Task 2:

Objective:

Design a smart agriculture system for commercial farms using IoT sensors and an AI model to predict crop yields and optimize farm decisions.

System Description:

The proposed system focuses on integrating IoT sensors across the farm to collect real time environmental input data. The collected input data is then sent to the cloud for the designed prediction model to use the inputs and predict crop yields, also give recommendations. The results from the model are then visualized in an easy to digest way, using a dashboard that can be easily accessed on the mobile phone or computers by the farmers. To collect the input data or features that can be used by the model to predict, a quite number of data collector devices i.e. sensors are needed as fully tabled below.

Sensor	Purpose
Moisture sensor	Tracks and monitor soil moisture level to counter over/under watering
Rain sensor	Tracks rainfall and assist with irrigation timing or saving water
Humidity sensor	Tracks air humidity -useful to predict diseases
CO2 sensor	Monitors CO2 levels to assess plants respiration
Light sensor	Measure sunlight exposure for photosynthesis purposes
GPS location module	Pins the farms' location data and facilitate precision farming

The sensors therefore collect input data which can then be fed to the yield prediction model.

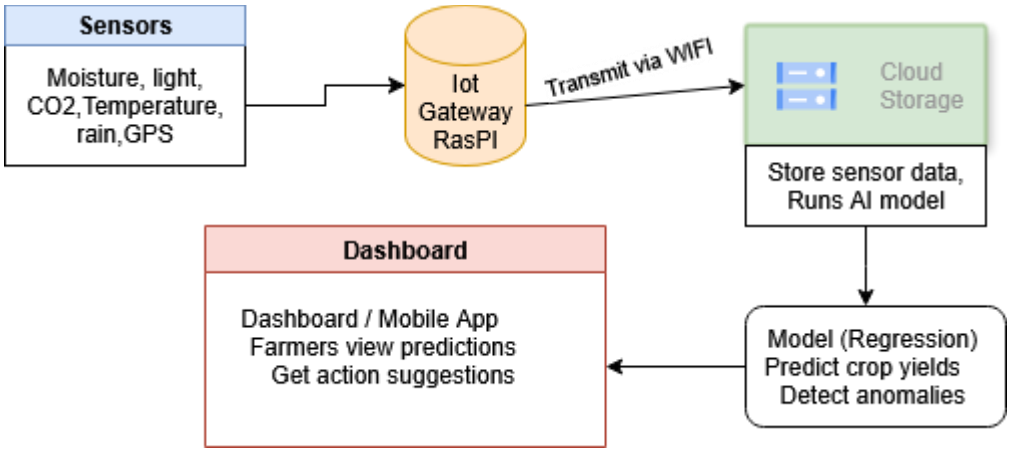
AI Model to Predict Crop Yields

A Supervised Regression Model is recommended for such a predictive task. For instance, a Random Forest model. The model can be trained on similar data or on the collected inputs and yields achieved in the historical data.

Input Feature (X)	Output (y)
Soil moisture, light level, rainfall, co2 levels, GPS location, temperature,	Predicted yield (kg/ha)

Agriculture System Data flow Diagram

The data flow diagram below depicts and summarizes the recommended integrated IoT AI Farming systems



Part 3: Futuristic Proposal (10%)

- **Prompt: Propose an AI application for 2030 (e.g., AI-powered climate engineering, neural interface devices).**
- **Requirements:**
    - **Explain the problem it solves.**
    - **Outline the AI workflow (data inputs, model type).**
    - **Discuss societal risks and benefits.**

Futuristic AI Proposal (2030): AI-Powered Smart Climate Shield for Commercial Agriculture

Title: AI-Driven Climate Shield System (AICS) for African Mega Farms

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Problem It Solves:

By 2030, commercial agriculture in Africa will face intensifying climate threats — including heatwaves, unpredictable rainfall, and pest outbreaks — that reduce crop yields and cause billions in losses. Traditional weather forecasts and response systems are too slow and generic. Farms need a localized, intelligent system that can predict, adapt, and act in real time.

AI Workflow Overview:

Data Inputs:

- Satellite feeds (climate patterns, cloud cover, radiation)
- Farm IoT sensors (soil temperature, humidity, rainfall, pH levels, pest detection)
- Historical crop and yield data
- Drone surveillance (visual health of crops)

AI Models Used:

- Time Series Forecasting: Predict weather and drought risk using LSTM or Transformer models
- Reinforcement Learning: Simulate and recommend best farm actions in harsh climate conditions
- Computer Vision (CNNs): Detect crop stress, diseases, or flooding from drone images
- Generative AI: Propose new planting patterns and irrigation schedules

Workflow:

1. Data Collection – Real-time data streamed from sensors, drones, and satellites.
2. Edge AI Gateway – Processes data locally on the farm for fast decisions.
3. Cloud AI Models – Handle deeper analysis and predictions.
4. Automated Action Layer – AI controls irrigation, shade nets, and pesticide systems.

5. Farmer Dashboard – Delivers alerts and recommendations via web or mobile.

Societal Benefits and Risks:

Benefits:

- Up to 40% increase in crop yield during climate stress seasons
- Early warning systems save crops and reduce farmer workload
- Promotes AI use in rural and commercial agriculture sectors
- Optimizes resource use (water, fertilizer) and supports food security

Risks:

- Over-dependence on AI may reduce traditional farming skills
- High initial costs could widen the gap between smallholder and large-scale farms
- Risk of misuse of drone surveillance or data privacy issues
- AI systems must be monitored for fairness, reliability, and ethical use

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