Work Breakdown Structure (WBS) Diagram

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1. Project management

1.1 Project initiation

1.1.1 Define project scope and determine project budget

1.1.2 Develop project schedule

1.1.3 Prepare Project Charter

1.1.4 Develop Stakeholder Register

1.2 Project planning

1.2.1 Prepare Project Management Plan

1.2.2 Develop Work Breakdown Structure (WBS)

1.2.3 Develop Design Document

1.3 Project execution

1.3.1 Conduct Sprint Planning events

1.3.2 Acquire resources (conduct procurements)

1.3.3 Manage quality

1.3.4 Manage project knowledge

1.3.5 Manage stakeholder engagement

1.3.6 Implement risk mitigation plans

1.4 Project control

1.4.1 Monitor and control project work

1.4.2 Perform integrated change control

1.4.3 Validate scope and control quality

1.4.4 Control schedule

1.4.5 Control costs and procurements

1.4.6 Control resources

1.4.7 Monitor risks

1.4.8 Monitor stakeholder engagement

1.4.9 Conduct Sprint Review and Sprint Retrospective events

1.5 Project closing

1.5.1 Verify project deliverables

1.5.2 Conduct project performance analysis

1.5.3 Document challenges and lessons learned

1.5.4 Prepare Project Summary Report and final Cost Report

1.5.5 Organize project repository and archive documentation

2. IoT compute unit

2.1 Hardware procurement

2.1.1 Select and procure Raspberry Pi as microcomputer of IoT system

2.2 Hardware setup

2.2.1 Assemble hardware components of Raspberry Pi compute unit

2.3 Software development

2.3.1 Set up Raspberry Pi OS

2.4 Testing

2.4.1 Perform system testing of Raspberry Pi compute unit

3. Data collection system from sensors

3.1 Hardware procurement

3.1.1 Select and procure electronic sensors for telemetry of IoT system

3.2 Hardware setup

3.2.1 Assemble hardware components of electronic sensors

3.2.2 Connect electronic sensors to Raspberry Pi compute unit

3.3 Software development

3.3.1 Develop sensor interfacing software

3.3.2 Develop data collection system from sensors to Raspberry Pi

3.4 Testing

3.4.1 Perform unit tests of sensor interfaces

3.4.2 Perform integration tests of data collection system

4. Peripheral device for power control

4.1 Supplies procurement

4.1.1 Select and procure components for power control device

4.2 Hardware development

4.2.1 Design electronic circuit of power control device

4.2.2 Manufacture and assemble power control device

4.2.3 Connect and integrate power control device with main system

4.3 Testing

4.3.1 Perform functional testing of power control peripheral device

4.3.2 Perform integration tests of power control peripheral device

5. Peripheral device for irrigation control

5.1 Supplies procurement

5.1.1 Select and procure components for irrigation control device

5.2 Hardware development

5.2.1 Design electronic circuit of irrigation control device

5.2.2 Manufacture and assemble irrigation control device

5.2.3 Connect and integrate irrigation control device with main system

5.3 Testing

5.3.1 Perform functional testing of irrigation control peripheral device

5.3.2 Perform integration tests of irrigation control peripheral device

6. Peripheral device for fertilizer injection

6.1 Supplies procurement

6.1.1 Select and procure components for fertilizer injection device

6.2 Hardware development

6.2.1 Design electronic circuit of fertilizer injection device

6.2.2 Manufacture and assemble fertilizer injection device

6.2.3 Connect and integrate fertilizer injection device with main system

6.3 Testing

6.3.1 Perform functional testing of fertilizer injection device

6.3.2 Perform integration tests of fertilizer injection device

7. Embedded PCB

7.1 Supplies procurement

7.1.1 Select and procure components for embedded PCB

7.1.2 Select PCB manufacturer of embedded PCB

7.2 Hardware development

7.2.1 Design electronic circuit of embedded PCB

7.2.2 Submit design of embedded PCB for manufacturing

7.2.3 Receive manufactured PCBs for embedded PCB

7.2.4 Solder electronic components and connectors onto embedded PCB

7.2.5 Connect and integrate embedded PCB with main system

7.3 Testing

7.3.1 Perform functional testing of peripheral IoT devices

7.3.2 Perform integration tests of peripheral IoT devices

7.3.3 Perform continuity testing of embedded PCB

7.3.4 Perform functional testing of embedded PCB

7.3.5 Perform integration tests of embedded PCB

8. Web dashboard

8.1 Deployment environment setup

8.1.1 Set up development environment

8.1.2 Set up testing environment

8.1.3 Set up production environment

8.2 Frontend development

8.2.1 Design user interface (UI) of web dashboard

8.2.2 Implement data visualization for web dashboard

8.2.3 Implement real-time updates of web dashboard

8.2.4 Develop user input forms for web dashboard

8.3 Backend development

8.3.1 Implement data transmission from Raspberry Pi to cloud

8.3.2 Set up database for web dashboard

8.3.3 Develop API of web dashboard

8.3.4 Implement data processing logic of web dashboard

8.3.5 Develop historical data tracking for web dashboard

8.3.6 Develop notification system for web dashboard

8.3.7 Develop environmental control system for web dashboard

8.4 Testing

8.4.1 Perform unit tests of frontend components

8.4.2 Perform unit tests of backend components

8.4.3 Perform integration tests of web dashboard

8.4.4 Perform user acceptance testing (UAT) of web dashboard

9. Product documentation

9.1 Technical documentation

9.1.1 Create Device Specifications document

9.1.2 Finalize Design Document

9.2 Marketing

9.2.1 Create promotional materials about GrowHub project

9.2.2 Create promotional materials about GrowHub product