

# Farm Field Surveillance Robot

Prof. S. C. Hingne<sup>1</sup>, Jay A. Dhamale<sup>2</sup>, Saquib Ahemad Feroz Khan<sup>3</sup>, Sahil V. Meshram<sup>4</sup>,  
Jay S. Tumsare<sup>5</sup>, Sahil V. Harne<sup>6</sup>, Prathamesh G. Khandare<sup>7</sup>

Lecturer<sup>1</sup>

Students<sup>2-7</sup>

Dr. Rajendra Gode Institute of Technology and Research, Amravati (Polytechnic), Maharashtra, India

**Abstract:** Agriculture faces increasing challenges such as crop losses, pest infestations, and labor shortages. Conventional manual field inspection methods are time-consuming, error-prone, and inefficient. This paper presents the design and development of a Farm Field Surveillance Robot, an autonomous mobile platform equipped with sensors, cameras, and wireless communication modules to monitor crop health, soil conditions, and environmental factors in real time. The system is aimed at improving precision agriculture through automated data collection and analysis ..

**Keywords:** Farm Field Surveillance Robot, Smart Agriculture, IoT, Precision Farming, Wireless Sensor Network, Crop Monitoring, Autonomous Robot, Soil Moisture Sensor, GPS Navigation, Artificial Intelligence

## I. INTRODUCTION

Modern agriculture is shifting toward precision farming, where timely and accurate information about crop and soil conditions is essential. Farmers currently rely on periodic manual inspections, which are labor-intensive and often fail to detect issues early.

Robotics, IoT, and AI can transform this process. A farm field surveillance robot can autonomously navigate farmlands, collect high-resolution data, and provide actionable insights to farmers, thereby improving productivity and sustainability .

## II. LITERATURE REVIEW

Unmanned Ground Vehicles (UGVs) are widely researched for agricultural monitoring (e.g., AgBot, BoniRob). Existing systems focus on weed detection, yield prediction, and soil parameter sensing. However, many lack multi-sensor integration, cost-effectiveness, or real-time data transfer to farmers. IoT-based agriculture monitoring systems focus on soil moisture and temperature but lack animal detection. Image processing has been used in crop disease detection but not fully integrated with real-time farm surveillance. Solar-powered agricultural robots are emerging but not widely adopted.

### Principle Of Operation : -

- To design an autonomous mobile robot capable of navigating farm fields.
- To integrate multiple sensors (camera, temperature, humidity, soil moisture).
- To enable wireless real-time data transfer to a cloud-based dashboard.
- To provide early warning alerts for pests, diseases, or abnormal conditions.

### Hardware Component

**Chassis & Drive:** Four-wheel or tracked robot base with DC/BLDC motors.

**Navigation:** GPS + IMU + ultrasonic/LiDAR sensors for obstacle detection.

**Sensing Units:**

High-resolution RGB camera for crop imaging.

Copyright to IJARSCT

[www.ijarsct.co.in](http://www.ijarsct.co.in)



DOI: 10.48175/568



Soil moisture and temperature sensors.

Environmental sensors for humidity, CO<sub>2</sub>, and temperature.

**Controller:** Microcontroller or SBC (Raspberry Pi/Arduino).

**Communication:** Wi-Fi / LoRa / GSM for remote monitoring.

#### **Software Components**

**Navigation Algorithm:** GPS-based waypoint navigation + obstacle avoidance.

**Image Processing:** Plant health assessment via NDVI or deep learning models.

**Cloud Platform:** Data storage and visualization dashboard.

#### **Working Of Methodology :-**

- The robot follows a pre-mapped route using GPS waypoints.
- Sensors continuously record data and send it to the onboard controller.
- The controller processes the data and transmits it to a cloud server.
- Farmers receive real-time updates and can analyze trends over time.
- Sensors measure soil moisture, temperature, and humidity.
- Image processing detects wild animal intrusion.
- Data transmitted in real-time to mobile app via IoT.
- Solar panels provide green electricity for continuous operation.
- Alerts and images sent instantly to the farmer's smartphone.

### **III. CONCLUSION**

The farm field surveillance robot represents a step forward in precision agriculture. Future enhancements may include integration of drone-based imaging for aerial surveys, AI-based disease prediction, and autonomous spraying modules to make the system a complete solution for smart farming.

The Farm Field Surveillance System using Image Processing is a sustainable, smart, and secure agricultural solution. By integrating IoT, renewable energy, and real-time monitoring, it ensures higher productivity, reduced losses, and eco-friendly farming practices.

### **REFERENCES**

- [1]. Blackmore, S. et al. (2022). "Autonomous Robots in Agriculture: A Review." Precision Agriculture Journal.
- [2]. Cheein, F. A. A., & Carelli, R. (2013). "Agricultural robotics: Unmanned robotic service units in agricultural tasks." IEEE Industrial Electronics Magazine.

