



Horizon Europe Brokerage Event
Cluster 6 Calls 2025
27 May 2025 | Warsaw, Poland

Smart Greenhouse: Image-Based AI and Robotic Orchard Fruit Production Optimization

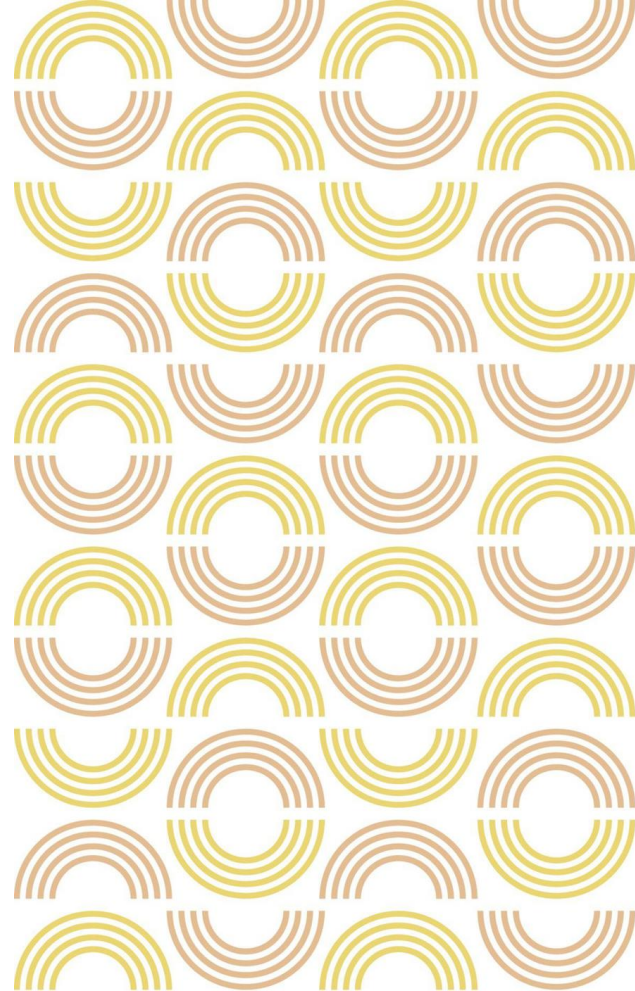
L Cihan Gulmez

Çalık Company



This project has received funding from the European Union's Horizon Europe research and innovation programme, under Grant Agreement No 101059839

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Current Landscape and Challenges in Orchard Fruit Greenhouse Farming

Limitations of traditional greenhouse management

- Reliance on manual observation → human error & inefficiency
- Resource waste (water, fertilizers, energy)
- Delayed intervention due to lack of real-time monitoring
- High labor demands & operational costs

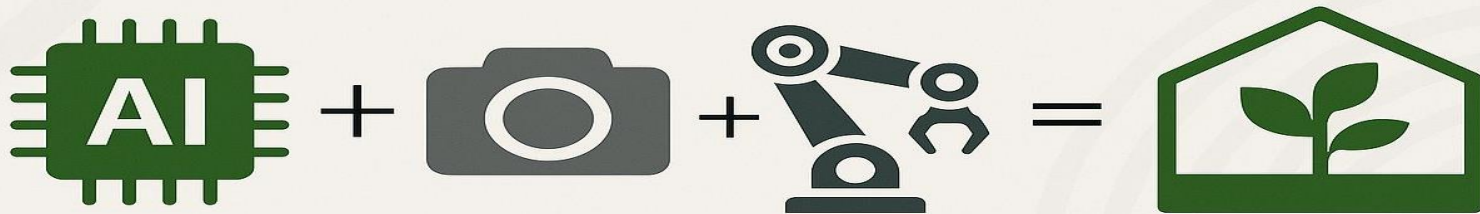
Factors leading to yield and quality losses

- **Diseases & pests:** Uncontrolled outbreaks
- **Suboptimal growing conditions:** Inconsistent light, humidity, temperature
- **Poor resource management:** Over/under-irrigation, nutrient imbalance
- Excessive chemical/water usage → soil degradation & pollution
- High carbon footprint from energy-intensive practices
- Growing regulatory & consumer pressure for eco-friendly farming

Growing concerns regarding sustainability and environmental impact

- **Precision agriculture:** IoT, sensors, AI-driven analytics
- **Automation:** Robotics for labor reduction
- **Sustainable practices:** Closed-loop systems, renewable energy integration

The potential of technology in the agricultural sector



Why a Smart Greenhouse? Our Project's Solution

The transformative potential of image analytics, deep learning, and robotics in agriculture.

Our project's core aim: To enhance efficiency, elevate product quality, and adopt sustainable production methods.

Our vision: To create a more precise, efficient, and eco-friendly model for orchard fruit greenhouse farming using technology.

Our Key Objectives



Establish a continuous and high-resolution imaging system.



Develop deep learning models for accurate detection of diseases, pests, maturity, and growth.



Create a central data platform integrating environmental and image data.



Develop machine learning algorithms to optimize processes like irrigation, fertilization, and climate control.



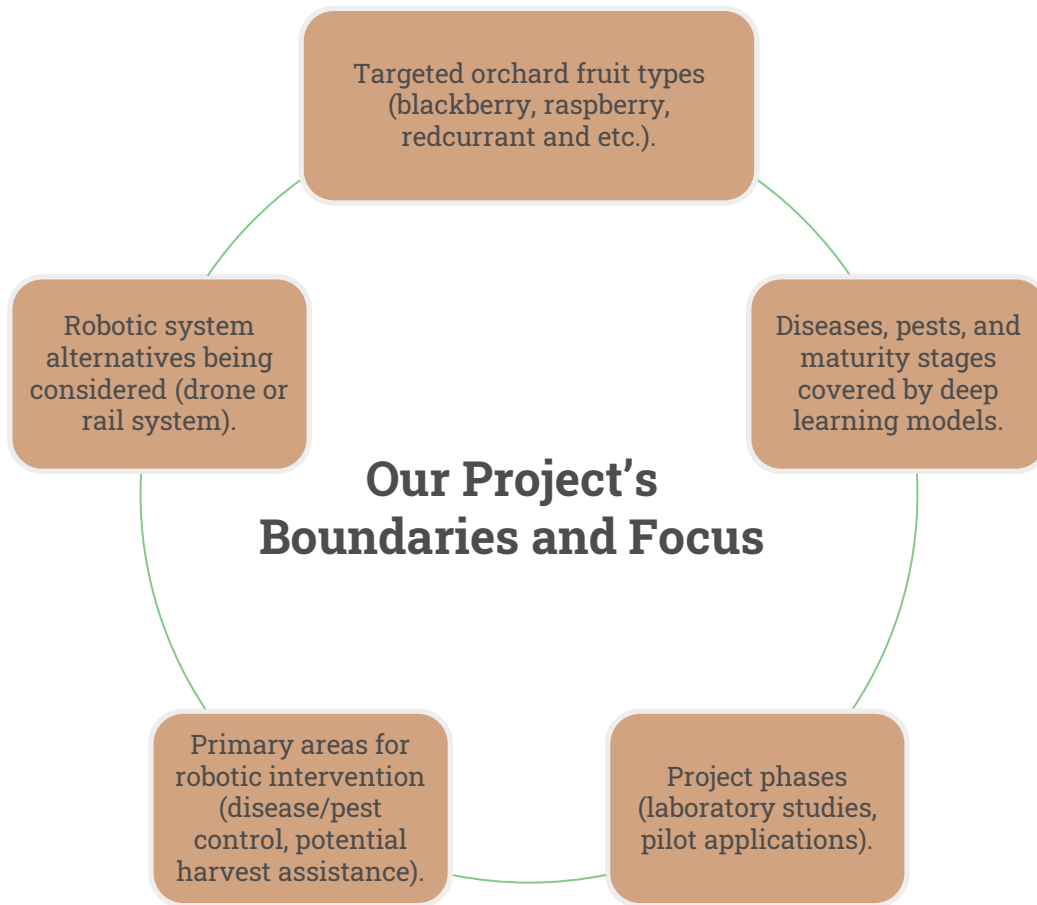
Integrate AI decisions with robotic systems for targeted intervention and harvest support.



Define metrics to measure and evaluate system performance.



Produce scientific and technical outputs.



How We Will Achieve It?

Imaging Systems:
(Camera specifications, drone/rail system details)



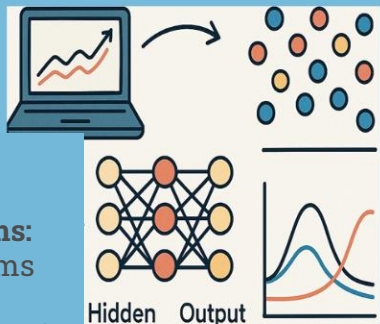
Deep Learning:
(Types of models to be used, training dataset creation)



Data Management Platform:
(Data collection, storage, integration)



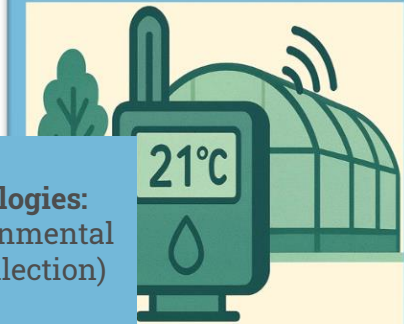
Machine Learning Algorithms:
(Algorithms for optimization)



Robotic Systems:
(Robot functionalities, control mechanisms)



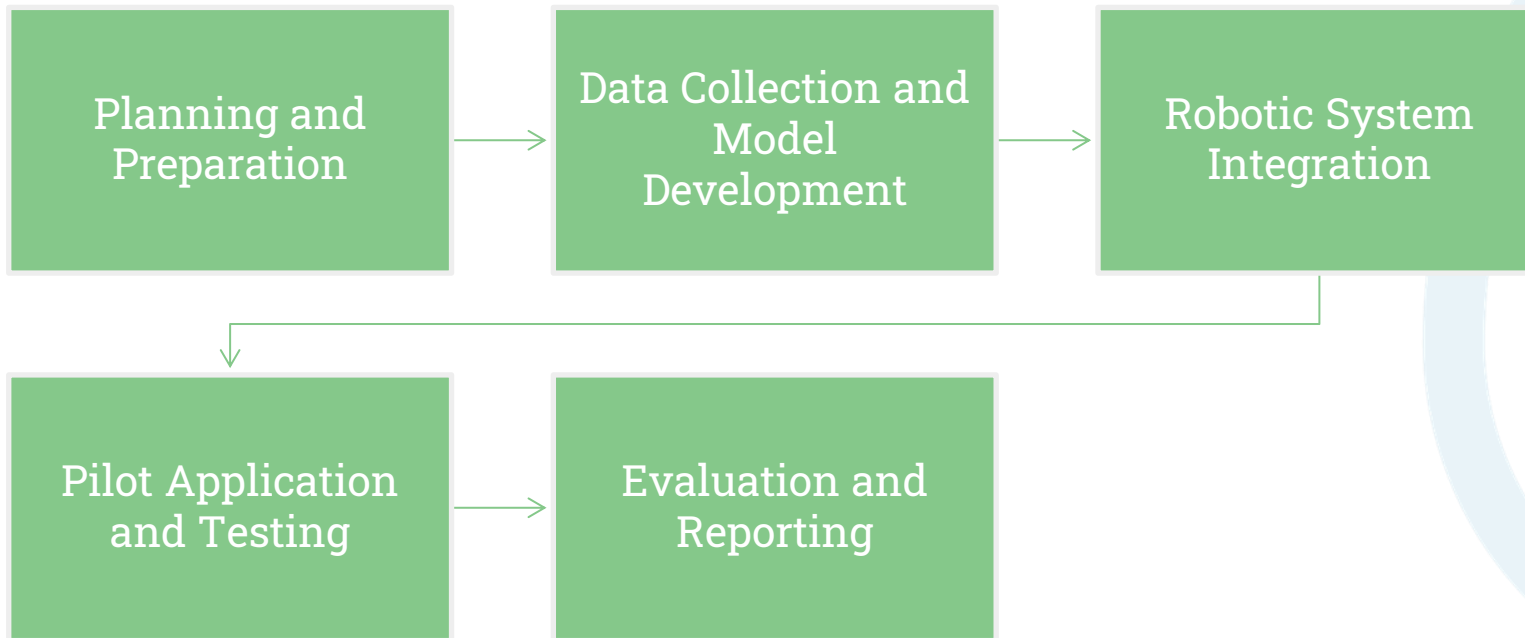
Sensor Technologies:
(Environmental data collection)



The Potential Impact of Our Project

- » Reduced product losses (through early detection).
- » Increased product quality (optimal harvest timing).
- » Significant resource savings (data-driven management).
- » Environmentally friendly production (reduced chemical use via targeted intervention).
- » Increased labor efficiency and decreased costs.
- » Development of an innovative smart agriculture model.
- » Contributions to the scientific and technological fields.

Project Phases and Schedule (Summary)



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Thank You!