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TITLE PAGE

- **Problem Statement ID** – 1554
- **Problem Statement Title-** Smart Irrigation System for Precision Farming
- **Theme-** Agriculture, FoodTech& Rural Development
- **PS Category-** Hardware
- **Team ID-** 10761
- **Team Name (Registered on portal) -** Team XSpark

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SMART IRRIGATION SYSTEM

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Explanation of proposed solution:

- **Sensor Monitoring:**
  Real-time data from soil moisture, light, temperature, and water flow sensors.
- **Automated Irrigation:**
  Neural networks and fuzzy logic optimize water delivery.
- **Mobile Alerts:**
  Real-time monitoring and notifications via mobile apps.
- **Secure Scheduling:**
  Blockchain ensures transparent and reliable irrigation scheduling.
- **Efficiency:**
  Reduces water waste, costs, and manual intervention.

Innovation and Uniqueness of the Solution:

- Adaptive and Automated irrigation
- Machine Learning for Predictive Analytics
- Uses **LoRaWAN** for long-range, free data transfer, avoiding LTE costs.

How It Addresses the Problem:

- Optimized Water Usage and Irrigation
- Enhanced Crop Yields
- Minimise Manual Efforts
- Provides real-time farm data, accessible from any device

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TECHNICAL APPROACH

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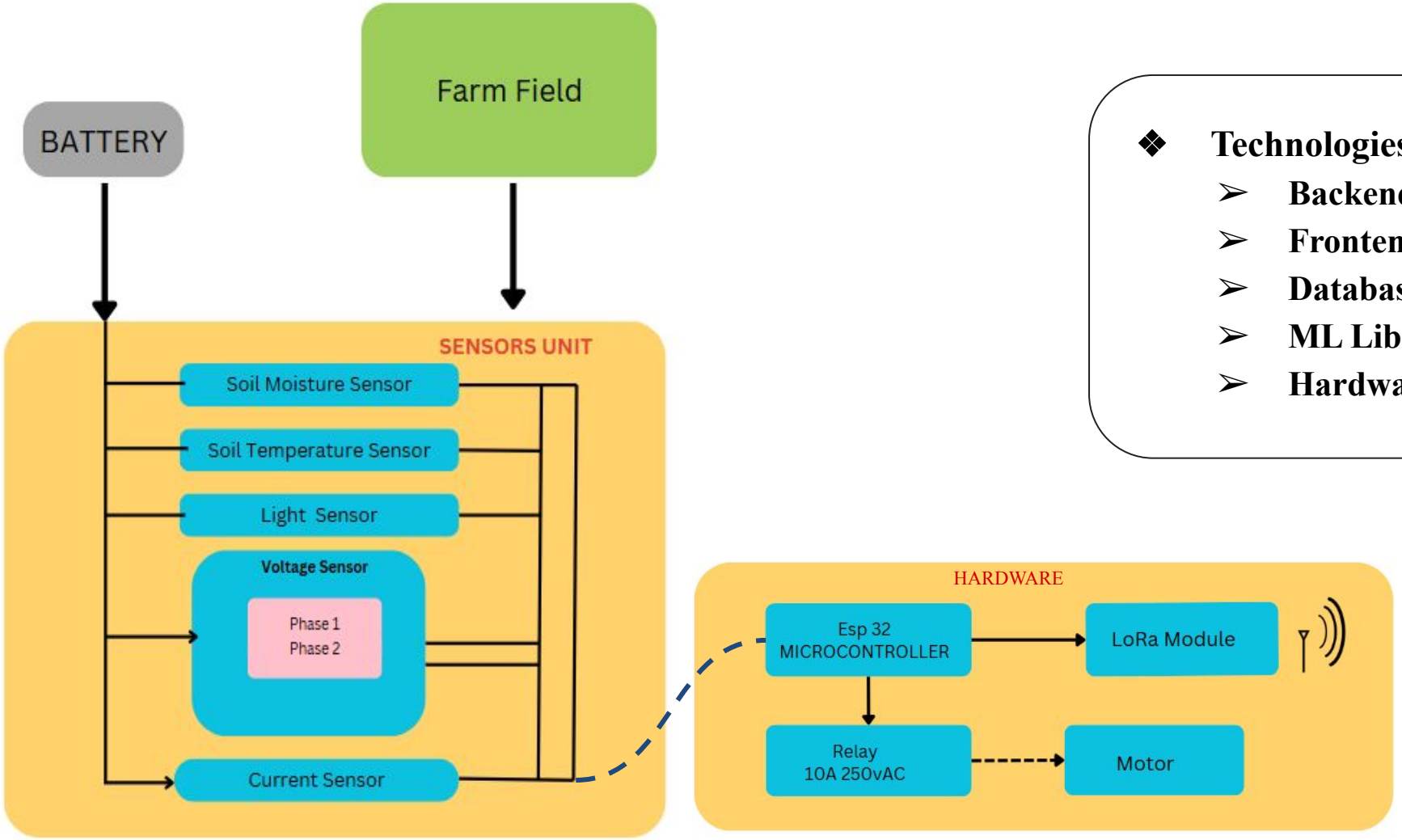

- **Technologies Stack :**
  - **Backend :** Python, Azure
  - **Frontend :** Kotlin
  - **Database :** Firebase
  - **ML Libraries :** TensorFlow, Scikit learn
  - **Hardware Coding :** C/C++

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FEASIBILITY AND VIABILITY

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Analysis of the Feasibility of the Idea

- **Technical Feasibility**: LoRaWAN enables cost-effective, long-range data transfer, making the system ideal for large farms. Sensor integration with automation and machine learning enhances performance.
- **Economic Feasibility**: The solution lowers water usage and labor costs, it provides long-term savings. Initial setup costs are balanced by reduced water bills and higher crop yields.
- **Operational Feasibility**: The system simplifies farm management by automating irrigation and providing remote access to farm data, making it easy to implement and manage, even for farmers with less technical expertise.
- **Scalability**: The use of LoRaWAN ensures scalability, making the system viable for farms of varying sizes, from small fields to large agricultural areas.

Overcoming Challenge

- **Water Wastage:** AI-powered precision irrigation minimizes overwatering.
- **Inconsistent Yields:** Precise scheduling improves crop health and maximizes yields.
- **Manual Labor:** Automation eliminates constant manual monitoring, saving time and resources.
- **Lack of Data:** Real-time data empowers informed decision-making.
- **Affordable:** Cost-effective solution accessible to all farmers.

Potential Challenges and Risks

- Integrating diverse technologies (sensors, machine learning , learning curve) into a cohesive system can be challenging.
- Ensuring reliable data transmission and processing in real-time.
- Software Glitches & Bugs
- Initial Investment & Learning Curve
- Data Privacy & Security

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IMPACT AND BENEFITS

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Impact on Target Audience:

- Optimizes watering for better growth.
- Significantly reduces water wastage.
- Lowers water bills and maintenance expenses.
- Simplifies with automation and remote control.
- Adapts changes through continuous learning.
- Improves decision-making with predictive analytics.

Benefits of the Proposed Solution

- **Social Benefits:**
- Enhances productivity and reduces labor.
- Reduces labor intensity and stress for farmers.
- **Economic Benefits:**
- Reduces water bills and maintenance expenses.
- Increases crop yields, boosting profitability.
- **Environmental Benefits:**
- Significantly reduces water wastage.
- Minimizes environmental footprint.
- **Operational Benefits:**
- Automates and streamlines irrigation.
- Utilizes machine learning for better predictions and adaptability.

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RESEARCH AND REFERENCES

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