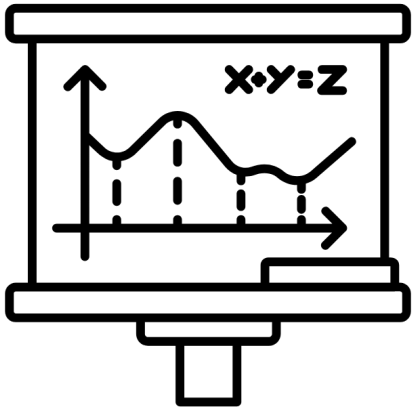
Soil data: The Soil Landscapes of Canada (SLC)



Climate data: NASA POWER Project database

Crop data: Peer-reviewed articles and government reports

Enhanced GHG Emissions Modeling



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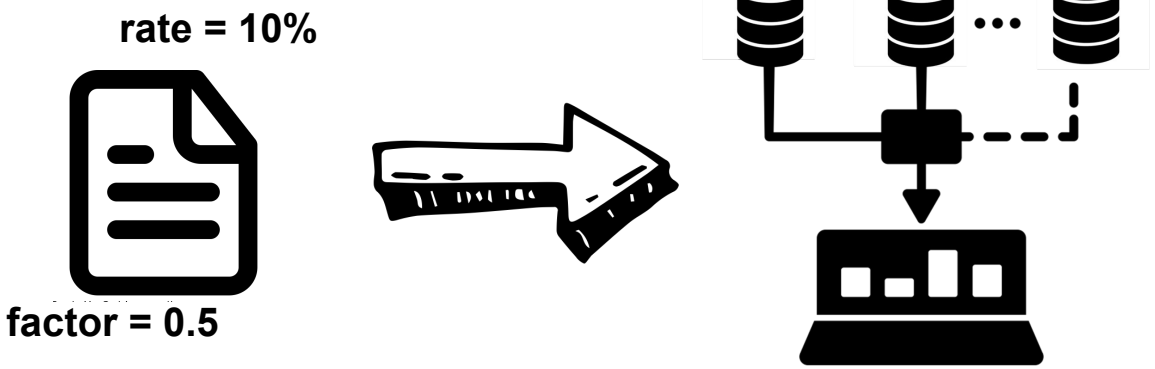


Identify and resolve discrepancies
Existing Models vs **Python Implementation**

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

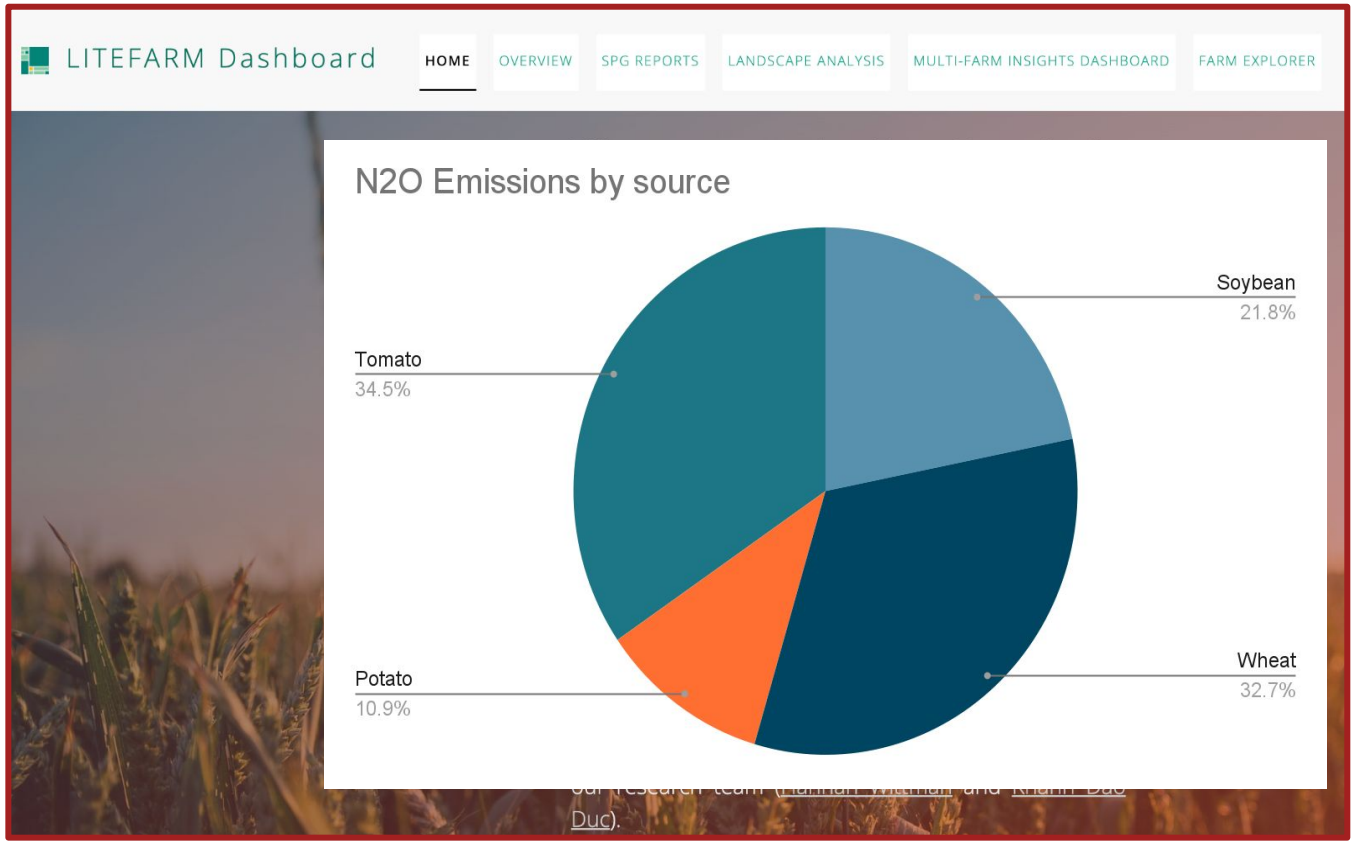
Method and techniques

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

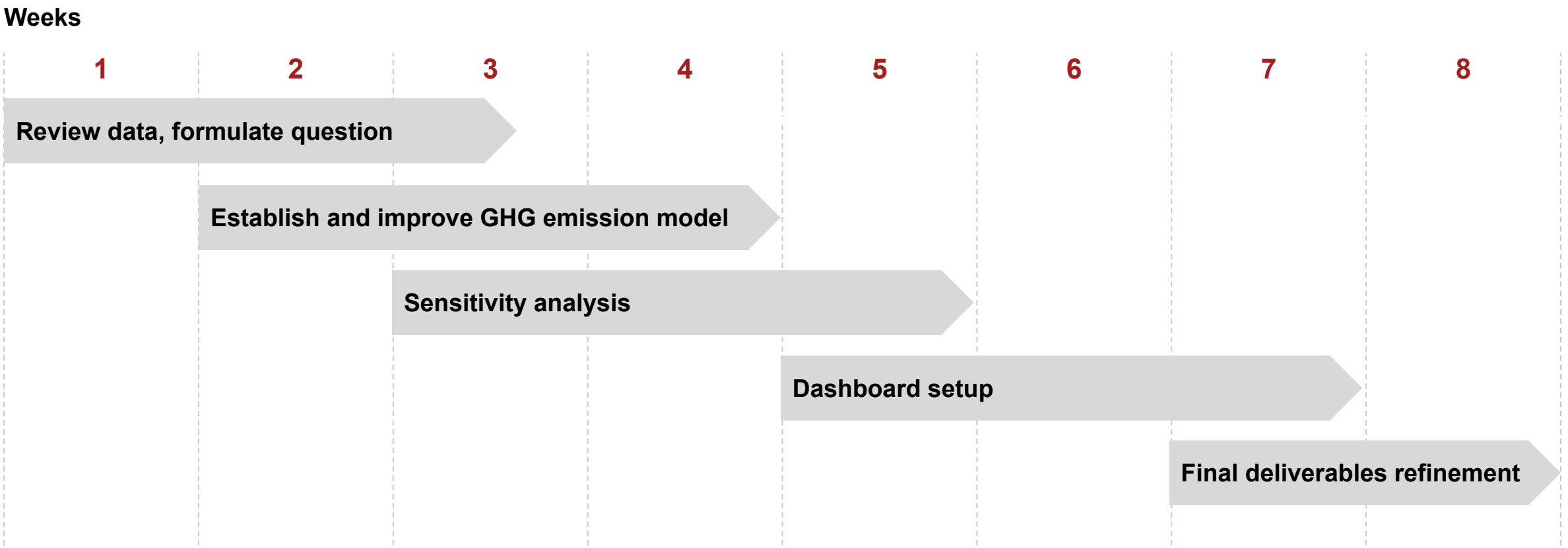
Success criteria

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


Weeks
1
2
3
4
5
6
7
8
Review data, formulate question
Establish and improve GHG emission model
Sensitivity analysis
Dashboard setup
Final deliverables refinement

Q&A

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