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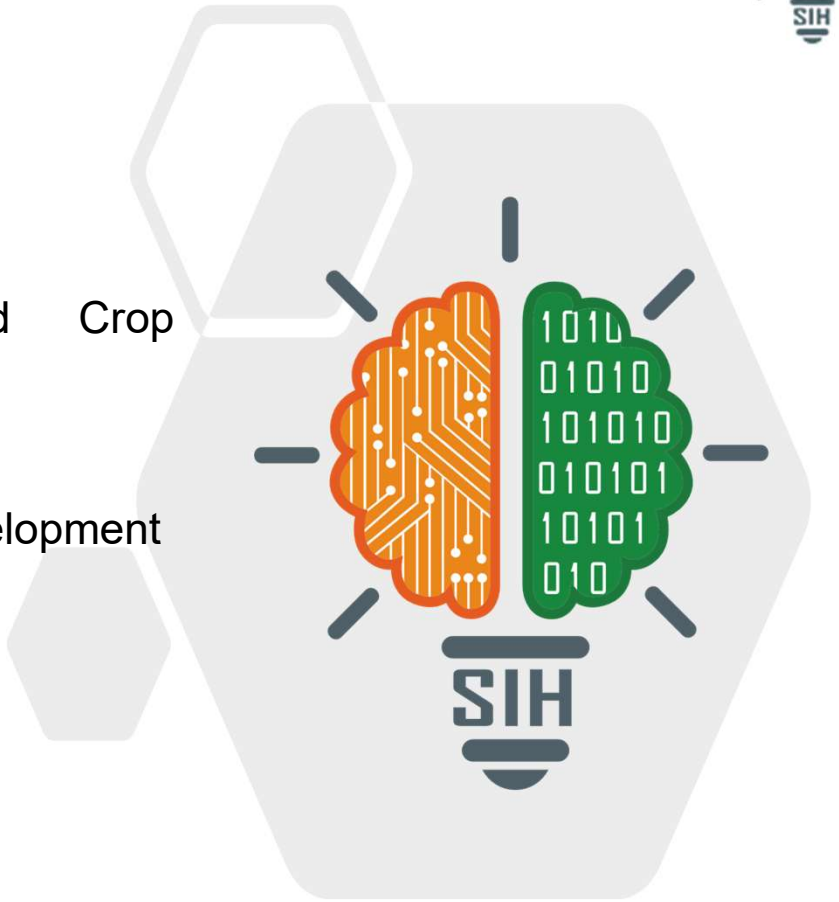
- **Problem Statement ID –** 25030
- **Problem Statement Title-** AI-Based Crop Recommendation for Farmers
- **Theme-** Agriculture, FoodTech & Rural Development
- **PS Category-** Software
- **Team ID-** 52
- **Team Name :** TechNest



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TerraMind

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Proposed System Overview: IoT-based soil sensing using ESP32 + NPK, pH, moisture, and temperature sensors. Data stored in MongoDB, integrated with live Weather API. AI Model analyzes soil param + weather conditions → crop suggestion + fertilizer advice.

Innovation & Uniqueness

🌾 First to integrate real-time NPK with AI and weather prediction for crop guidance

🧠 Pre-Trained AI model suitable for edge devices

💬 Voice-based chatbot interface, breaking literacy/language barriers

💰 Cost-effective & deployable in rural environments

Addresses the Problem:

- Helps farmers with real-time soil health insights.
- Avoids overuse of water/fertilizers, improving yield.

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TECHNICAL APPROACH

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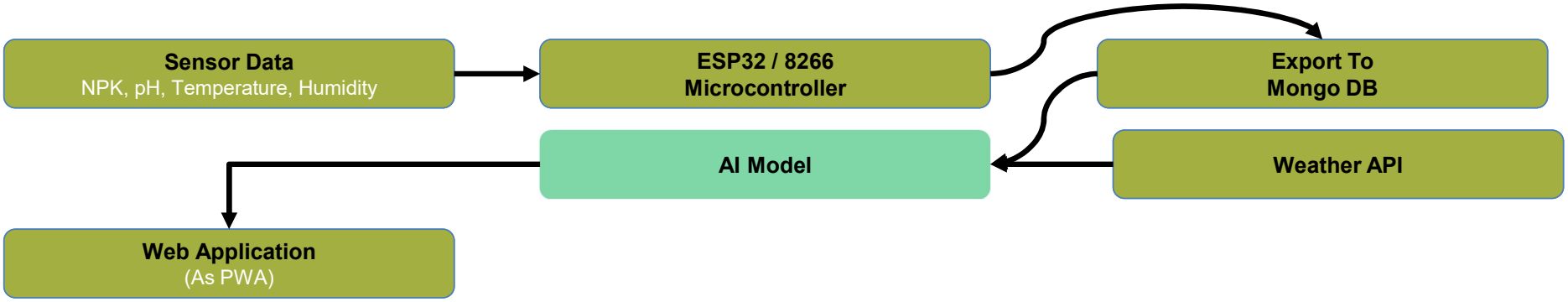
Technologies:

- **Hardware:** ESP32/8266, NPK Sensor, pH Sensor, Moisture Sensor.
- **Software**: MongoDB, Pre-Trained AI models (Ollama3, Gemini 2.5), Weather API, ReactJS (UI Library).
- **Interface**: Web & PWA with Chatbot Integration (multilingual + voice).



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FEASIBILITY AND VIABILITY

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Feasibility:

Low-power, affordable sensors + ESP32 (scalable for smallholder farms).

AI runs on lightweight models (cloud/edge/API).

Potential Challenges:

Sensor calibration for different soils.

Internet connectivity in rural areas.

Strategies to Overcome:

Offline caching, Push-Notification alerts.

Localized AI model tuning.

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IMPACT AND BENEFITS

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Target Audience:

Farmers (small & large scale), agri-tech startups, terrace gardeners.

Benefits:

- 🌱 Up to 30% yield improvement (better crop & nutrient planning).
- 💧 20–40% water savings (smart irrigation alerts).
- 👩‍🌾 Empowers smallholder farmers with real-time insights.
- 🌍 Supports sustainable agriculture & rural development.
- 💬 Voice-based chatbot overcomes literacy barriers.

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RESEARCH AND REFERENCES

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- Nigam et al. (2019) – ML algorithms for yield prediction.
- Mishra et al. (2016) – Neural networks in agriculture.
- Bang et al. (2019) – Fuzzy logic & weather data.
- IEEE ICACRS (2024) – Crop suggestion using CNNs.

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