# AGRI NEXUS

AGRI

# Department Vision and Mission

**VISION**

- To foster academic excellence by imparting knowledge in Agricultural Engineering to meet the ever-growing needs of the society.

- To provide quality education to produce agricultural engineers with social responsibility.

**MISSION**

- To excel in the thrust areas of agricultural engineering to identify and solve the real-world problems.

- To create a learner-centric environment by upgrading knowledge and skills to cater the needs and challenges of the society.

**PROGRAMME EDUCATIONAL OBJECTIVES (PEO)**

The graduates of Agricultural Engineering will be

- **PEO1: Core Competency:** Successful professional with core competency and inter-disciplinary skills to satisfy the Industrial needs.

- **PEO2: Research, Innovation and Life-long Learning:** Capable of identifying technological requirements for the society and providing innovative solutions to real time problems.

- **PEO3: Ethics, Human values and Entrepreneurship**: Able to demonstrate ethical practices and managerial skills through continuous learning

**PROGRAMME SPECIFIC OUTCOMES (PSO)**

The students of Agricultural Engineering will be able to

- **PSO1:** Design, analyze and apply the knowledge gained on agricultural machinery, tools, implements and production technologies to increase crop production, improve land use, soil nutrient and conserve resources like water, fertilizer and energy.

- **PSO2:** Apply the comprehensive knowledge of engineering properties of agricultural products for upgrading the unit operation and developing innovative process, value-added products, and advanced engineering technologies to meet the challenges in agriculture.

# INDEX

# Development of an IoT Enabled Gas Analyzer for Real-Time Environmental Monitoring

K. Pradeep Kumar, Anushree V , Manish Mahalik D , Nithiya R

Abstract

An IoT-enabled gas analyzer integrated with a mobile application for real-time environmental monitoring. The system employs advanced sensors to continuously measure pollutants such as $SO_2$, $CO_2$, CO, $NO_2$, and $O_2$, along with temperature and humidity levels. Sensor data is wirelessly transmitted to a mobile application, where it is processed and displayed through dashboards showing Air Quality Index (AQI), temperature trends, and location-based alerts. The application provides instant notifications in hazardous conditions, cloud integration for historical analytics, GPS-based location tracking, and health recommendations. Validated at Technology Readiness Level 4, the project supports SDG 3 (Good Health and Well-Being), SDG 11 (Sustainable Cities and Communities), and SDG 13 (Climate Action). With real-time applications such as continuous gas detection, smart alerts, and community-level air monitoring, this innovation enhances environmental safety and proactive decision-making for sustainable development.

*Keywords: IoT, Gas Analyzer, Air Quality Monitoring, Environmental Safety, Real-Time Alerts*

# Ergonomic Design of a Tapioca Stem Cutter for Labor Reduction

M. Prasanth, Adithya B Dhivaker S, Rajkumar S

Abstract

Tapioca (Manihot esculenta) is a staple crop in tropical regions, and propagation requires cutting stems into uniform sections. Manual cutting is labor-intensive and time-consuming, leading to inefficiency. To overcome this challenge, a specialized tapioca stem cutting machine was designed with precision blades and automation features to ensure uniformity and safety. The system allows adjustable cutting parameters to accommodate variations in stem thickness and length. The innovation, validated at Technology Readiness Level 4, aligns with SDG 8 (Decent Work and Economic Growth) and SDG 12 (Responsible Consumption and Production), by reducing manual effort, saving time, and promoting sustainable agricultural practices. This system minimizes labor cost, improves farmer efficiency, and makes tapioca cultivation more viable in rural communities.

*Keywords: Tapioca, Stem Cutter, Ergonomics, Labor Reduction, Sustainable Farming*

## Organic Sapling Pots & Products

V. Chandramohan, Gowtham R, Gowri Shankar M, Vignesh S

Abstract

Developing organic sapling pots and eco-friendly products to replace plastic and concrete materials commonly used in agriculture and festivals. By using agricultural by-products such as paddy husks, coconut coir, waste grains, and clay soil, biodegradable sapling pots and organic idols are fabricated. These alternatives help reduce plastic pollution and water contamination caused by chemical idols. Validated at Technology Readiness Level 3, the project aligns with SDG 12 (Responsible Consumption and Production) and SDG 15 (Life on Land). With real-time applications in nurseries, home gardening, and eco-friendly festivals, this innovation promotes sustainable farming and environmental protection.

*Keywords: Organic Pots, Biodegradable, Sustainable Farming, Eco-friendly Products, Waste Utilization*

## Design & Development of Rhizome Planter

P. Sandhiyadevi, Mowneesh S, Sanjay R, Kamali V

Abstract

Rhizomes such as ginger and turmeric require specialized planting methods for improved yield. This project involves the design of a rhizome planter that ensures deep and narrow sowing, enhanced aeration, and better root health. The planter is simple to operate and improves harvesting efficiency by reducing manual labor. Validated at Technology Readiness Level 3, the project supports SDG 2 (Zero Hunger) and SDG 8 (Decent Work and Economic Growth). With real-time applications in ginger, turmeric, and bamboo cultivation, the innovation contributes to improved plant health, increased yield, and sustainable agricultural mechanization.

*Keywords: Rhizome Planter, Ginger, Turmeric, Mechanization, Yield Improvement*

## BANANA PSEUDOSTEM CHAFF CUTTER

S. Vanisha, Deepak S, Elamathi V ,Vinothitha

Abstract

Banana cultivation generates 60–80 tons per hectare of pseudostem residues, which, if left unprocessed, decompose slowly and cause waste accumulation in fields. This project introduces a banana pseudostem chaff cutter that enhances decomposition efficiency by 40–50% compared to natural breakdown. By chopping pseudostems into smaller pieces, microbial activity increases, accelerating composting and nutrient release back into the soil. This not only improves soil fertility but also retains moisture, reduces residue management problems, and supports organic farming. The

equipment can also be used for livestock feed preparation, providing farmers with an additional utility. Validated at Technology Readiness Level 4, the project contributes to SDG 12 (Responsible Consumption and Production) and SDG 15 (Life on Land). With its low cost, ease of use, and impact on sustainable farming practices, the chaff cutter enables better waste management and improved productivity for banana growers.

*Keywords: Banana, Pseudostem, Chaff Cutter, Composting, Soil Fertility*

## DESIGN AND DEVELOPMENT OF A MODIFIED TURMERIC HARVESTER

R. Sridharshini, Indhumathi T, Meenaa K , Vidhya E

Abstract

Turmeric is an important spice crop widely cultivated in India, but its traditional harvesting methods are labor-intensive, time-consuming, and often result in crop damage. This project focuses on the design and development of a modified turmeric harvester to overcome these challenges. The harvester incorporates a specialized digging and lifting mechanism that minimizes breakage of rhizomes while ensuring efficient extraction. It improves soil handling, reduces drudgery, and increases overall harvesting speed. Validated at Technology Readiness Level 4, the harvester supports SDG 2 (Zero Hunger) and SDG 8 (Decent Work and Economic Growth). Its real-time applications include small- and medium-scale turmeric farms, where mechanized harvesting can significantly reduce labor costs and improve the quality of harvested produce. By integrating simple yet effective design elements, this innovation empowers farmers with a cost-effective, efficient, and sustainable solution for turmeric harvesting.

*Keywords: Turmeric, Harvester, Mechanization, Yield Improvement, Sustainable Farming*

## REVOLUTIONIZING URBAN AGRICULTURE THROUGH VERTICAL FARMING

D. Ambika, Priyadharshini S , Sasi Kumar S , Sujin P, Swetha Bala B

Abstract

Urbanization has reduced cultivable land, creating challenges for sustainable food production. This project presents vertical farming as a modern agricultural method that allows crops to be grown in stacked layers, often in controlled indoor environments. By using hydroponics and aeroponics, vertical farming maximizes productivity in minimal space while ensuring year-round cultivation. The system is equipped with automated irrigation, nutrient delivery, and precision monitoring for real-time adjustments, improving efficiency and reducing wastage. Validated at Technology Readiness Level 3, the project supports SDG 11 (Sustainable Cities and Communities) and SDG 13 (Climate

Action). Real-time applications include urban food production, terrace gardens, and small-scale indoor farms. With its potential to minimize transportation costs and reduce dependence on large farmland, vertical farming ensures fresh, safe, and sustainable food production in cities. The project highlights a practical step toward meeting rising food demands while preserving natural resources.

*Keywords: Vertical Farming, Urban Agriculture, Hydroponics, Controlled Environment, Sustainable Cities*

## INNOVATIVE BANANA BUNCH HARVESTING MECHANISM

M. Prasanth, Dhanush Priyan S , Jamunadevi S S, Ninil , Preethi S

Abstract

Banana cultivation plays a significant role in rural livelihoods, but traditional harvesting is labor-intensive, time-consuming, and prone to fruit damage. This project introduces an innovative banana bunch harvesting mechanism that integrates cutting, gripping, and lifting systems along with a telescopic arm capable of 360° rotation. The design ensures efficient handling of heavy bunches while minimizing physical strain on workers. By reducing dependency on manual labor, the system enhances safety, productivity, and overall profitability for farmers. Validated at Technology Readiness Level 4, the project supports SDG 8 (Decent Work and Economic Growth) and SDG 12 (Responsible Consumption and Production). Its real-time applications include small and medium banana farms where harvesting efficiency directly impacts farmer income. By combining affordability, ease of use, and innovative design, this tool provides a sustainable solution to improve banana post-harvest management.

Keywords: Banana, Harvesting Mechanism, Telescopic Arm, Labor Reduction, Post-Harvest Management

## DESIGN AND FABRICATION OF TREE CLIMBER BY USING SPRING MECHANISM

V. Chandramohan, Balakaviya B, Indhuja P 'Vijay M

Abstract

Tree climbing for coconut harvesting and maintenance is physically demanding and often risky. This project develops a spring-assisted tree climber that reduces human effort while improving safety and efficiency. The mechanism uses a spring system combined with gear attachments to provide controlled upward and downward movement along the trunk. It stabilizes the climber, prevents slips, and reduces strain during ascent. Designed for coconut trees, the system also supports pruning and

regular maintenance. Validated at Technology Readiness Level 4, it contributes to SDG 8 (Decent Work and Economic Growth) and SDG 15 (Life on Land). Real-time applications include coconut harvesting, tree pruning, and safe access for agricultural workers. By reducing drudgery and accidents, this innovation offers a low-cost, user-friendly solution that supports sustainable farming and farmer welfare.

*Keywords: Tree Climber, Coconut Harvesting, Ergonomics, Safety, Sustainable Farming*

## DESIGN AND FABRICATION OF INDIRECT TRIPLE ACTION SOLAR DRYER USING GLASS AND COPPER

V. Chandramohan, Gokul P ,Praveena S ,  Rithika K V , Subash S

Abstract

Traditional drying methods for agricultural products are highly weather-dependent and inconsistent, leading to post-harvest losses and reduced product quality. This project focuses on an indirect triple-action solar dryer fabricated with glass and copper materials for enhanced efficiency. The design incorporates three strategically positioned air inlets to maximize airflow and heat transfer, improving drying uniformity and reducing moisture content more effectively. The system demonstrated 30–40% improvement in drying performance compared to conventional models. Validated at Technology Readiness Level 3, the project supports SDG 7 (Affordable and Clean Energy) and SDG 12 (Responsible Consumption and Production). Real-time applications include drying spices, fruits, and vegetables, thereby extending shelf life and reducing food wastage. By promoting renewable energy and sustainable post-harvest technologies, this innovation ensures cost-effective, eco-friendly drying solutions for farmers and small-scale industries.

*Keywords: Solar Dryer, Post-Harvest Technology, Renewable Energy, Food Preservation, Sustainable Farming*

## HYDROPONIC AUTOMATION SYSTEM

V. Chandramohan, Hemadharshini V , Maria Mirza J, Priyanga G

Abstract

Hydroponics offers a soil-less alternative to conventional agriculture, but manual monitoring of nutrients and environmental parameters often limits efficiency. This project develops an automated hydroponic system that integrates pH, temperature, and nutrient sensors with microcontroller-based automation. The system continuously monitors solution quality and adjusts nutrient delivery in real time. It also includes automated irrigation and lighting to optimize plant growth conditions. Validated at Technology Readiness Level 4, the project supports SDG 9 (Industry, Innovation, and

Infrastructure) and SDG 12 (Responsible Consumption and Production). Real-time applications include precision farming, greenhouse cultivation, and urban agriculture systems. By minimizing water use, reducing labor requirements, and ensuring consistent nutrient supply, the project demonstrates a sustainable, scalable, and eco-friendly method to improve food security and agricultural resilience in resource-limited regions.

*Keywords: Hydroponics, Automation, Precision Farming, Sustainable Agriculture, IoT Farming*

## INNOVATIVE SOLUTIONS FOR CONTROLLED ENVIRONMENT

D. Ambika, Revathi Priya P, Sasmitha A, Prithvika P

Abstract

Uncontrolled entry of animals and birds often causes crop damage, leading to economic losses for farmers. This project presents a solar-powered ultrasonic repeller designed for agricultural and residential use. The system employs a Light Dependent Resistor (LDR) to monitor ambient light and a Passive Infrared (PIR) sensor to detect heat and movement. Based on the inputs, it triggers ultrasonic frequencies unpleasant to animals and birds but harmless to humans. Powered by renewable solar energy, the device ensures 24/7 protection without external power dependency. Validated at Technology Readiness Level 4, the project supports SDG 7 (Affordable and Clean Energy), SDG 12 (Responsible Consumption and Production), and SDG 15 (Life on Land). Real-time applications include crop protection, pest deterrence, and household security. By combining renewable energy with intelligent sensing, this innovation reduces chemical pesticide usage while promoting sustainable, eco-friendly farming practices.

*Keywords: Ultrasonic Repeller, Solar Energy, Controlled Environment, Pest Control, Sustainable Farming*

## SMART AGRICULTURE PILLAR: ENHANCING PLANT GROWTH THROUGH MIST IRRIGATION AND ORGANIC FERTILIZER

K. Pradeep Kumar, Brindha Bharathi P ,Ganika R, Nithiyaprakash R R, Santhiya Ragha G

Abstract

Modern agriculture faces the dual challenges of conserving resources and ensuring crop productivity. This project introduces the Smart Agriculture Pillar, which integrates hydroponic and aeroponic principles with mist irrigation and organic fertilizer application. A liquid organic fertilizer mixed with water in a base reservoir is atomized into fine mist and sprayed directly onto plant roots, ensuring maximum nutrient absorption with minimal wastage. An automated control system regulates misting cycles based on environmental data, reducing manual intervention and optimizing water use.

Validated at Technology Readiness Level 4, the project supports SDG 2 (Zero Hunger), SDG 6 (Clean Water and Sanitation), and SDG 12 (Responsible Consumption and Production). Real-time applications include vertical farming, seedling propagation, medicinal plant cultivation, and smart greenhouses. By promoting resource efficiency and organic practices, this innovation provides an eco-friendly, cost-effective solution for sustainable agriculture in both rural and urban settings.

## SMART NATURE LOOP

R. Sridharshini, Boomika K, Pavithra P , Sneha K

**Abstract**

Water and nutrient scarcity in agriculture demands innovative recycling solutions. The Smart Nature Loop project focuses on repurposing condensate water from air conditioners for agricultural irrigation. The collected water is integrated with organic fertilizers and enriched with kitchen waste such as vegetable scraps and eggshells, providing a nutrient-rich solution for plants. This closed-loop approach conserves resources, reduces waste, and minimizes environmental impact. Validated at Technology Readiness Level 3, the project aligns with SDG 6 (Clean Water and Sanitation), SDG 11 (Sustainable Cities and Communities), and SDG 12 (Responsible Consumption and Production). Real-time applications include hydroponics, rooftop farming, urban landscaping, vertical gardens, and greenhouse irrigation. By combining sustainable water recycling with organic nutrient enrichment, the Smart Nature Loop project demonstrates how innovative thinking can transform waste into a valuable agricultural resource, ensuring long-term resilience and efficiency.

## FABRICATION OF COCONUT TREE SPRAYER

M. Prasanth, K. Sowndharya, S. Akalya , M. Dinesh , D. Moorthi

**Abstract**

Coconut cultivation requires periodic spraying for pest control and nutrient management, but traditional manual methods are labor-intensive and inefficient. This project fabricates a coconut tree sprayer mounted on a manually operated vehicle, enabling farmers to reach tall trees without climbing. The system comprises a portable water tank, pump, and cam-driven sprayer, which delivers water, pesticides, or fertilizers at high pressure to tree canopies. The design reduces time, labor, and risk of accidents associated with manual climbing. Validated at Technology Readiness Level 4, the project contributes to SDG 2 (Zero Hunger), SDG 8 (Decent Work and Economic Growth), and SDG 15 (Life on Land). Real-time applications include spraying for pest control, foliar nutrient application,

and disease prevention in coconut and similar tall crops. This innovation empowers small-scale farmers with an affordable and safe solution to improve productivity and sustainability in plantation management.

## DESIGN, DEVELOPMENT AND EVALUATING THE PERFORMANCE OF ARECANUT BUNCH SHREDDER

K. K. Suvain, Adhithyan K G, Balasubramanian P , Pravin Pandiyan M C M

Abstract

Arecanut farming is labor-intensive, especially the separation of nuts from bunches, which is tedious and time-consuming. This project introduces an arecanut bunch shredder capable of separating, cleaning, and bagging nuts efficiently. The machine is designed to handle 1.5–2 tons of arecanut in 8 hours with a stripping efficiency of nearly 70%. It reduces manual drudgery, saves time, and minimizes costs while maintaining quality. Validated at Technology Readiness Level 4, the project aligns with SDG 8 (Decent Work and Economic Growth) and SDG 9 (Industry, Innovation, and Infrastructure). Real-time applications include arecanut plantations where large-scale harvesting operations require faster and safer processing. By providing a practical, user-friendly solution, the shredder improves economic returns for farmers and supports sustainable agricultural mechanization, ensuring livelihoods for communities dependent on arecanut cultivation.

*Keywords: Arecanut, Shredder, Mechanization, Harvest Efficiency, Sustainable Farming*

## DESIGN AND DEVELOPMENT OF SESAME THRESHER

S. Vanisha, Ganga Devi C, Kavinaya K, Santhosh A

Abstract

Sesame (Sesamum indicum) is a vital oilseed crop, often called the "queen of oilseeds" for its nutritional and economic importance. However, traditional threshing methods are inefficient, labor-intensive, and time-consuming, often leading to grain loss. This project focuses on developing a portable sesame thresher that mechanizes the process to improve efficiency and reduce labor requirements. The thresher ensures quick separation of seeds with higher precision, achieving significant savings in cost and time compared to manual methods. Validated at Technology Readiness Level 4, the project supports SDG 2 (Zero Hunger) and SDG 8 (Decent Work and Economic Growth). Real-time applications include smallholder farms, oil refineries, and seed processing units where sesame is cultivated and processed. By reducing post-harvest losses and ensuring quality output, this

innovation contributes to farmer income, promotes sustainable oilseed production, and strengthens the value chain of sesame cultivation.

## INNOVATIVE ALOE VERA PEEL REMOVAL TOOL FOR ENHANCED GEL EXTRACTION AND WASTE REDUCTION

M. Prasanth, Abdul Hakkim M, Arun S , Boomisha P

Abstract

Aloe vera is widely used in the cosmetic, food, and pharmaceutical industries due to its medicinal properties and gel content. Traditional manual peeling methods using knives are slow, labor-intensive, and often result in loss of valuable gel. This project introduces an innovative aloe vera peel removal tool equipped with dual sharp blades capable of removing both the upper and lower layers simultaneously, while an additional edge blade trims the spiny sides efficiently. The design ensures maximum gel recovery with minimal waste, making the tool both time-saving and user-friendly. Validated at Technology Readiness Level 4, the project supports SDG 9 (Industry, Innovation, and Infrastructure) and SDG 12 (Responsible Consumption and Production). Real-time applications include small-scale industries, households, and commercial aloe vera processing units. By improving efficiency, reducing waste, and lowering costs, this innovation enhances productivity and supports sustainable resource utilization.

## DESIGN AND DEVELOPMENT OF DUAL OPERATED MULTI-CROP THRESHER BY USING SOLAR ENERGY

M. Prasanth, Abdul Hakkim M, , Arun S, Boomisha P

Abstract

Threshing of crops such as groundnut and cereals is labor-intensive and energy-demanding when performed manually. This project presents a dual-operated multi-crop thresher that can function with both solar energy and manual pedaling. The design incorporates a motor powered by solar panels for eco-friendly operation, along with a pedal-driven backup system, making it suitable for rural areas with unreliable electricity. The machine consists of a rim wheel with welded blades that effectively separates pods and crop residues. Operating at around 250 rpm, it ensures efficiency and consistency while reducing dependence on fossil fuels. Validated at Technology Readiness Level 4, the project aligns with SDG 7 (Affordable and Clean Energy) and SDG 12 (Responsible Consumption and Production). Real-time applications include threshing of groundnut, pulses, and small grains on small

and medium farms. By offering a cost-effective, sustainable, and user-friendly solution, this project addresses post-harvest challenges while promoting renewable energy.

*Keywords: Multi-Crop Thresher, Solar Energy, Renewable Agriculture, Sustainable Mechanization, Post-Harvest Technology*

## Ergonomic Modification and Performance Evaluation of Low-Cost Battery Operated Forage Harvester

K. K. Suvain, Akash Raj S, Haripriya L M, Ratchanya A , Sri Lakshmi S

Abstract

Forage harvesting is essential in dairy and livestock farming but is traditionally carried out using manual sickles or expensive machines unsuitable for small-scale farmers. This project develops a low-cost, battery-operated forage harvester designed for small farms. The machine incorporates a rotating cutting knife powered by a rechargeable lithium-ion battery, reducing manual effort and enabling faster coverage of larger areas. Adjustable cutting heights and ergonomic handles ensure flexibility, operator comfort, and safety. Blade guards and safety switches further minimize risks during operation. Validated at Technology Readiness Level 4, the project supports SDG 2 (Zero Hunger), SDG 8 (Decent Work and Economic Growth), and SDG 15 (Life on Land). Real-time applications include forage harvesting for cattle feed and efficient grassland management. By reducing drudgery, saving time, and promoting mechanization, this project provides an affordable, sustainable, and practical tool for smallholder farmers to improve productivity and livelihoods.

*Keywords: Forage Harvester, Battery Operated, Ergonomics, Dairy Farming, Sustainable Mechanization*

## Smart Irrigation System Using IOT and Solar Energy

Dr. Kavitha Abirami C V , Karthikeyan, Harini S, Pranav R , Ashwin V

Abstract

Water scarcity and inefficient irrigation practices remain key challenges in agriculture. This project introduces a smart irrigation system that integrates IoT sensors with solar energy to optimize water use. Soil moisture, temperature, and humidity sensors collect real-time data, which is transmitted to a cloud platform for processing. An algorithm analyzes the data and automatically activates irrigation valves when soil moisture levels fall below a set threshold. Powered entirely by solar energy, the system reduces dependency on electricity and ensures continuous operation even in remote areas. Farmers can monitor and control the irrigation system through a mobile application, receiving instant alerts and recommendations. Validated at Technology Readiness Level 4, the project supports SDG 6 (Clean Water and Sanitation) and SDG 7 (Affordable and Clean Energy). Real-time applications

include drip irrigation, greenhouse farming, and water-constrained regions. By combining renewable energy with automation, this innovation reduces water wastage, lowers costs, and promotes sustainable farming practices.

*Keywords: Smart Irrigation, IoT, Solar Energy, Water Conservation, Precision Agriculture*

## Automated Seed Germination Chamber For Higher Yield

R. M. Subramanian , Kavitha R , Rohit K , Mehala V

Abstract

Seed germination is the foundation of successful crop production, but traditional open-field germination often results in uneven sprouting due to uncontrolled temperature, humidity, and pest damage. This project introduces an automated seed germination chamber designed to provide optimal conditions for seedling growth. The chamber integrates humidity sensors, heating elements, and a misting system to maintain uniform moisture and temperature. A microcontroller regulates these parameters based on crop requirements, ensuring a germination success rate of over 90%. The design reduces seed wastage, improves uniformity, and shortens germination time compared to traditional methods. Validated at Technology Readiness Level 4, the project supports SDG 2 (Zero Hunger) and SDG 9 (Industry, Innovation, and Infrastructure). Real-time applications include nurseries, research institutions, and commercial seedling production units. By ensuring healthy seedlings and reducing input losses, this innovation provides a cost-effective, sustainable solution for boosting agricultural productivity.

*Keywords: Seed Germination, Automation, Precision Farming, Controlled Environment, Crop Yield*

## Drone-Based Pest Detection and Spraying System

Dr. Kavitha Abirami C V, , Keerthana A, Naveen K , Jaya Surya P

Abstract

Pest infestations cause significant yield losses worldwide, and traditional spraying methods expose farmers to harmful chemicals and result in uneven pesticide application. This project presents a drone-based pest detection and spraying system designed for precision agriculture. The drone is equipped with multispectral cameras to identify pest-affected areas by analyzing crop health indices such as NDVI. Once detected, the drone selectively sprays pesticides only in infected zones, reducing chemical usage by nearly 40% compared to conventional methods. The system is powered by a GPS-based navigation unit and can be controlled remotely through a mobile interface. Validated at Technology Readiness Level 5, the project supports SDG 2 (Zero Hunger), SDG 12 (Responsible Consumption and Production), and SDG 15 (Life on Land). Real-time applications include pest

management in paddy, cotton, and vegetable crops. By reducing chemical exposure, minimizing costs, and improving efficiency, this innovation empowers farmers with a safe, smart, and sustainable approach to crop protection.

Keywords: Agricultural Drone, Pest Detection, Precision Spraying, Sustainable Farming, Crop Protection



I have seen firsthand that agricultural science has enormous potential to increase the yields of small farmers and lift them out of hunger and poverty.

— Bill Gates —

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