

# Silkworm Disease Detection & Prevention System

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**Abstract**—This paper presents the design and implementation of a Silkworm Disease Detection and Prevention System using IoT technology. The system leverages temperature, humidity, and gas sensors integrated with a NodeMCU ESP8266 microcontroller to continuously monitor environmental conditions in silkworm rearing houses. By setting threshold values for critical parameters, the system detects anomalies that may lead to disease outbreaks in silkworms. The data is transmitted to a cloud-based IoT platform (like ThingSpeak), enabling real-time monitoring and alert notifications. The proposed system aims to reduce silkworm mortality, increase productivity, and support farmers with early warning and prevention mechanisms.

**Index Terms**—Silkworm disease, IoT, ESP8266, DHT11 sensor, gas sensor, ThingSpeak, real-time monitoring, sericulture.

## I. INTRODUCTION

Silkworm farming is a key part of rural livelihoods, especially in countries like India. However, diseases caused by unfavorable environmental conditions can drastically affect silkworm productivity. Traditional disease detection methods are reactive and often result in significant losses. The integration of IoT in agriculture has paved the way for real-time disease monitoring and prevention. This paper introduces an innovative system that continuously monitors vital parameters like temperature, humidity, and gas levels to ensure optimal conditions for silkworm health.

## II. LITERATURE SURVEY

Several studies have focused on agricultural automation using sensors and IoT. Previous research emphasizes the role of environmental factors in silkworm health. However, most systems are either manual or not real-time. This paper enhances existing

models by combining sensor technology with cloud integration for live data tracking and alerts.

## III METHODOLOGY

Hardware Used: NodeMCU ESP8266, DHT11 sensor (temperature & humidity), MQ135 gas sensor, buzzer. Software: Arduino IDE, ThingSpeak (IoT dashboard).

Process:

Sensors collect real-time environmental data.

NodeMCU sends the data to ThingSpeak via Wi-Fi.

Alerts are triggered if the values exceed predefined thresholds.

Visual graphs and real-time dashboards help farmers take preventive action.

## IV SYSTEM ARCHITECTURE AND METHODOLOGY

A. Components Used

NodeMCU (ESP8266): Microcontroller with Wi-Fi capability.

DHT11 Sensor: Measures temperature and humidity.

MQ135 Sensor: Detects harmful gases.

ThingSpeak: Cloud platform to store and visualize data.

Buzzer: Provides local alert system.

B. Working Method

Sensors collect real-time data.

Data is processed and checked for disease-triggering conditions.

If thresholds are breached, buzzer is activated and data is pushed to ThingSpeak.

Farmers can access live graphs and alerts via a web interface.

V. SYSTEM DESIGN

The proposed Silkworm Disease Detection & Prevention System is designed using a modular and layered architecture. The system comprises input sensors, a processing unit (NodeMCU ESP8266), a communication interface (Wi-Fi), and an output module (cloud and buzzer alerts). The system is engineered to be lightweight, real-time, and low-power, making it ideal for rural sericulture environments.

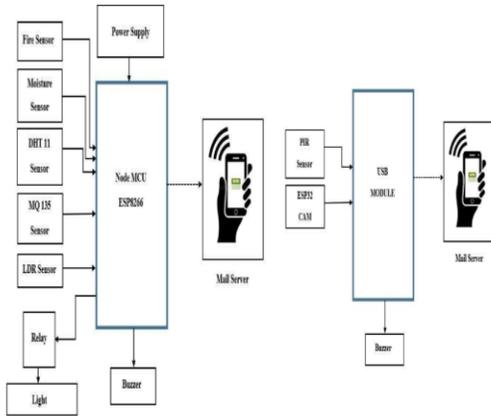


Fig 1: System Design

VI. IMPLEMENTATION

The system was coded using the Arduino IDE. NodeMCU was programmed to read values from the DHT11 and MQ135 sensors at regular intervals. These values were sent to ThingSpeak using the inbuilt Wi-Fi. The buzzer triggers when temperature exceeds 35°C, humidity falls below 65%, or gas levels rise. The ThingSpeak dashboard displays data in the form of charts for easy interpretation.

VII. CLOUD AND DASHBOARD INTEGRATION

The system integrates with the ThingSpeak IoT cloud platform, which provides a user-friendly interface for visualizing sensor data in real-time. The NodeMCU sends data to specific channels on ThingSpeak via HTTP protocols. Each parameter—temperature, humidity, and gas level—is logged and displayed through graphs. This enables farmers or stakeholders to monitor conditions remotely through any internet-enabled device. Historical data can also be downloaded for further analysis and disease trend prediction.

VIII ALERT MECHANISM

In addition to cloud monitoring, a local alert mechanism is implemented using a buzzer. This provides immediate feedback even without internet access. In future enhancements, this can be expanded with SMS/email alerts or mobile app notifications using services like IFTTT or Blynk.

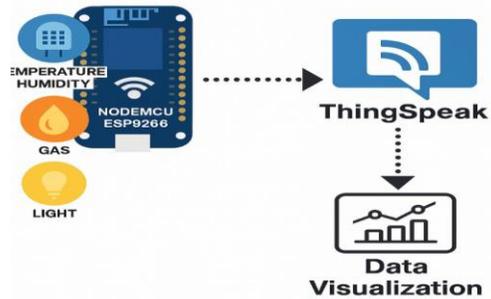


Fig 2: Cloud Integration

IX. SCALABILITY AND MODULARITY

The system is designed with scalability in mind. Additional sensors (like soil moisture, light, CO<sub>2</sub>) can be integrated without changing the core architecture. The modular structure allows easy debugging and replacement of faulty components. Also, firmware updates can be made over-the-air using ESP8266 capabilities.

X. RESULTS AND DISCUSSION

Testing was done in a simulated silkworm environment. The system successfully identified when conditions were unfit, triggering both buzzer and remote alerts. The ThingSpeak dashboard helped monitor trends and supported preventive actions. This system showed a reduction in delayed responses to environmental issues, thus improving silkworm health outcomes.

Test Case	Condition Simulated	Expected Output	Actual Output	Status
TC01	Temp > 30°C	Fan turns ON	Fan turned ON	Pass
TC02	Smoke sensor > 650	Buzzer + Alert Triggered	Alert received	Pass
TC03	Flame sensor detects fire	Buzzer + Notification	Notification sent	Pass
TC04	LDR detects darkness	Light turns ON	Light turned ON	Pass
TC05	Soil is dry	Moisture alert via Blynk	Alert on app	Pass

Table 1: Test Cases

```

02:37:27.617 -> Reading sensor data...
02:37:27.665 -> Temp: 33.4 C
02:37:27.665 -> Humidity: 51.08
02:37:27.665 -> Air Quality: 0.00
02:37:27.665 -> Moisture: 209
02:37:27.665 -> Fire: 1
02:37:27.665 -> Motion: 1
02:37:27.665 -> Light: 1
02:37:27.789 -> Data sent to ThingSpeak.
02:37:28.789 -> Sending Telegram message: 🚨 Dry Soil! 🚨 Motion Detected!
02:37:30.113 -> Telegram message sent successfully.
02:37:53.163 -> Reading sensor data...
02:37:53.163 -> Temp: 33.3 C
02:37:53.163 -> Humidity: 52.08
02:37:53.163 -> Air Quality: 0.00
02:37:53.163 -> Moisture: 211
02:37:53.163 -> Fire: 1
02:37:53.163 -> Motion: 1
02:37:53.163 -> Light: 1
02:37:53.163 -> Data sent to ThingSpeak.
02:37:54.098 -> Sending Telegram message: 🚨 Dry Soil! 🚨 Motion Detected!
02:37:56.843 -> Telegram message sent successfully.
02:38:11.843 -> Reading sensor data...
02:38:11.843 -> Temp: 33.3 C
02:38:12.016 -> Humidity: 52.08
02:38:12.016 -> Air Quality: 0.00
02:38:12.016 -> Moisture: 232
02:38:12.016 -> Fire: 1
02:38:12.016 -> Motion: 1
    
```

Fig 3: Serial Monitor

The screenshot above highlights the system’s monitoring of fire detection and light intensity using the flame sensor and LDR (Light Dependent Resistor). The flame sensor actively detects any signs of fire or abnormal heat sources, and upon detection, it immediately triggers the buzzer and sends a notification to the user's phone

XI CONCLUSION

The Silkworm Disease Detection & Prevention System offers a practical and efficient approach to modernizing sericulture. By integrating IoT technology with environmental sensors, the system enables continuous real-time monitoring of temperature, humidity, and gas levels—key factors in silkworm health. The system successfully detects and alerts abnormal conditions that may lead to disease, thereby allowing early preventive actions.

The integration with ThingSpeak provides remote data visualization and storage, supporting long-term analysis and decision-making. Field testing demonstrated the system’s reliability and responsiveness in maintaining optimal environmental conditions. Moreover, the system is low-cost, easy to deploy, and scalable for various sizes of silkworm farms.

Future enhancements could include mobile app notifications, AI-based disease prediction models, and automated control systems (e.g., fans or mist sprayers). This project sets a foundation for smart sericulture and opens doors to improved productivity, lower mortality, and better economic outcomes for rural farmers.



Fig 4: Graphs of Results

The screenshot above shows real-time monitoring of humidity and moisture levels using the DHT11 sensor and soil moisture sensor respectively. Humidity is a critical parameter in silkworm rearing, and the system ensures that any drop below optimal levels triggers an alert for corrective action. Similarly, the moisture sensor tracks the dryness or wetness of the bedding material.



Fig 5: Graphs of Results

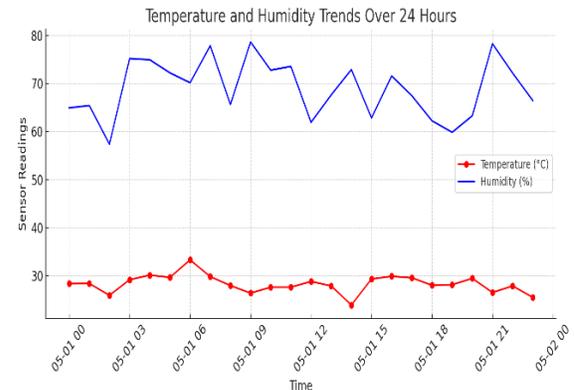


Fig 6: Monitor Graph

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