# Arduino Microcontroller-Driven Indoor Hydroponic Fodder System

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# Introduction

• Hydroponics is transforming agriculture through indoor growth capabilities . A fully automated mini fodder grow chamber has been developed for rapid indoor fodder production.

• The system features a temperature-controlled chamber, grow lights for simulated sunlight, and water/moisture monitoring . An Arduino controller, interfaced with a keypad, collects user inputs on water flow and indoor temperature . Continuous monitoring using water, moisture, and temperature sensors ensures optimal indoor conditions.

• A motorized pump, controlled by the Arduino, maintains water levels for ideal moisture conditions . The system automates indoor artificial sunlight cycles as specified by the user . Efficiently managed by the Arduino, the entire operation is repeated regularly without failure . An alarm alerts users if the water tank is depleted, enhancing system reliability . Overall, the system establishes an automatic indoor fodder growth environment using Arduino control.

# Problem Statement

- Traditional agriculture, despite using a small amount of resources, faces limitations in meeting growing food demands due to genetic and chemical constraints . Intensification and expanding land for food production are considered the main options, with 70% of global water usage dedicated to agriculture, driven by unsustainable irrigation practices . Currently, 38% of non-frozen land is used for food production, and projections suggest a need to convert 593 million hectares into agricultural land by 2050 to meet global calorie needs.

- This expansion poses a threat to essential ecosystems, particularly rainforests, which house the majority of the world's biodiversity and play a crucial role in carbon balance . Deforestation, driven by industrial agriculture, contributes to anthropogenic carbon emissions and a significant decline in biodiversity, with 52% of vertebrate species richness already destroyed.

# Motivation and Significance of the Project

In hydroponic farming, plants are grown in nutrient-rich water solutions rather than soil. Hydroponic farming initiatives are linked to various noteworthy factors and incentives.

- Resource Efficiency
- Year-round Crop Production
- Space Utilization
- Faster Growth
- Consistency
- Environmental Sustainability
- Optimal Nutrient Management
- Educational Opportunities
- Community and Economic Development
- Innovation and Technology Integration
- Food Security

# Aim and Objectives of the Proposed Project

- Aim

➢ improvement of hydroponic cultivation using modern technology

- Objectives

➢ **Sustainable Agriculture**: Promote environmentally conscious farming practices that utilize resources efficiently.

➢ **Year-round Crop Production**: Ensure consistent, uninterrupted crop output unaffected by seasonal variations.

➢ **Water Conservation**: Optimize water usage through reduced waste and improved irrigation techniques.

➢ **Maximize Space Utilization**: Utilize vertical farming and small hydroponic systems to efficiently use available land or space.

- **Enhance Crop Quality**: Cultivate advanced crops with improved flavor, nutritional content, and aesthetic appeal.
- **Increase Crop Yield**: Surpass conventional soil-based farming in terms of yields per unit area.
- **Illness and Vermin Control**: Mitigate the risk of soil-borne illnesses and pests through regulated growing environments.
- **Localized Food Production**: Foster local food security by growing fresh produce within the community.
- **Educational Outreach**: Provide educational programs to the public and schools, promoting awareness of modern farming methods and sustainability.
- **Job Creation**: Establish and maintain hydroponic farming systems to create employment opportunities in the community.
- **Food Innovation**: Encourage experimentation with a variety of crops, especially those less common in traditional agriculture, to promote food innovation.
- **Adaptability to Varied Environments**: Develop flexible hydroponic systems capable of adapting to diverse environmental and geographic conditions.

# Major Process

An auto indoor hydroponic fodder grow chamber is designed to facilitate the automated and controlled cultivation of nutrient-rich fodder for livestock.

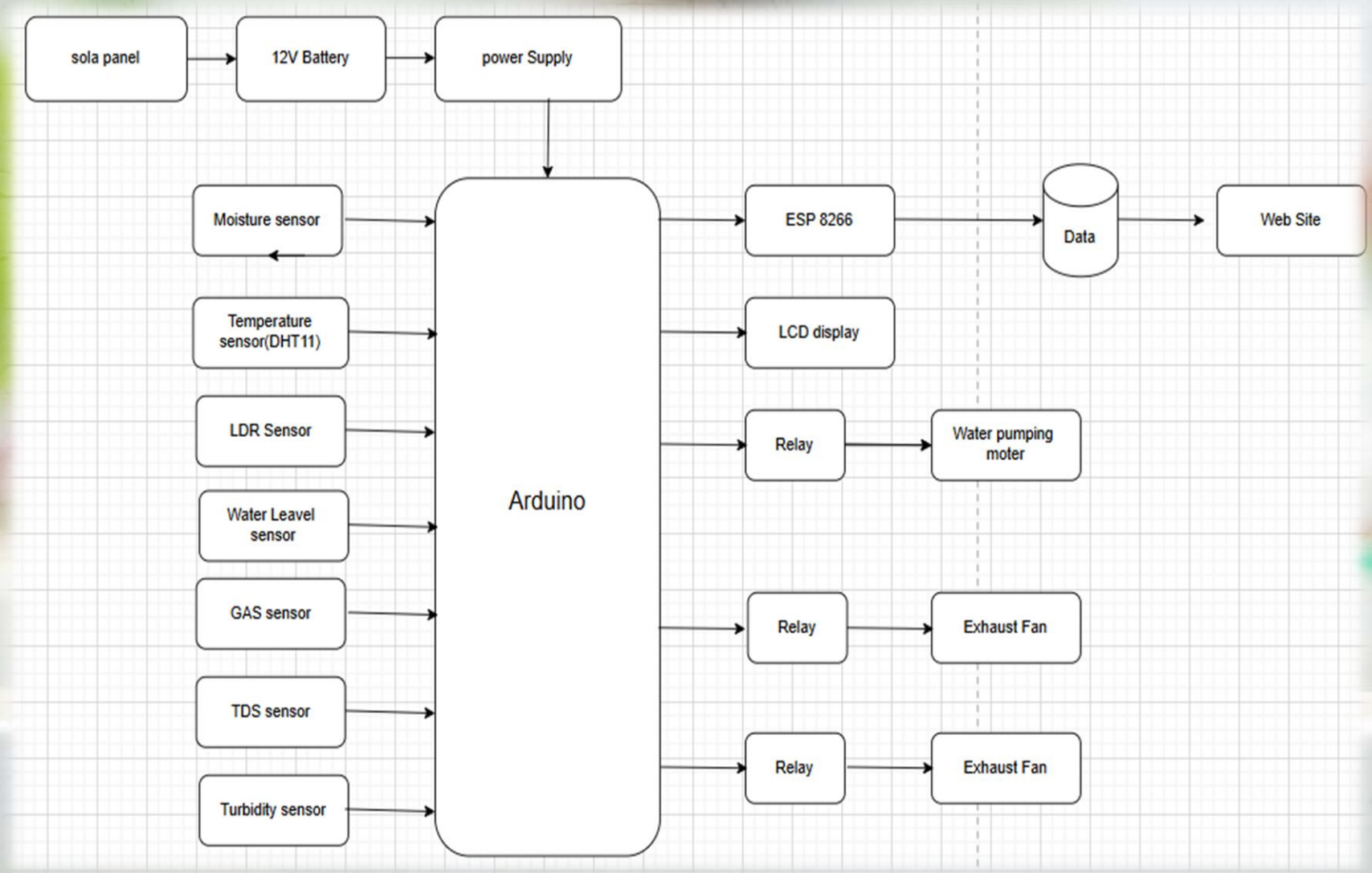
- **Germination Containers**: Evenly distribute seeds in specialized trays or containers with built-in mechanisms for maintaining optimal humidity and temperature levels.
- **Automated Watering System**: Employ an automated watering system to ensure consistent and sufficient moisture for germinating plants.
- **Nutrient Delivery**: Supply essential nutrients through hydroponic fertilizer solutions, delivered to growing roots via regulated mechanisms or pumping systems.
- **Temperature and Humidity Control**: Continuously monitor and control the environment within the grow chamber for both temperature and humidity, crucial for promoting healthy and rapid plant growth.
- **Lighting System**: Utilize artificial lighting systems, such as LEDs, to provide steady and regulated light cycles, mimicking the effects of natural sunlight for efficient photosynthesis.

# Expected Deliverables

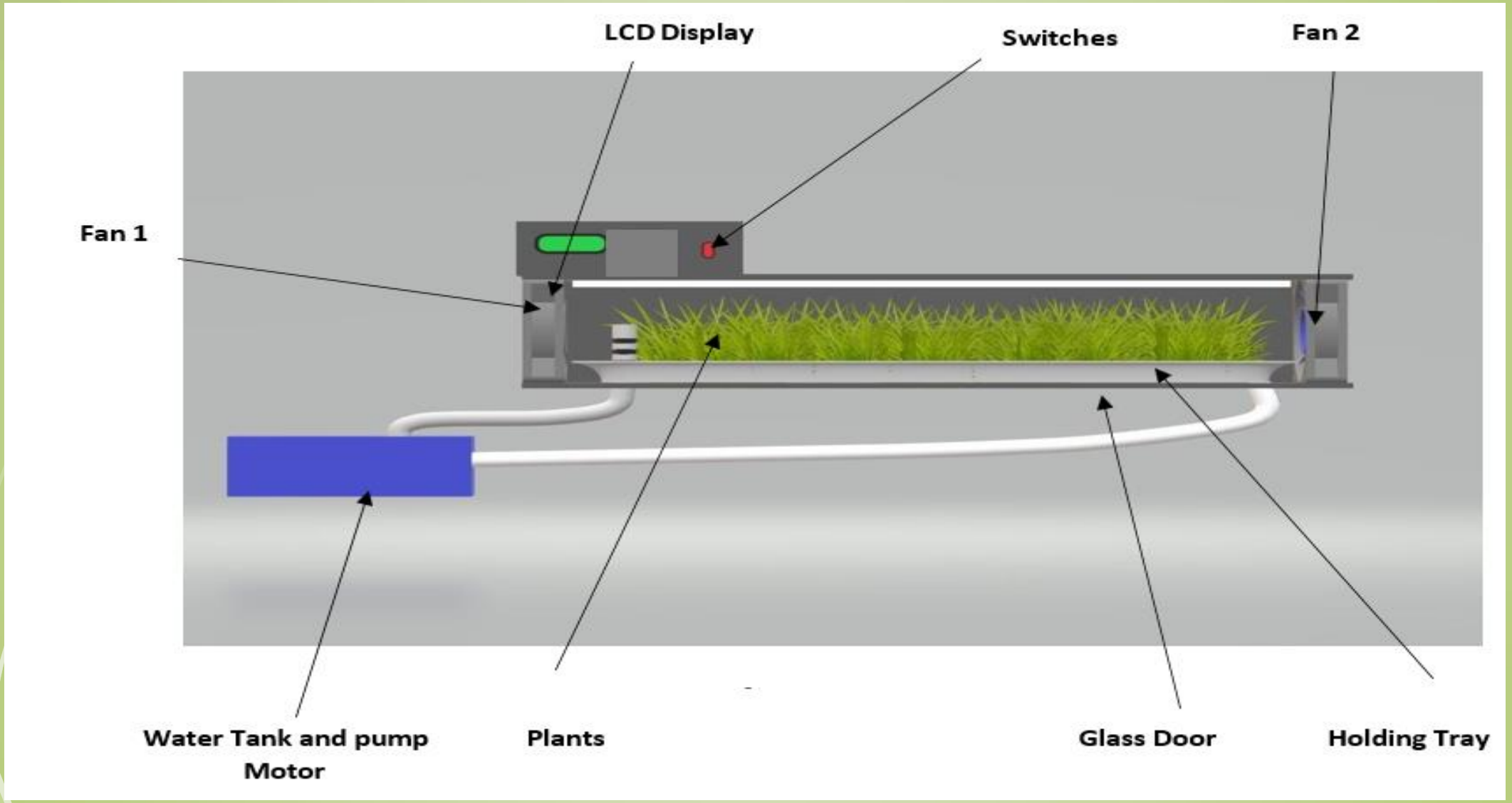
- Design Diagrams
- Block diagrams
- Test Cases and Test Results
- Source Codes
- User manual
- Mobile app

# System Overview

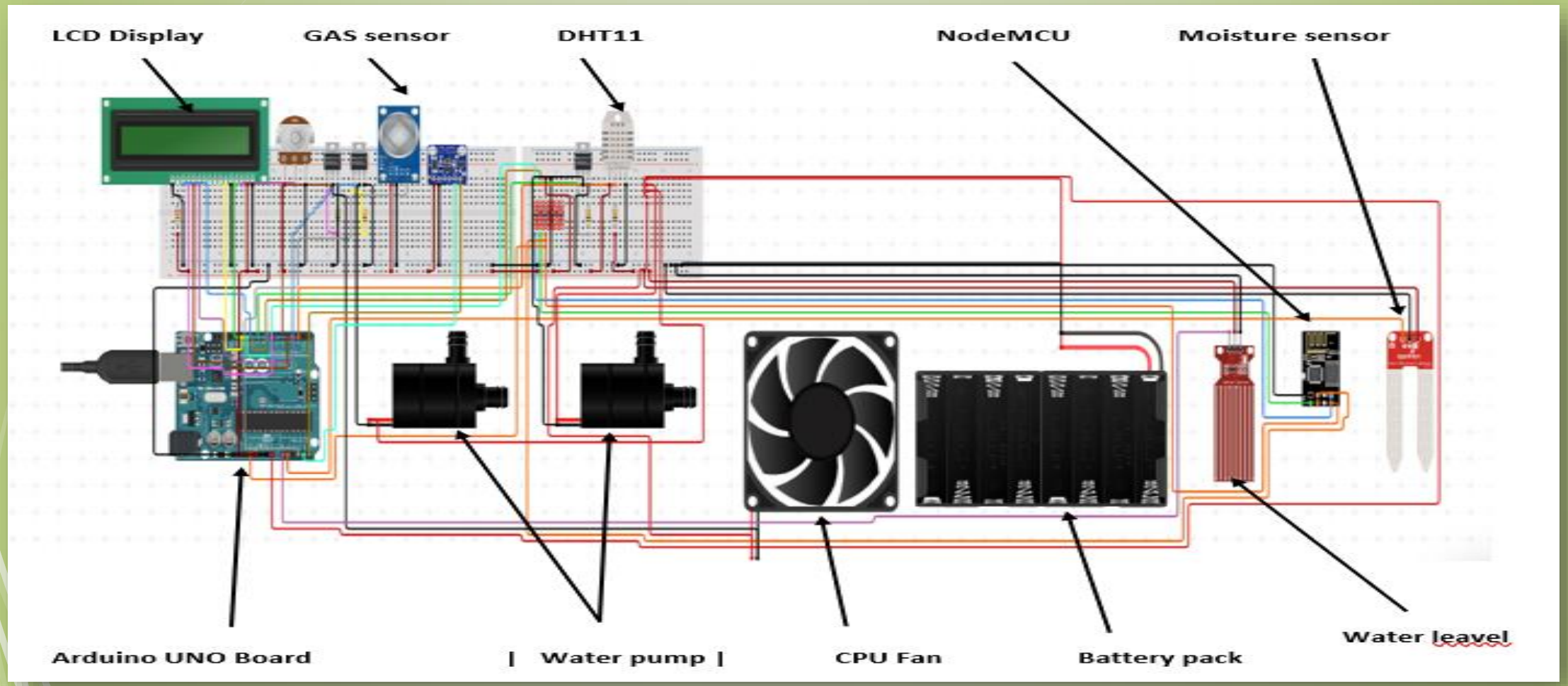
- Block Diagram



- Design Diagram



# Circuit Diagrams



# Hardware and Software Requirements

- Hardware Requirement

  - Arduino
  - Water Sensor
  - TDS Sensor
  - Turbidity Sensor
  - Moisture Sensor
  - Temperature Sensor
  - Artificial Solar Light(LDR Sensor)
  - Pump Motor
  - LCD Display
  - LED’s
  - Switches
  - Water Tank
  - Pipes and Tubes
  - Resistors
  - Capacitors
  - Diodes
  - Transistors
  - Outer Frame
  - Mounts and Fittings
  - Supporting Frame
  - Screws & Joints
  - GAS sensor
  - Sola panel

- Software Requirement

  - Operating System: Any Android/ios Phone
  - Development Environment:Visual Studio Code
  - Languages: React Native (JSX)
  - Minimum 4GB RAM

# Ongoing Project

# References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2 S. S. Turakne, 11 03 2021. [Online]. Available: https://ijsrset.com/IJSRSET2183177.

3 https://journal.hmjournals.com/index.php/IJAAp International Journal of Agriculture and Animal Production

4 https://doi.org/10.32628/IJSRSET83177 International Journal of Scientific Research in Science

5 https://doi.org/10.4038/kjms.v6i1.108 KDU Journal of Multidisciplinary Studies

6 www.mdpi.com/journal/sensors vertical hydroponics; indoor farming; automated system

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Thank You