कृषि एवं किसान कल्याण मंत्रालय
MINISTRY OF AGRICULTURE AND FARMERS WELFARE

NATIONAL BANK FOR AGRICULTURE AND RURAL DEVELOPMENT
NABARD

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AGRISURE GREENATHON

Team Details

- Team Name: **Krishi Pragati**
- Team Leader Name: **ARPIT BOHRE**
- Problem Statement: **Smart Agriculture on a Budget (**Small and marginal farmers face challenges in optimizing water usage due to high-cost smart agriculture technologies)

Brief about the idea:

Smart PM-KUSUM Irrigation system with GSM and Sensors.

Problem: Small and marginal farmers face challenges in optimizing water usage due to the high cost of smart agriculture technologies and limited access to real-time data.

Solution: A low-cost, solar-powered irrigation system equipped with soil moisture sensors and GSM (Global System for Mobile Communications) technology to provide farmers with data-driven insights and remote control over their irrigation system.

Key Benefits:

- Reduced water wastage
- Increased crop yield
- Environmental sustainability
- Farmer convenience through remote control via SMS

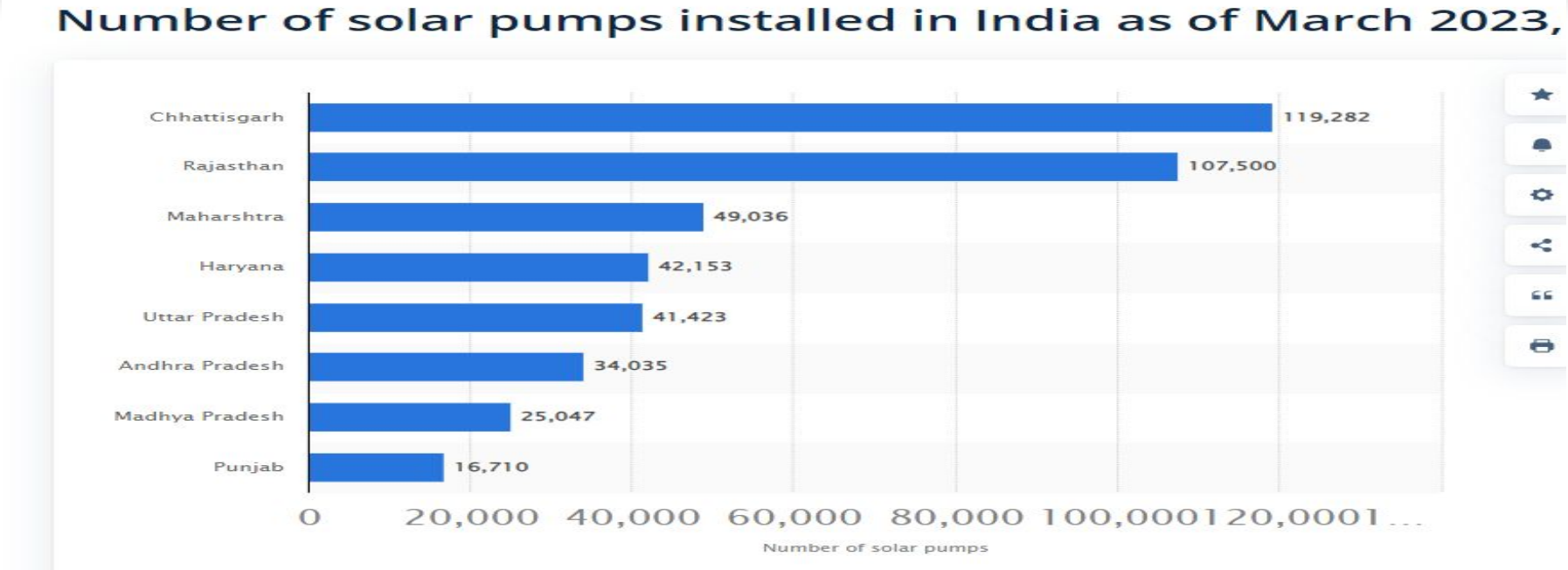
By combining solar power, soil sensors, and GSM technology, this solution offers a comprehensive approach to efficient and sustainable irrigation management for small-scale farmers.

Opportunities

- How different is it from any of the other existing ideas?

Key Differentiators:

- **PM-KUSUM scheme:**Integration of smart solution to the existing irrigation system which farmers installed under PM-KUSUM (Pradhan Mantri Kisan Urja Suraksha evam Utthaan Mahabhiyan) scheme.
- **Focus on small and marginal farmers:** solution directly addresses the specific needs of a market segment. tailor made solutions can be provided to farmers.
- **Low-cost approach:** Emphasizing affordability makes technology accessible to a wider range of farmers.
- **GSM integration:** The ability to remotely control the irrigation system offers greater flexibility and convenience for farmers.**does not require internet connection**.
- **Data-driven decision making:** Using soil moisture data to optimize irrigation schedules provides a significant advantage over traditional methods.



The Union Minister for Power and New and Renewable Energy in a written reply to a question in the Lok Sabha announced that over 295,000 standalone off-grid solar water pumps have been installed across India under Component B of the PM-KUSUM scheme for farmers.

- How will it be able to solve the problem?

➢ **Precision Irrigation:** By using soil moisture sensors, farmers can apply water only when and where it is needed,reducing wastage and optimizing water usage.protecting farmers from water distress situation.

➢ **Utilization of solar energy potential:** Through PM-KUSUM scheme government want to make farmers self reliant on energy production and also to increase farmer income as extra electricity produced can be feed in grid.

➢ **Data-Driven Decision Making:** Real-time data on soil moisture levels empowers farmers to make informed decisions about irrigation schedules, leading to improved crop health and yield.

➢ **Increased Efficiency:** Automation of irrigation tasks saves farmers time and labor, allowing them to focus on other farm activities.

➢ **Environmental Impact:** By optimizing water usage, the system contributes to water conservation and reduced environmental degradation.

➢ **Community Empowerment:** Encouraging knowledge sharing and collaboration among farmers can foster a sense of community and resilience.

➢ **Data-Driven Policy Making:** The system can generate valuable data on water usage, crop performance, and economic impact, which can inform agricultural policies and support sustainable practices.

Synergy between INDCs and SDGs

INDCs & Water

- Enhancing efficient use of water (WUE by 20%)
- Ensure water access
- Water harvesting & GW recharge
- Wastewater reuse (also source of nutrients)
- Increased forest/tree cover (C sink of 2.5-3 bil. t of CO_2 equivalent)
- Solar pumps (100K)

Harmonize complementarities

Proposed smart irrigation system helps in achieving Sustainable development goals for INDIA

- USP of the proposed solution

- **Integration with government schemes:** Aligning solution with existing government initiatives can increase its impact example **PM KUSUM Scheme.**
- **Affordability and Accessibility:** The system is designed to be cost-effective, making it accessible to small and marginal farmers with limited resources.
- **Data-Driven Decision Making:** The integration of soil moisture sensors and data analysis empowers farmers to make informed decisions for optimal crop growth.
- **Ease of Use:** The user-friendly interface and minimal technical requirements also system does not require internet so that farmers can easily operate the system without extensive training.
- **Bundled services:** Can Offer additional services like crop advisory, weather forecasts, or market price information can increase the value proposition.
- **Community Impact:** The potential for data sharing and collaborative decision-making can foster a stronger farming community and improve overall agricultural outcomes.

List of features offered by the solution

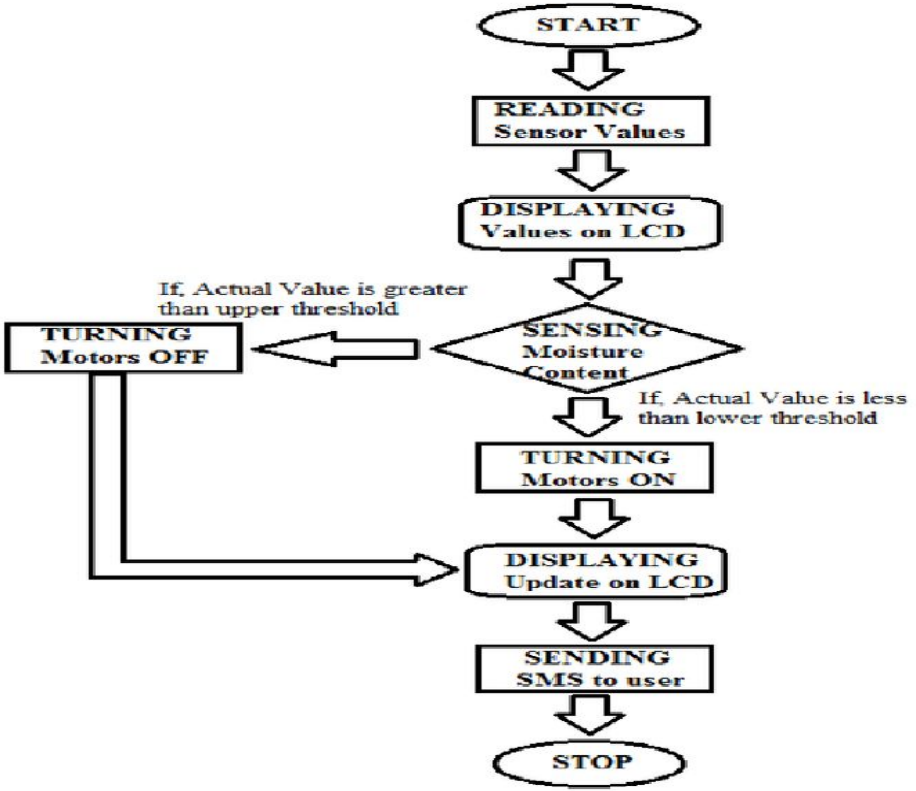
Core Features:

- **Solar Power Integration:** Harnessing renewable energy for sustainable operation.
- **Soil Moisture Sensing:** Real-time monitoring of soil moisture levels for precise irrigation.
- **GSM Module:** Remote control and monitoring of the irrigation system via SMS.
- **Automated Irrigation:** Scheduled or demand-based irrigation based on soil moisture data.
- **Data Logging and Analysis:** Recording and analyzing irrigation data for optimization.

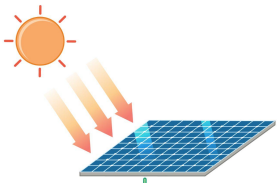
Additional Features:

- **Weather Data Integration:** Incorporating weather forecasts for more accurate irrigation scheduling.
- **Crop-Specific Recommendations:** Providing tailored irrigation advice based on crop type and growth stage.
- **Water Level Monitoring:** Tracking water tank or reservoir levels for efficient management.

Process flow diagram
or
Use-case diagram



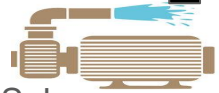
Architecture diagram of the proposed solution



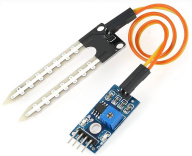
Solar Panel

Energy storage

Battery



Solar pump



Soil Moisture with threshold value

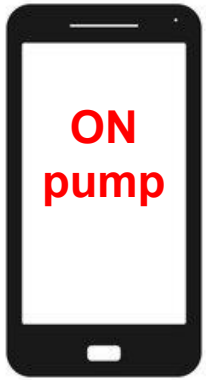
Pump ON command

Data transmitted to control system

Smart controller with

- **GSM modem**
- **LCD display**
- **LED**
- **Micro controller**

Message sent to farmer mobile to switch ON the water pump as soil moisture gone below the set value



Technologies to be used in the solution

Hardware Components:

- **Microcontroller:** Arduino, Raspberry Pi, or similar for system control and data processing.
- **Soil Moisture Sensors:** Capacitive, resistive, or neutron probe type based on soil conditions and cost.
- **Solar Panels:** Polycrystalline or monocrystalline panels for efficient energy conversion.
- **Battery:** Lithium-ion or lead-acid for energy storage.
- **Charge Controller:** MPPT (Maximum Power Point Tracking) charge controller for efficient solar energy harvesting.
- **Water Pump:** Submersible or surface pump based on water source.
- **GSM Modem:** For cellular communication and SMS control.
- **Sensors (optional):** Temperature, humidity, light, and rainfall sensors for additional data points.

Software and Communication:

- **Embedded Software:** Programming language like C++ or Python for microcontroller firmware.
- **Cloud Platform:** For data storage, analysis, and remote monitoring (e.g., AWS, Azure, Google Cloud).(***Optional)***
- **Mobile App Development:** For user interface and control (platforms like Android, iOS).(***Optional)***
- **Communication Protocols:** GSM, Wi-Fi, or LoRa for data transmission.(***Optional)***

Additional Considerations:

- **Power Management:** Efficient power management techniques to optimize battery life.
- **Data Analytics:** Machine learning algorithms for predictive modeling and optimization.
- **Cybersecurity:** Measures to protect data and system from unauthorized access.

THANK YOU

Submission by,

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