**Chapter IV**

**4.1 Overview of the System Outputs**

The SMART HYDROPONICS system is equipped to monitor critical aspects of hydroponic farming, specifically nutrient levels, pH levels, and pest activity. The outputs are designed to provide actionable insights to growers in real-time. Key outputs include:

Real-time nutrient and pH level data: Displayed on the dashboard with color-coded alerts for thresholds.

Automated pest detection results: Images with highlighted pest-infected regions and suggested countermeasures.

System notifications: Alerts for critical conditions, such as nutrient deficiencies, unsafe pH levels, or pest presence.  
\*insert pic

**4.2 System Interface and Dashboard**

The system interface presents a consolidated view of all essential information. Features include:

Graphical representation: Line graphs displaying nutrient and pH trends over a 24-hour period.

Real-time pest detection module: Displaying captured images with pests marked in red rectangles.

Alert notifications panel: Listing recent system recommendations and warnings.

**4.3 System Outputs and Data Logs**

Below is a summary of the data recorded during the system trial period:

Timestamp Nutrient Level (ppm) pH Level Pest Detection Action Suggested

2024-11-27 08:00 950 6.5 No pests detected Maintain current conditions

2024-11-27 12:00 890 5.8 Aphids detected Apply neem-based pesticide

2024-11-27 16:00 870 5.4 Thrips detected Use organic pest repellents

**4.4 Analysis of System Performance**

Sensor Accuracy: The nutrient sensor and pH sensor achieved a 98% match when compared with manual testing devices.

Pest Detection: The system accurately identified pest infestations in 9 out of 10 test scenarios, with false positives occurring in 1 case due to lighting variations.

System Responsiveness: Alerts were delivered within 10 seconds of detecting anomalies, ensuring minimal delay in action.

found on leaf cluster A. Suggested action: Apply neem oil spray."