1. **Introduction**

Agriculture is undergoing a rapid transformation driven by Artificial Intelligence (AI), Robotics, Internet of Things (IoT), and data-driven technologies. To prepare students and researchers for this new era and to address real-world agricultural challenges, it is proposed to establish an AI & Robotics Lab for Smart Agriculture at the university level. This laboratory will serve as a center for teaching, research, innovation, and industry collaboration, focusing on modern, sustainable, and technology-enabled farming practices.

2. **Vision**

To create a state-of-the-art academic and research facility that integrates AI, robotics, and smart technologies for solving agricultural problems, improving productivity, sustainability, and farmer decision-making.

3. **Objectives**

- To provide hands-on training in AI, robotics, and smart agriculture technologies.
- To promote interdisciplinary research involving engineering, data science, and agriculture.
- To develop low-cost, scalable smart farming solutions suitable for Indian conditions.
- To support UG, PG, and PhD projects, startups, and patent-oriented research.
- To strengthen collaboration with industry and government bodies in agritech.

4. **Scope of the Laboratory**

The proposed laboratory will support academic teaching, laboratory courses, funded research projects, prototype and proof-of-concept development, skill development programs, faculty training, consultancy, and collaborative projects with agritech industries and government agencies.

5. **Laboratory**

Structure AI & Data

Analytics Module

This module will focus on intelligent data-driven decision-making. Activities will include crop yield prediction, plant disease and pest detection using image processing, weather-based advisory systems, market price forecasting, and analysis of GIS and satellite data.

Robotics & Automation Module

This module will focus on automation and autonomous systems for agriculture. It will include agricultural mobile robots, robotic arms for harvesting and handling, autonomous navigation systems, obstacle avoidance algorithms, and development using Robot Operating System (ROS).

IoT & Sensor Module

This module will enable real-time monitoring of agricultural parameters. It will include soil moisture, temperature, humidity, pH, and NPK sensors, smart irrigation systems, greenhouse automation, wireless communication technologies such as LoRa and GSM, and

cloud-based monitoring dashboards.

Smart Farming Simulation Module

This module will provide near-real-field experience. It will include a mini greenhouse or polyhouse setup, small test plots for experimentation, access to drone and satellite image datasets, and digital farm and crop simulation tools.

Key Technology Areas
- Artificial Intelligence and Machine Learning.
- Computer Vision for agricultural applications.
- Agricultural robotics and automation.
- Precision and digital farming technologies.
- Climate-smart and sustainable agriculture.
- IoT-based agricultural systems.

Sample Student and Research Projects
- AI-based crop disease detection using leaf images.
- Autonomous weeding and spraying robot.
- Smart irrigation system using soil data and AI.
- Drone-based crop health monitoring.
- Machine learning-based fertilizer recommendation system.
- Crop yield prediction using soil and weather data.

Infrastructure and Resource Requirements

Hardware

High-performance computing systems with GPU support. Robotics platforms including mobile robots and robotic arms. IoT and

sensor kits for soil and environment monitoring.

Drone for aerial data collection (recommended).

Software

Python and MATLAB.

TensorFlow, PyTorch, OpenCV. Robot Operating System (ROS).

GIS and data visualization tools.

Human Resources

Faculty expertise in AI, data science, and robotics. Agriculture or soil science expert in an advisory role. Dedicated lab engineer or technical assistant.

Indicative Budget

AI and computing infrastructure: ₹25–45 lakhs.

Robotics platforms and automation systems: ₹15–25 lakhs.

Sensors and IoT systems: ₹5–10 lakhs.

Drone and imaging tools: ₹8–15 lakhs.

Software, cloud services, and laboratory setup: ₹5–8 lakhs.

Total estimated budget: ₹50 lakhs to ₹1.2 crore.

The laboratory can be implemented in phases based on funding availability.

Funding and Support Opportunities

AICTE schemes such as MODROB and

IDEA Lab. DST and SERB research

grants.

ICAR and Ministry of Agriculture

programs. State government

innovation funds.

CSR support from agritech and industrial organizations.

Expected Outcomes

Development of industry-ready graduates with

strong practical skills. High-quality research

publications and funded projects.

Indigenous and scalable smart agriculture

technologies. Enhanced institutional

reputation and academic visibility.

Strong collaboration between the university, industry, and farming community.