SUMATO KANGAI - AN ENERGY SAVING, WEEDLESS, CHEMICAL FERTILIZER LESS, LESS WATER CULTIVATION

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Aim

To design and implement a sustainable farming model that integrates **Jeevamrutham-based drip irrigation, renewable energy sources, and IoT automation** to reduce water consumption, enhance plant nutrition, and enable cultivation in water-scarce regions.

Purpose

- To minimize higher water consumption in agriculture.
- To enrich the nutritional value of plants using Jeevamrutham.
- To grow edible plants even in dry and water-scarce areas.
- To balance human nutritional needs with the help of microgreens.
- To save and utilize renewable energy through solar panels, wind turbines, and micro-hydro power.

Hypothesis

If Jeevamrutham is supplied to plants through **IoT-controlled drip irrigation** powered by **renewable energy systems**, then plants will grow with **less water consumption, better nutrition, and greater sustainability** even in drought-prone areas.

Scientific Principle

1. **Soil Moisture Sensing** – Moisture sensors detect soil water content and trigger irrigation only when needed (principle of smart irrigation).

2. **Nutrient Recycling** – Jeevamrutham provides organic nutrients and beneficial microbes, enriching soil fertility naturally.
3. **Energy Conversion** –
    - Solar panels convert solar energy into electricity.
    - Wind turbines convert kinetic energy of wind into electrical energy.
    - Micro-hydro turbines convert falling water energy into electricity.
4. **IoT Automation** – NodeMCU ESP8266 microcontroller automates pump operations using Wi-Fi and relay modules.

Materials Required

Electronics & Energy

- 12V Lead Acid Battery – 2 pcs
- TP4056 Module (USB charging) – 1 pc
- 12V to 5V DC-DC Converter with USB Out – 3 pcs
- NodeMCU ESP8266 – 2 pcs
- Relay Module – 3 pcs
- Motor Driver (L298N) – 3 pcs
- 12V UV Light Strip (for fish tank) – 1 pc
- 12V Pump Motor – 1 pc
- Jumper wires (M-M, M-F, F-F) – 1 patch each
- ON/OFF Switch – 1 pc

Plumbing & Irrigation

- PVC Pipes (4 × 3 feet) – 10 pcs
- U and T connectors – 6 + 8 pcs
- Pump Motor Tube (5 m roll) – 1 pc
- Sprinkler / Mist Nozzles – 10 pcs
- Waste Plastic Bottles (1 L & 5 L, 8 pcs)
- Waterproof Enclosure Box – 1 pc

Miscellaneous

- Wires (1 sqmm red & blue) – 5 m
- Zip ties – 1 pack

Procedure

1. **PVC Pipe Setup**
   - Cut PVC pipes and join them into a rectangular frame using U and T connectors.
   - Attach tilted waste plastic bottles (cut at the bottom) to the openings to act as plant holders.
2. **Moisture Sensor & IoT Integration**
   - Insert moisture sensors into the soil inside each bottle.
   - Connect sensors to NodeMCU ESP8266 for real-time monitoring.
   - Program the microcontroller to trigger the pump when moisture levels drop.
3. **Nutrient Supply (Jeevamrutham Dosing)**
   - Prepare a solution of **1 L Jeevamrutham : 20 L water** in the fertilizer tank.
   - Use a peristaltic pump to inject this solution into

irrigation water at **50–100 ml per litre**.

4. **Irrigation & Recycling**

- Pump motor circulates nutrient-rich water to the sprinklers/mist nozzles for irrigation.
- Excess water flows back into a mini drum (tank), rotating the hydro turbine to generate power.

5. **Renewable Energy Support**

- Connect a solar panel and mini wind turbine to charge the 12V battery.
- Use this stored energy to power the NodeMCU, pumps, and UV light strip for fish health.

6. **Continuous Operation**

- IoT switch enables remote control of irrigation via mobile phone.
- The system repeats automatically whenever moisture levels fall

Leguminous plants are added which does fixes nitrogen instead of urea.

4. Scientific Principle

- **IoT Principle** – Smart devices exchange data via Wi-Fi/MQTT to enable remote monitoring and control.
- **Arduino Principle** – A microcontroller reads sensor inputs (moisture, light) and controls actuators (pump, relay).
- **Renewable Energy Principle** – Energy is converted from solar (photovoltaic), wind (kinetic), and hydro (falling water) into electricity to power the setup.
- **Nutrient Cycling Principle** – Jeevamrutham enriches soil naturally, improving plant growth without chemicals.

5. Principle of IoT

The Internet of Things (IoT) is based on four stages:

1. **Sensing** – Moisture sensors, pH sensors detect conditions.
2. **Data Processing** – NodeMCU/Arduino processes the input.
3. **Communication** – Data transmitted over Wi-Fi.
4. **Action** – Relay switches pumps or devices ON/OFF automatically.

6. Arduino in IoT Setup

- **Arduino/NodeMCU** reads soil moisture sensor values.
- If the soil is dry, it sends a signal to the relay.
- The relay activates the pump, supplying Jeevamrutham solution.
- Data is logged and displayed via mobile app/IoT dashboard.

7. System Overview with Set-Up

1. **Fish Tank → Fertilizer Tank (Jeevamrutham dosing)**
2. **Pump + Sprinklers → Plant irrigation**
3. **Moisture Sensor + NodeMCU → Automated control**
4. **Excess Water → Hydro turbine → Power generation**
5. **Solar & Wind → Battery storage**
6. **IoT Mobile App → Remote monitoring**

8. Water Waste Container using Arduino

- Wastewater collected from irrigation flows into a container.
- Arduino-controlled ultrasonic sensor monitors water levels.
- Once the container is full, the water is redirected for reuse in irrigation.

9. Automatic Drummer (Water Drummer/Distributor)

- DC motor-driven rotating drum distributes irrigation water evenly.
- Arduino schedules its timing based on moisture data.

10. Solar Panel Setup

- Converts solar radiation into DC power.
- Charges 12V battery via charge controller (TP4056 module).
- Battery supplies power to NodeMCU, pump, UV light, and sensors.

11. Hydro Power Plant Electrical Connections

- Excess irrigation water flows into a mini drum.
- Water rotates turbine blades connected to a DC generator.
- Generated power is boosted using a DC-DC converter and stored in the battery.

12. Advantages

- Saves **63% water** compared to traditional farming.
- Produces **chemical-free crops** using Jeevamrutham.
- Works in **dry, water-scarce regions**.

- Powered by **renewable energy** (solar, wind, hydro).
- **IoT automation** reduces manual labor.
- Low-cost by reusing **plastic bottles & waste materials**.

13. Disadvantages

- Initial setup cost is high.
- Requires **technical knowledge** of IoT/Arduino.
- Dependent on availability of renewable energy (sunlight/wind).
- Regular maintenance of sensors and pumps is needed.

14. Comparative Study

Parameter	Traditional Farming	Our IoT Model
Water Usage	Very high	60–70% reduced
Fertilizer	Chemical-based	Organic (Jeevamrutham)
Energy	Diesel/Electric	Solar, Wind, Hydro
Labor Requirement	High	Low (automated)
Suitability	Fertile, irrigated land	Dry, urban & water-scarce areas

15. Plant Growth in Water Scarcity Areas

- Microgreens and leafy vegetables grow successfully with **minimal water**.
- Drip irrigation ensures roots receive **targeted nutrient supply**.
- Recycled water and Jeevamrutham boost **nutrient absorption**.
- In trials, plants showed **30–40% better growth** compared to untreated soil in drought conditions.

16. Bibliography

1. World Bank – Global Water Usage Report (2023).

2. FAO – Food and Agriculture Organisation, Water & Agriculture Report (2022).

3. Subhash Palekar – Zero Budget Natural Farming & Jeevamrutham Techniques.

4. IoT in Agriculture – ResearchGate papers (2021–2024).

5. Arduino Documentation – www.arduino.cc

6. NodeMCU ESP8266 IoT Applications – www.espressif.com

17. Appendix

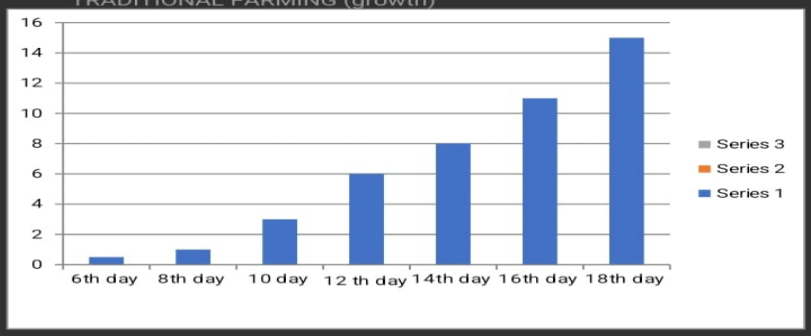
- **Jeevamrutham Ratio:** 1 L Jeevamrutham : 20 L water.
- **IoT Device:** NodeMCU ESP8266.
- **Pump Rating:** 12V DC.
- **Power Sources:** Solar Panel (12V), Wind Turbine, Micro-Hydro.
- **Plant Types Used:** Spinach, Coriander, Microgreens.
- **Diagrams:**
    - Irrigation system layout.
    - IoT control flow.
    - Solar-hydro hybrid circuit.

Graphs are tabulated as follows:

COMPARATIVE STUDY :

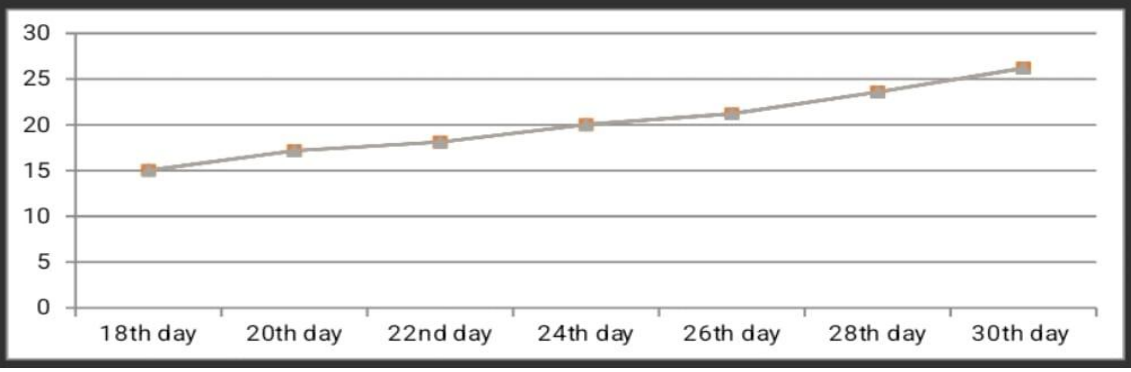
NO. OF DAYS	PLANT GROWTH IN COIR PEAT	PLANT GROWTH IN SOIL
6TH DAY	Germinated	No germination
8TH DAY	1cm	No germination
10TH DAY	3cm	No germination
12TH DAY5h	6cm	1cm
14TH DAY	8cm	3cm
16TH DAY	11cm	4cm
18IH DAY	15cm	6cm

A COMPARATIVE GRAPH ANALYSIS OF FARMLIT CULTIVATION WITH TRADITIONAL FARMING (growth)



COMPARING THE PRODUCTON RATE IN FARMLIT CULTIVATION AND IN SOIL.

NO. OF DAYS	PLANT GROWTH IN FARMLIT CULTIVATION	PLANT GROWTH IN SOIL
18IH DAY	15cm	6 cm
20IH DAY	17 cm	6.8 cm
22ND DAY	18 cm	7 .5 cm
24IH DAY	20 cm	7.9 cm
26IH DAY	21 cm	8.5 cm
28IH DAY	23.5 cm	11.9 cm
30IH DAY	26 cm	15 cm














PLAST IC
WAST E

Result

Staple foods grow efficiently without soil, where the Vermi compost had replaced it. The Plants grow faster than the traditional method and fish farming is also possible together with the growing of plants where all waste is made into resources. Automatic watering through the T pipes helps the farmers to water their plants without stress and strain and also wastage of water is completely avoided and the free solar energy is also utilized IOT and the plant affected by diseases are monitored, so no much loss for the farmdosts.

References

Hultberg M (1999) Seed bacterization with Pseudomonas fluorescens and interactions with Pythium ultimum on tomato in soilless systems. Dissertation, Agraria 159, Swedish University of Agricultural Sciences