🌾 AI-Driven IoT Concept: Smart Agriculture System

Objective

Design a smart agriculture system that uses AI and IoT to optimize irrigation, monitor crop health, and **predict crop yields** based on real-time environmental data.

🔧 Required Sensors

To monitor and manage the agricultural environment, the system will integrate the following IoT sensors:

- **Soil Moisture Sensor** – monitors water availability for crops.
- **Temperature Sensor** – tracks ambient temperature for plant growth analysis.
- **Humidity Sensor** – measures air moisture affecting plant transpiration.
- **Light Intensity Sensor** – tracks sunlight exposure.
- **pH Sensor** – checks soil acidity/alkalinity, critical for nutrient absorption.
- **Rain Sensor** – detects precipitation levels to adjust irrigation plans.

□ AI Model for Crop Yield Prediction

- **Model Type**: **Random Forest Regression**
  - Chosen for its robustness with tabular data, interpretability, and resistance to overfitting.
- **Inputs**:
  - Soil moisture levels
  - Average daily temperature and humidity
  - Light exposure hours
  - Rainfall patterns
  - Historical crop yield data
- **Output**: Predicted crop yield (in tons/hectare)

🔄 Data Flow Diagram (Overview)

```
[Sensors]
   ↓
[Edge Device (e.g., Raspberry Pi)] → [Preprocessing (filtering, normalization)]
   ↓
[Cloud Server / AI Model Hosting]
   ↓
[AI Model (Random Forest)] → [Crop Yield Prediction]
   ↓
[Farmer Dashboard / SMS Alerts]
```

✅ Benefits

- Reduces water and fertilizer waste
- Enables timely interventions for crop health
- Maximizes productivity with data-driven decisions