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# Design of Intelligent Protection and Promotion System for Non-Heritage Music Inheritance based on Internet of Things

Weiwei Li[1*]

[1*]Ph.D Candidate, DFA, International College, Krirk University, Bangkok, Thailand.
weiweide21@163.com, https://orcid.org/0009-0009-1618-4979

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**Abstract**

Eco-friendly methods for the avoidance and control of crop illnesses and insects are essential to minimize synthetic pesticide usage, enhance agriculture quality, safeguard the ecosystem, and foster equitable agricultural growth. Utilizing Internet of Things (IoT) gadgets, the research created a framework for preventing and managing the spread of farming diseases and insects, comprising two primary parts: a plant security device (equipment) and a system for handling information (programs). The research integrated two varieties of protective plant gadgets to accommodate facility- and field-based manufacturing settings, employing ozone sterilizing and light-trap technology. The gadgets were outfitted with many sensors to gather immediate information and track the agricultural growing environment. The database of information features an IoT-based design and incorporates a mobile application to provide remote operation of plant security devices for the competent administration of plant security information. The framework facilitates efficient administration of extensive equipment deployments and multi-device collaboration for illness, pest control, and prevention. The implemented technique has functioned effectively for many years in China and has been utilized for cucumbers, tomatoes, grains, and other commodities. The research illustrates the efficacy and feasibility of the technique in the setting of a greenhouse and the field.

**Keywords:** System Design, Data Management, Crop Diseases, Insect Pests, Internet of Things.

## 1 Introduction

Plant illnesses and insects that are noted for their wide variety, detrimental effects, and isolated occurrences can result in considerable losses to agriculture (Yactayo-Chang et al., 2020). Viruses and pests significantly jeopardize the availability of food and diminish the quality and productivity of crops. Annually, 20%-40% of all world crop harvests are lost due to crop illnesses and pests. In China, insect

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*Corresponding author: Ph.D Candidate, DFA, International College, Krirk University, Bangkok, Thailand.

insects and diseases result in an annual loss of around 40 million tons of wheat (Shan et al., 2021). Alterations in the worldwide weather and farming practices have resulted in variations in the prevalence of agricultural illnesses and bug pests (Sawicka & Egbuna, 2020). The effects on agricultural productivity are intensifying and are already reaching previously untouched areas.

Chemicals are frequently employed by farmers to manage illnesses and bugs due to their high efficacy and fast action, enabling farmers to enhance crop yields (Lesk et al., 2022). Excessive use of synthetic pesticides can result in issues such as soil contamination, chemical residues, and microbial resistance, which significantly compromise the safety and effectiveness of crop goods, the natural world, and the viability of agriculture. Solutions to applying pesticides in farming have become crucial. Scientific research and methods in plant cultivation and growth are mainly approached from the standpoint of biological disciplines, such as biochemistry, biological processes, and ecology (Di Giulio et al., 2020). Green technologies utilize physical methods, including light, heat, power, moderate radiation, and machinery, to avoid and manage illnesses and bugs. Physical control methods diminish the quantity of synthetic pesticides necessary for attaining substantial crop yields.

## 2 Related Works

To enhance crop output and refine farming processes, agricultural technology requires consideration and comprehensive assessment of several elements throughout the execution stage. Internet of Things (IoT) technology is utilized in digital settings to improve agricultural yields (Laghari et al., 2021). Artificial intelligence (AI) is advantageous in controlling things from afar (Zhai et al., 2021). IoT devices in wireless networks measure ecological variables such as absolute moisture levels, temperature, and pH. Various detectors, including temperature gauges, moisture indicators, and soil humidity instruments, are employed for the real-time assessment of environmental data (Rasheed et al., 2022). Standard datasets aggregate past information on moisture and temperature measurements. This data is comprised of data collected from agricultural operations.

Agricultural data is collected simultaneously with crops' growth, analyzed, and stored in servers (Zhu & Li, 2021). The gap between the volume of data collected and the extent of data analyzed for management expands as the quantity of stored data increases. Data about farming, goods, and other pertinent subjects grows daily (Saiz-Rubio & Rovira-Más, 2020). The objective of this data should be reduction. Appropriate machine-learning approaches, if employed, might facilitate informed decision-making using this knowledge.

Machine learning (ML) enables extracting salient features from extensive data collections and identifying formerly unrecognized patterns and hidden relationships within the data that pertain to sustainable agriculture challenges (Sarhan et al., 2022). A predictive approach derives inferences about the present based on data collected in the past. The forecasting model is predicated on the concept that the virus combines with the host, surroundings, and illnesses to create a pyramid structure. The primary objective is to accurately predict the simultaneous presence of the three variables above host, ecological, and disease. The complete system has been taught with that input (Bernardo-Cravo et al., 2020).

The forecasting model for agricultural diseases has four aspects, employing IoT and artificial intelligence. The first unit comprises information acquisition of the wireless sensor networks, which use internet access to obtain data such as temperature and moisture readings (Li et al., 2020). The second section discusses online services that download collected data for universal accessibility. The prediction model for neural networks that utilizes training data to anticipate crop illnesses is incorporated in the relevant part. The notification element transmits notifications to the farmer via text and is included in the last part (Klaina et al., 2022).

A substantial quantity of statistical proof must be correlated with variable frequency information to enhance the notion of resilience to the maximal from Hadoop in agriculture. Two fundamental components of OpenStack technologies are the Miller-recommended Standard Files Standard and the TensorFlow data models (Nguyen et al., 2020).

Multiple processors can be employed with system effectiveness. The open-source Apache Control System promotes methods for translation reductions. Traditional hardware structures distribute a substantial volume of data during processing. Individualized evaluation of data is conducted by approximating and description methodologies.

## 3 Methodology

The system design has four primary levels: detector, networking, service administration, and application tiers (Figure 1).

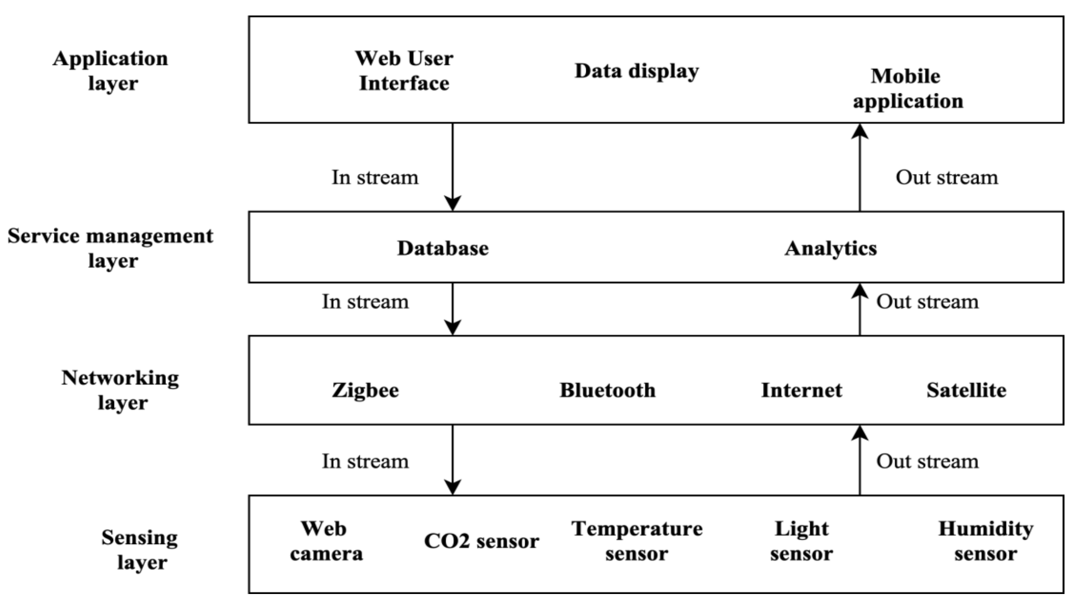


Figure 1: The Layered Architecture of the Model

- **Sensor Layer**

The sensing layer comprises detectors that gather data from the environment and control that relay the data via an interface and networking for subsequent processing. Various sensors, such as light magnitude, temperatures, humidity levels, CO2 detectors, and security cameras, can be utilized in the plant security gadget.

- **Network Layer**

The networking layer is the intermediary between the sensing layer and the provider's administration level and has data transfer responsibilities. The networking layer facilitates access to information and delivery, transferring data generated by the sensing layer across safe paths to the service administration level. Considering the agricultural production setting and expenses, the structure employs a short-range wireless connection integrated with remote wireless communications. The sent information primarily comprises gathered ecological information, gadget specifications, personnel details, operational and repair records, and control device directives. The method by which the plant safeguards transmit data wirelessly to a data administration system is outlined as follows.

Creating a Transmission Control Protocol (TCP) link: upon activation and operation of the plant security gadget, it links to the Internet via a wireless link and endeavors to set up a TCP exchange with the backend gateways of the data control system. TCP links guarantee the dependability and sequential integrity of data transfer.

The handshaking technique involves the plant security device transmitting a TCP Synchronization (SYN) message to the method's backend router to initiate a connection setup request. Upon receiving the SYN message, the backbone gateways reply with a SYN-Acknowledgement (ACK) message to acknowledge the link attempt. The handshake procedure has concluded.

Communication, processing, and analysis of proprietary protocol information: after establishing a TCP relationship, the crop security device transmits proprietary protocol information to the network's backbone gateways. Upon receiving the encrypted protocol information, the backbone of the entrance must parse the information, conduct data verification according to the processed information and directives, and perform the appropriate activities or produce control commands to relay back to the plant security equipment.

Encoding of information and safe communication: to guarantee data security, secret protocol information must be encoded during communication. Prevalent encryption techniques encompass security. Security methods can be employed to safeguard information privacy and integrity.

Terminate TCP link: upon completing the information transfer, the plant security device transmits a TCP Finish (FIN) message to the backend terminal, closing the TCP link and relinquishing network bandwidth.

Frequent heartbeat monitoring: to preserve the integrity of the link and promptly identify anomalies, the plant security equipment can periodically transmit "heartbeat" detecting messages to the backend gateways. This facilitates the reliability of the link and swiftly identifies and resolves any possible difficulties.

Table information is saved and handled via the Regional Database Managing Software. The primary data categories involve String, Float, Boolean, and Date. The system facilitates data sharing, preservation, and administration. Multiple technologies are utilized to enhance the administration of computing assets and service planning. The ideal capacity of devices linked to this information architecture is around 3800-5000 gadgets per individual service.

- **Service Management Layer**

The service administration layer comprises many application hosts to handle information handling and storage, facilitating intelligent decision-making and, depending on those judgments, providing services across the network via interfaces. Diverse methods of analysis can be employed to derive informed judgments. The data retention server retains both organized and unorganized information. The business server processes queries from the application level, executes designated actions in its database, and relays the results to the application stack. Data on protecting plants is maintained in two-dimensional organized data fields and related tables of information.

- **Application Layer**

The application level is an end-user interface, enabling customers to access desired services. Clients can conduct real-time surveillance of environmental information, remotely operate plant defense apparatus, oversee online plant protection gadgets, and present data via visualization tools, including websites and mobile applications. This tier enables customers to access several types of historical information and utilize export tools for study and analytical purposes.

**Intelligent Analysis and Early Warning Technology for the Conservation of Crop Protection**

The intelligent analysis and early warning technology for crop protection apply modern information technology, especially artificial intelligence, extensive data analysis, machine learning, and other technologies, to deeply analyze and monitor the protection status, dissemination channels, audience acceptance level, etc., of crop protection, to achieve early warning of potential risks and optimization suggestions for protective measures. Applying this technology can improve the efficiency and effectiveness of crop protection and provide scientific guidance for the sustainable development of crop protection. The content in Table 1 shows the main application directions of intelligent analysis and early warning technology for crop protection protection.

Table 1: Main Application Directions of Intelligent Analysis and Early Warning Technology for Crop Protection Conservation

| Application Direction | Specifics |
| --- | --- |
| Condition Monitoring and Assessment | Comprehensively monitor and assess the current status of crop protection projects through intelligent analysis techniques, including their frequency of activities, number of participants, social influence and other indicators, in order to evaluate their protection status. |
| Risk Warning | Establish an early warning mechanism to identify problems and potential threats in the protection work, such as inheritance faults, lack of funds, etc., in a timely manner through continuous data analyses, and put forward early warning hints. |
| Recommendations for Optimisation of Protection Measures | Based on the results of intelligent analyses, propose targeted conservation measures and improvement strategies, including suggestions on technological innovation, policy support, public participation, etc. |

The implementation strategy of intelligent analysis and early warning technology for the protection of crops is an essential and forward-looking work. The first step is to build a comprehensive database of crops, collect various forms of information, including audio, video, text, etc., and integrate relevant social, economic, and cultural background data to provide sufficient information support for subsequent analysis and early warning. The second is to develop a specialized intelligent analysis and early warning platform that integrates artificial intelligence, big data processing, visualization, display, and other technologies, providing strong technical support. By building such a platform, the research can achieve deep mining and comprehensive analysis of crop data, providing a scientific basis for protection. Model development and training are the core links of intelligent analysis and early warning technology for protection. Based on machine learning algorithms, an analysis and prediction model suitable for crop protection is developed, and the model is trained and optimized using actual data to improve its accuracy and prediction ability. The circuit diagram is shown in Figure 2. This model can help us promptly identify problems and hidden dangers in the inheritance of crops and provide timely warnings and countermeasures for protection work.

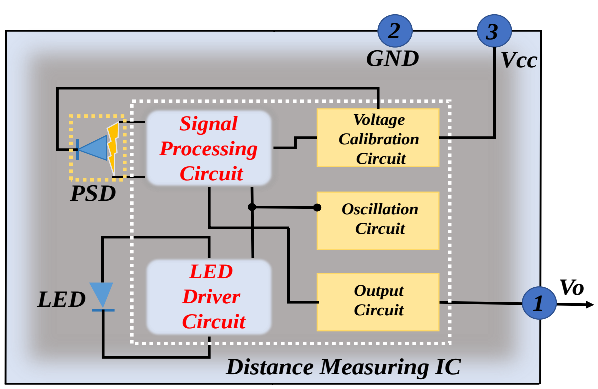


Figure 2: Circuit Schematic Diagram of Intelligent Protection Infrared Module

The data that controls the start of non-legacy crop playback in the crop module can be regarded as trigger data, and the data that controls real-time changes in the parameters of the crop module can be considered variable data. The controller controls the content shown in Figure 3 to control the variable values, and logical comparisons are made through preset thresholds. Once the threshold is reached or exceeded, it is triggered. Conditional triggered preset values can be used for other logical comparisons.

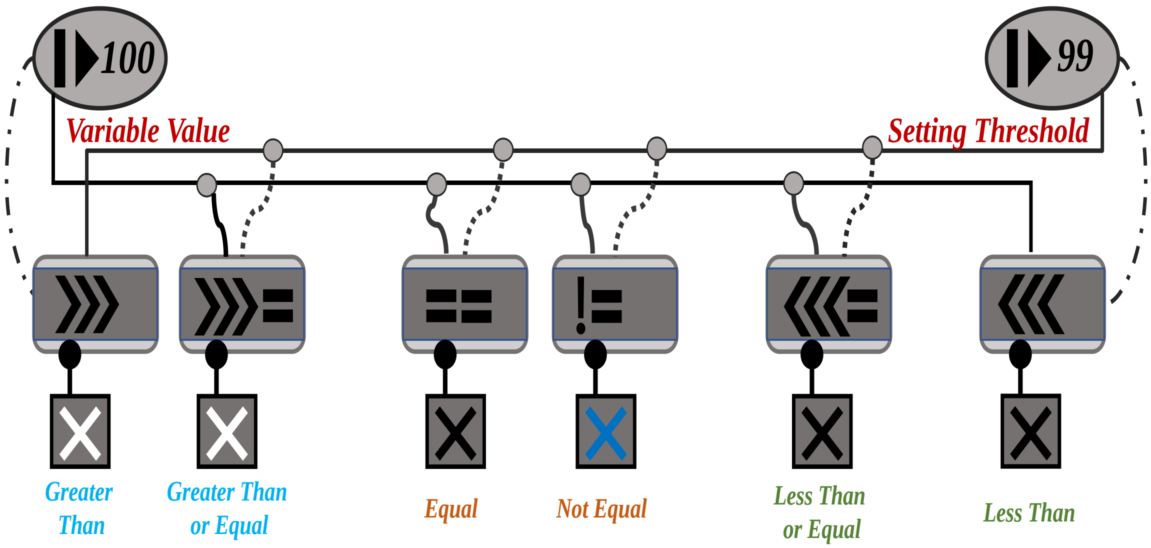


Figure 3: Data Logic Comparison and Reach Trigger Logic

At the same time, it strengthens cooperation with relevant disciplines such as culture, sociology, and economics, comprehensively applies interdisciplinary knowledge, and improves the accuracy and effectiveness of intelligent analysis and early warning. The exchange and cooperation between different disciplines can bring more innovative ideas and solutions to the protection of crop protection, promoting the development and progress of this field. Finally, the results of intelligent analysis and early warning for crop protection should be applied. The effectiveness of the crop should be regularly evaluated, and adjustments and optimizations should be based on feedback to ensure the effectiveness and practicality of the technology application. Through continuous feedback and improvement, the role and value of intelligent analysis and early warning technology in crop protection can be continuously enhanced.

**Design of Security and Privacy Protection Mechanisms**

The design of security and privacy protection mechanisms for intelligent protection systems is an important and complex task involving many aspects, such as information security, data protection, and user privacy. When designing such a system, it is necessary to consider potential threats and risks and take corresponding measures to ensure the system's security and users' privacy are not violated. Table 2 shows the main aspects of designing intelligent protection systems' security and privacy protection mechanisms.

Table 2: Main Aspects of Safety Design for Intelligent Protection Systems

| System Security Design | Specific operations |
|---|---|
| Reinforcement of Identity Authentication | Use multi-factor authentication, biometrics and other means to ensure that only authenticated users can access the system. |
| Encrypted Communication | Use encryption protocols to protect data during transmission and prevent eavesdropping or tampering. |
| Vulnerability Remediation | Regularly scan and repair vulnerabilities in the system and update patches in a timely manner to prevent hackers from using vulnerabilities to invade the system. |
| Access Control | Set different access control policies according to user roles and permissions to ensure that users can only access data and functions within their permissions. |
| Log Monitoring | Record user operation logs, system event logs and other information to detect abnormal behaviours and respond to them in a timely manner. |

The protection of crop protection not only involves technology and inheritance but also needs to fully consider the design of privacy protection mechanisms to safeguard the rights and interests of individuals and groups participating in the protection of crop protection. In building a protection intelligent analysis and warning platform, attention should be paid to privacy protection to ensure that user's personal information is fully respected and protected (Figure 4). Anonymizing data is one of the fundamental measures used to protect user privacy. For users' personal information, the research will use professional anonymization technology to de-identify their identity information and avoid leaking sensitive information. Establishing an explicit privacy agreement is an important measure to protect user privacy. The research will establish a privacy policy to clarify to users what information the system will collect and how to use it and obtain their explicit consent. Before using the platform, users will be informed of the content of the privacy policy and required to explicitly agree to this operation to ensure that users have a clear understanding and control over their personal information. To ensure the security of user data, the research will take multi-level data protection measures. This includes but is not limited to ensuring the security of user data through technical means such as data encryption and permission control and preventing the leakage or misuse of user information. In addition, the research will commission a third-party organization to review the privacy protection mechanism of this system, ensuring that it complies with relevant laws, regulations, and standards and that users' privacy rights are fully protected. The ultimate goal is to protect users' rights, provide them with the right to access, modify, and delete their data, and ensure that users can easily exercise these rights. Users can access and manage their personal information anytime, ensuring its accuracy and completeness.

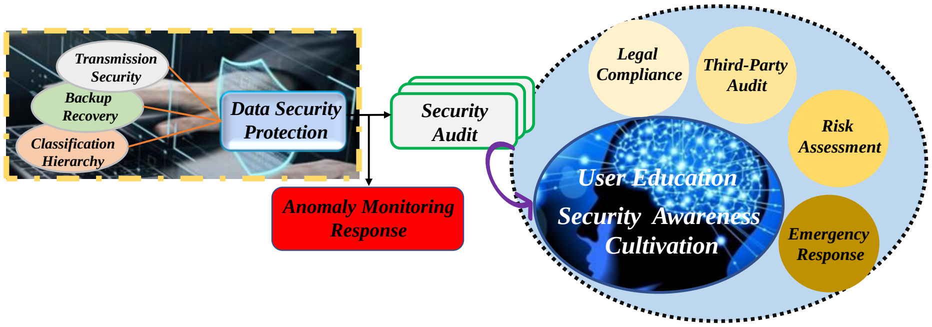


Figure 4: Design Idea of Security and Privacy Protection Mechanism of Intelligent Protection System

## 4 Results and Discussion

The swift advancement of bioinformatics study has established the groundwork for the evolution of omics research technologies. The conventional omics analysis technique will do a micro analysis on the mutation population, contingent upon acquiring phylogenetic data for the seeds. Investigators have undertaken several domestic and international investigations, employing advanced methodologies such as AI systems. They persist in operating within the limited objectives, and the crop morphology team retains ample direction for processing information. The comprehensive data the plant morphological team acquired is vast and intricate, necessitating exceptional search capabilities across diverse phenotypic characteristic regions. The existing machine learning approach has limited computing capacity, particularly for scripts for unstructured information, although it can potentially modify the analytical technological framework. The assessment of lighting rate for the suggested model with IoT assistance network at altitudes of 40 m, 80 m, and 120 m is depicted in Figure 5.

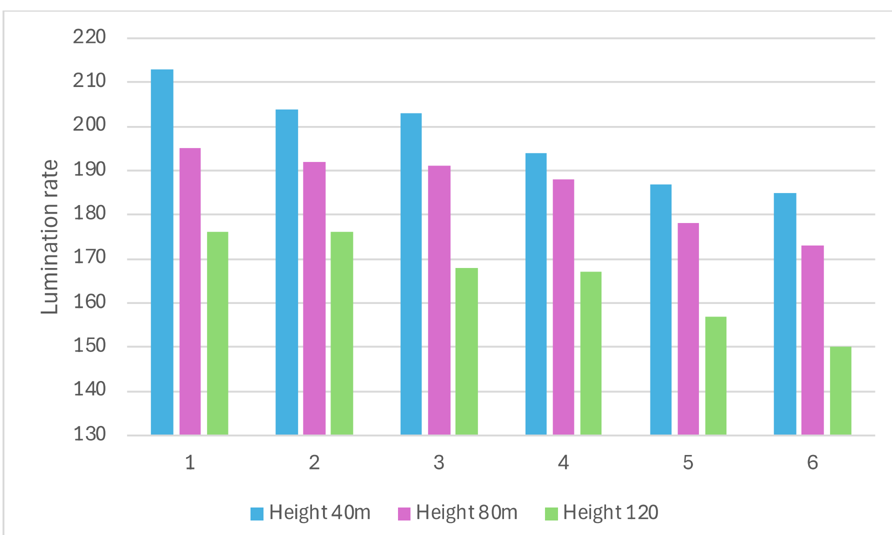


Figure 5: Lamination Analysis

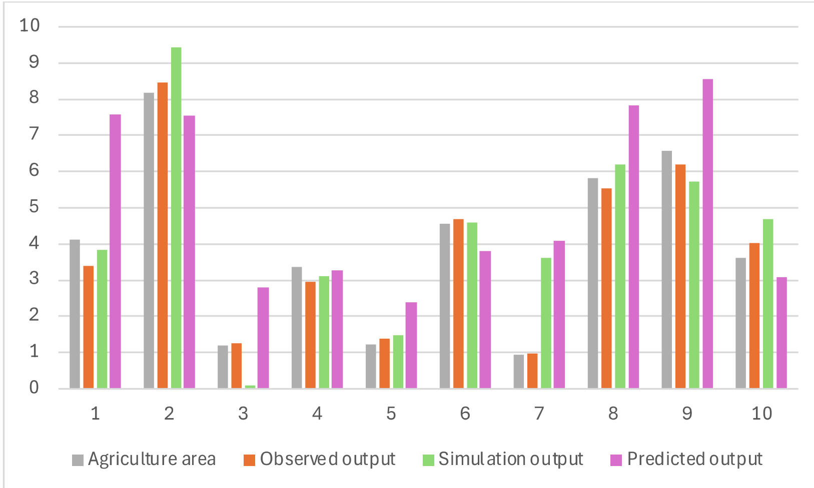


Figure 6: Yield Analysis

Figure 6 illustrates the proposed model's anticipated planting compared to the loT Help scheme. The number of people participating in the computerized analysis and the accurate assessment varied from 1 to 10. The table illustrates a depiction of the user's land for farming. The above computation and table illustrate the actual crop yield. The outcome of the model is assessed in tandem with the anticipated result. The analysis reveals that the simulation results and the operation method are enhanced when the customer has limited land accessible for agriculture.

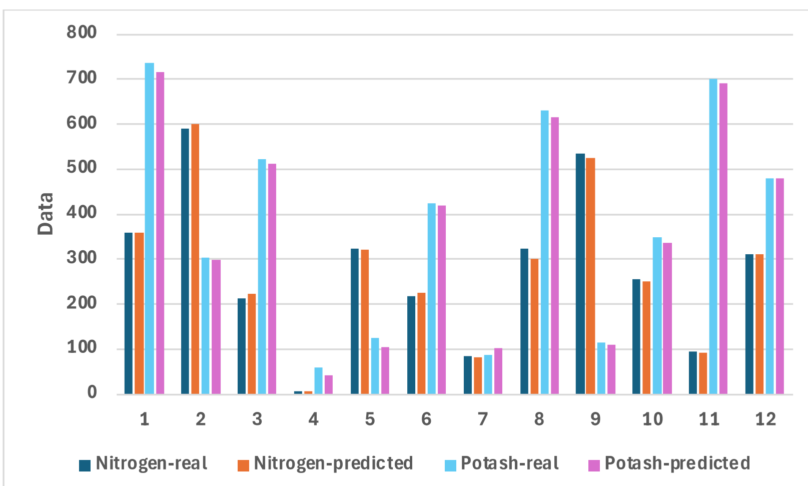


Figure 7: Nitrogen and Potassium Result Analysis

The nitrogen and potash delivery rates of the suggested model with IoT support structures are illustrated in Figure 7. The nitrogen and potassium supplied to the plant are assessed in both simulated and real-life studies. The results demonstrate that the proposed model with the IoT Assistance network has an evaluation that closely aligns with expectations. The suggested technique is thus the most precise and productive. According to data from the IoT Assistance structure, there is minimal disparity between the current data and the intended model.

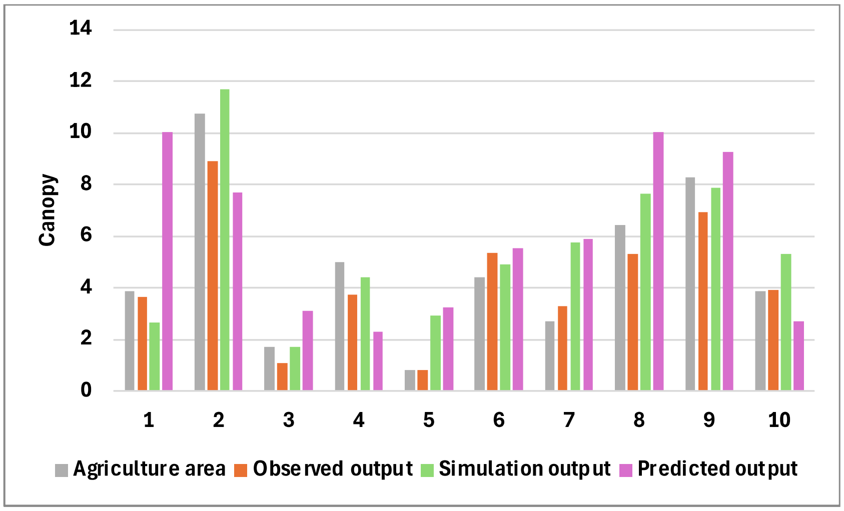


Figure 8: Canopy Result Analysis

The comprehensive canopy assessment of the planned model with the IoT Assistance network is presented in Figure 8. The number of those participating in the computerized analysis and practical evaluation varied from 1 to 10. The table depicts a representation of the user's agricultural property. The above computation and table demonstrate the actual crop yield. The model's outputs are evaluated and compared with the related outcomes. The analysis reveals that simulated production and practicing are enhanced when the consumer has limited agricultural space.

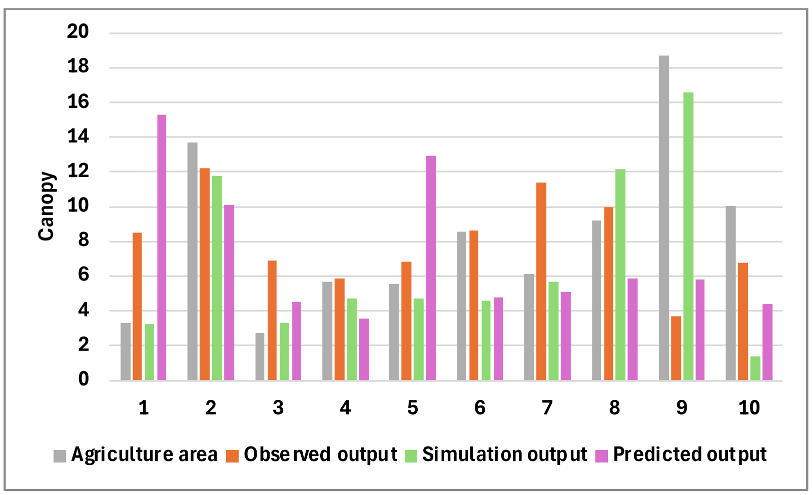


Figure 9: Harvesting Result Analysis

The number of those participating in the computerized examination and practical evaluation varied from 1 to 10. The table illustrates a representation of the consumer's farm property. The above computation and table depict the actual crop yield shows in figure 9. The model's outputs and the accompanying outcomes are assessed and contrasted. The analysis reveals that the projected production and the process are enhanced when the client has limited land accessible for agriculture.

## 5 Conclusion

The research established a system for preventing and managing agricultural diseases and pest insects by integrating ozone sanitation, light traps, and IoT technologies. Two categories of protection for plant devices were developed: one for application in manufacturing plants and another for field usage, eliminating the necessity for conventional pesticide application during crop cultivation. These gadgets were outfitted with numerous sensors that gather and analyze real-time environmental information, enabling farmers to assess crop growth conditions and enhance productivity. The IoT-based database management system allows remote operation of protective equipment and the intelligent administration of gathered plant security information. Furthermore, this system can integrate the scheduling of plant safeguarding tasks and work together across several devices. The research demonstrated that the architecture is user-friendly and displays security, practicality, and robust scalability in facilities and field applications. The technology successfully manages pests and diseases without negatively impacting normal crop development, substantially reducing the quantity of chemical pesticides utilized and dramatically lowering agrochemical and labor expenses. This study is an example of the advancement of intelligent apparatus that prevents and handles the spread of illnesses and insect infestations using physical management techniques.

The subsequent problem is to attain intelligent and exact avoidance and control of illnesses and pests utilizing frequency information. Future endeavors will concentrate on the meticulous regulation of ozone levels, adaptable modification of insecticide lamp operational hours, and real-time detection and surveillance of illnesses and pests, with the objective of advancing an intelligent iteration of the current system.

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