

Technology Stack

Table 1: Application Components

S.No	Component	Description	Technology
1	User Interface	User interfaces like Web UI or Mobile Apps to interact with the Power BI dashboards	HTML, CSS, JavaScript, ReactJS
2	Application Logic-1	Data ingestion logic to extract environmental and management data from various sources	Python
3	Application Logic-2	Speech-to-text logic for audio input (e.g., voice commands for querying plant growth stages)	IBM Watson STT service
4	Application Logic-3	Virtual assistant to answer user queries related to plant growth predictions	IBM Watson Assistant
5	Database	Stores raw and transformed data, including historical plant growth and environmental factors	MySQL, NoSQL
6	Cloud Database	Centralized storage of large-scale data for scalability	IBM Cloudant
7	File Storage	Storage for large environmental datasets and model output	IBM Block Storage or Cloud-based storage
8	External API-1	Provides real-time environmental data (e.g., weather conditions)	IBM Weather API
9	External API-2	Identity verification for restricted access (if required)	Aadhar API
10	Machine Learning Model	Predicts plant growth stages based on input data	Custom ML Model (developed in Python)
11	Infrastructure (Server/Cloud)	Deployment of application on a cloud platform for scalability and availability	Kubernetes on IBM Cloud

Table 2: Application Characteristics

S.No	Characteristics	Description	Technology
1	Open-Source Frameworks	Frameworks to build the application frontend or backend	ReactJS, Flask, Django
2	Security Implementations	Implements access controls, encryptions, and secure API calls	SHA-256, IAM Controls, OWASP Guidelines
3	Scalable Architecture	Designed as microservices or a 3-tier architecture for scaling	Kubernetes, Docker
4	Availability	Load balancers and distributed servers ensure consistent access	Load Balancers, Distributed Cloud Servers
5	Performance	Performance optimization using caching and CDNs	CDN, Redis Cache