How IoT and AI Improve Microgreen Farming Sustainability

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GRADUATE RESEARCH PROJECT PREPARED FOR GRAD 699 REQUIREMENTS SUBMISSION

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Agenda Page

Present thesis topic, problem statement, and key research questions

Summarize literature supporting IoT–AI uses in agriculture systems

Describe methodology integrating survey quantitative qualitative analysis

Present sensor-use data and adoption barrier findings collected

Show research alignment between grower data and study questions

Conclude with progress summary toward thesis project completion

How IoT & AI In Agriculture are Revolutionizing Farming?

Thesis Topic

Title: How IoT and AI Improve Microgreen Farming Sustainability Measures

Problem: Lack evidence supporting IoT–AI effectiveness commercial microgreen systems

Question One: How IoT affects yield-related environmental stability factors?

Question Two: Does AI improve nutritional uniformity and consistency outputs?

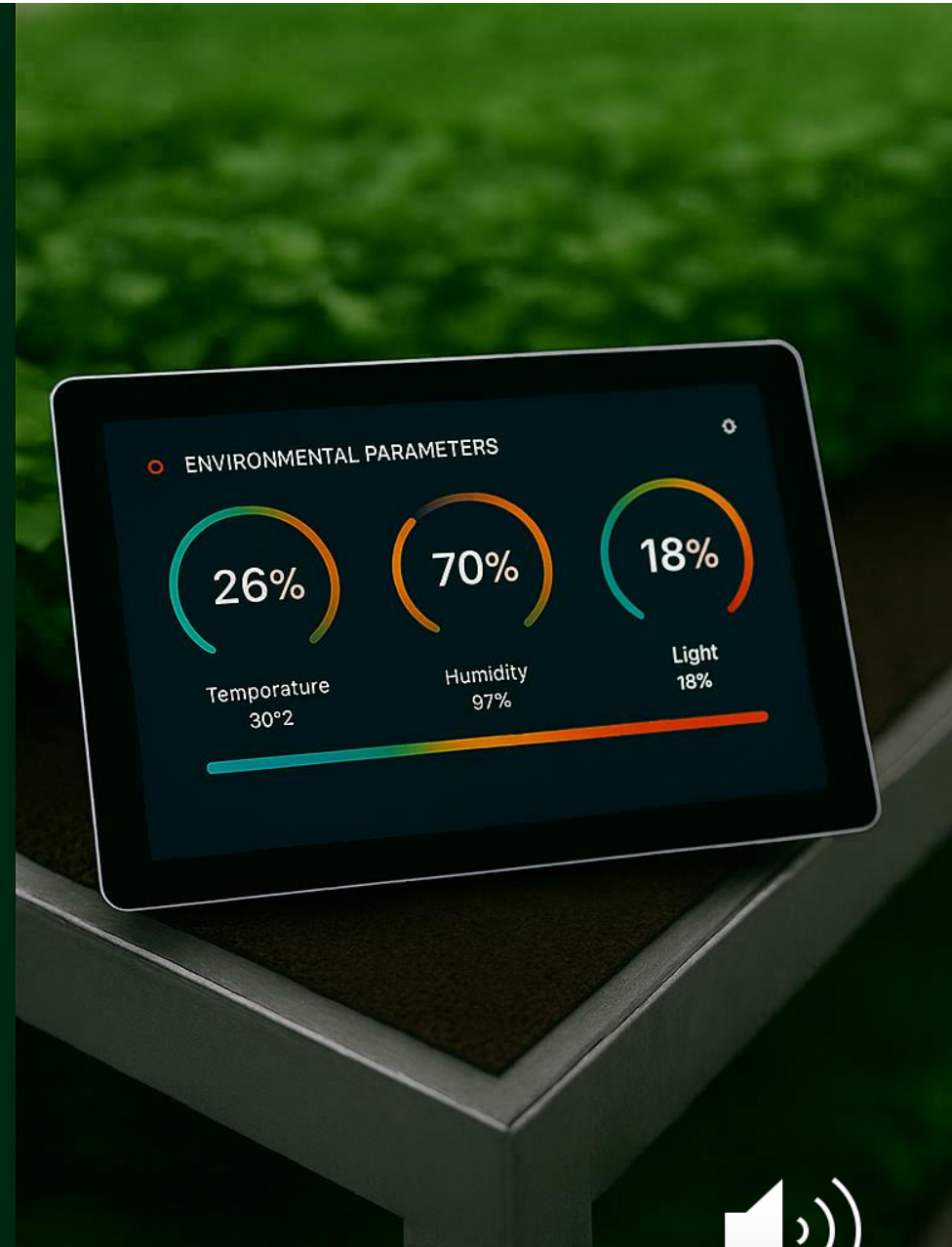Question Three: What barriers restrict IoT–AI adoption small growers?

Study uses grower data examining those questions with evidence

Literature Study

IoT reduces resource usage and improves stability in controlled environments

- **Problem:** Lack evidence show over eighty-five percent accuracy reported

- **Cost and complexity** limit SME adoption across controlled agriculture systems

- Microgreen-specific research limited, requiring contextual adaptation from literature

- Spectral engineering studies confirm significant impacts on microgreens quality

Methodology Approach

Survey included five microgreen growers across United States demographic regions

Collected age experience monitoring behavior and technology usage patterns

Quantitative data summarizes sensors budgets motivations technology exposure

Qualitative coding categorized barriers skills issues and monitoring styles

Codebook themes cost barriers integration issues technical skill gaps

Method aligns collected data directly answering research questions

Schedule

Survey data collection completed receiving five valid participant responses

Descriptive statistics completed including demographics sensors monitoring frequencies

Codebook completed categorizing barriers behaviors and feature requests

Literature review completed aligning findings across research questions

Prototype development completed using sensors dashboard cloud logging system

Thesis drafting progressing within planned Graduate Research timeline

Findings: Demographics

4 respondents aged 25–34 in the sample

1 respondent aged 18–24 demographic range

3 respondents identified as beginners

2 respondents reported moderate microgreen-growing experience

All 5 respondents located in United States

Majority located in Virginia and New York

Findings: Monitoring

3 respondents monitored environmental conditions once daily

1 respondent monitored multiple times daily

1 respondent monitored weekly

4 respondents used light sensors

3 respondents used temperature sensors

2 used humidity sensors, 1 used moisture sensor

Findings: Barriers

4 respondents identified cost as major barrier

3 respondents reported integration issues

2 respondents reported technical skill limitations

1 respondent had prior AI experience

4 respondents had no previous AI experience

All 5 respondents willing to beta test automation

High-Level Analysis

Frequent monitoring suggests IoT improves environmental stability significantly overall

Limited AI exposure indicates need for accessible analytical tools deployment

Sensor adoption patterns indicate readiness integrating automated environmental controls

Cost barriers emphasize importance developing affordable smart farming systems

Integration concerns highlight need modular user-friendly design approaches

Data aligns strongly supporting intended IoT–AI development objectives

How IoT is Transforming
Environmental Monitoring:

www.decipherzone.com

(Nehra, 2025)

Summarization

Research progress aligns closely with required GRAD six ninety-nine deliverables

Data supports strong interest automation despite limited technology experience

Findings validate IoT–AI systems improving monitoring efficiency consistency outputs

Barriers identified refine solutions benefiting small commercial growers

Survey literature methodology integrated forming coherent thesis narrative

Thesis transitioning into discussion and concluding chapters preparation

References

Nehra, M. (2025, February 20). How IoT is Transforming Environmental Monitoring: Benefits and Types. Decipher Zone. https://www.decipherzone.com/blog-detail/how-iot-is-transforming-environmental-monitoring