# ****Business Understanding Report****

## ****1. Project Context****

The agricultural sector is facing numerous challenges, including:

* **Climate Change:** Increasingly unpredictable weather patterns impacting farming.
* **Resource Optimization:** The need to efficiently use water, fertilizers, and pesticides to sustain productivity.
* **Yield Increases:** Ensuring sufficient food supply to meet growing demand.
* **Reduction of Losses:** Minimizing wastage in the production cycle.

This project aims to leverage artificial intelligence and data science to address these issues and provide actionable insights to farmers and agricultural businesses.

## ****2. Problem Statement****

Agriculture requires modern solutions to optimize resource usage and maximize yields. Farmers need personalized, data-driven recommendations to:

* Improve irrigation, fertilization, and crop selection.
* Detect and treat plant diseases effectively.

**Key Questions to Address:**

1. How can artificial intelligence help farmers make better decisions?
2. What are the main factors impacting crop yield, and how can they be optimized?
3. How can plant diseases be detected early to reduce pesticide usage and improve crop health?

## ****3. Business Objectives and Data Science Objectives****

### ****Business Objectives:****

1. Increase agricultural yields through personalized recommendations.
2. Reduce resource wastage (water, fertilizers, pesticides) while maintaining sustainability.
3. Mitigate plant diseases to improve crop health.
4. Optimize agricultural services by grouping farmers and land based on specific characteristics to improve efficiency and productivity.

### ****Data Science Objectives:****

1. **Develop Recommendation Systems:**
   * Build predictive models for irrigation, fertilization, and crop selection based on soil, climate, and historical yield data.
2. **Plant Disease Detection:**
   * Create image recognition models to classify plant diseases and suggest treatments with minimal pesticide use.
3. **Resource Optimization Models:**
   * Predict optimal resource usage based on environmental and yield data.
4. Develop a clustering model to segment farmers and land using data on farm size, crops, inputs, location, and climate.

## ****4. Project Methodology (TDSP)****

This project follows the **Team Data Science Process (TDSP)** methodology to ensure efficient, systematic, and collaborative execution. The process includes the following key phases:

1. **Business Understanding:** Define the problem, objectives, and stakeholders.
2. **Data Acquisition and Exploration:** Collect and analyze soil, climate, yield, and plant disease data.
3. **Modeling:** Develop predictive models for recommendations and disease detection.
4. **Deployment:** Build a platform for users to access recommendations and visualizations.

## ****5. Team Structure and Roles****

The team **LiberData** consists of six members, with each person assigned a specific role :

**Project Manager:**

Coordinates the overall project, ensures alignment with business objectives, and tracks progress across TDSP phases.

**Data Engineer:**

Responsible for data collection, cleaning, and preparation. Handles integration of soil, climate, and yield datasets.

**Data Scientist (2 Members):**

\* Develops machine learning models for disease detection and recommendation systems.

\* Works on data segmentation and optimization algorithms.

**Software Developer (2 Members):** Builds the web/mobile application, including dashboards for visualizing recommendations and analytics.

## ****6. Stakeholders****

### ****Primary Stakeholders:****

* **Farmers:** Direct beneficiaries of the recommendations to improve their yields and reduce costs.
* **Agricultural Businesses:** Interested in land segmentation and resource optimization for improved efficiency.
* **Environmental Agencies:** Concerned with sustainable practices in agriculture.

### ****Secondary Stakeholders:****

* Technology providers, policymakers, and academic researchers focusing on agricultural innovation.

## ****7. Success Metrics****

To measure the success of this project, the following metrics will be monitored:

* **Increase in Yield:** Percentage improvement in crop productivity.
* **Reduction in Pesticide Use:** Reduction in liters of pesticides per hectare.
* **Model Accuracy:** Achievement of over 95% accuracy in plant disease detection.
* **Adoption Rates:** Number of farmers using the platform.

## ****8. Conclusion****

This project is a step toward revolutionizing agriculture By addressing critical agricultural challenges and empowering farmers with data-driven insights, it aims to create a sustainable and efficient agricultural ecosystem.