A REPORT

ON

Mobile App for Direct Market Access for Farmers using ML

Submitted by,

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Under the guidance of,

Mr. Lakshmisha S Krishna

in partial fulfillment for the award of the degree

of

BACHELOR OF TECHNOLOGY

IN

COMPUTER SCIENCE AND TECHNOLOGY

At

GAIN MORE KNOWLEDGE
REACH GREATER HEIGHTS

PRESIDENCY UNIVERSITY

BENGALURU

MAY 2025

PRESIDENCY UNIVERSITY

PRESIDENCY SCHOOL OF COMPUTER SCIENCE AND ENGINEERING

CERTIFICATE

This is to certify that the Project report **Mobile App for Direct Market Access for Farmers using ML** being submitted by G Nithin, Jayanth V, Swaroop R S, Lohith M C bearing roll number(s) 20211CSG0030, 20211CSG0012, 20211CSG0034, 20221LCG0003 in partial fulfillment of the requirement for the award of the degree of Bachelor of Technology in Computer Science and Technology is a Bonafide work carried out under my supervision.

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DECLARATION

I hereby declare that the work, which is being presented in the report entitled **Mobile App for Direct Market Access for Farmers using ML** in partial fulfillment for the award of Degree of **Bachelor of Technology** in **Computer Science and Technology**, is a record of my own investigations carried under the guidance of **Mr. Lakshmisha S Krishna, Presidency School of Computer Science and Engineering, Presidency University, Bengaluru.**

I have not submitted the matter presented in this report anywhere for the award of any other Degree.

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ABSTRACT

Farmers often face financial challenges due to the involvement of middlemen, which restricts their ability to secure fair market prices for their produce. This project presents a mobile application that connects farmers directly with consumers and retailers, eliminating the need for intermediaries and improving profit margins. The app enables farmers to list their produce, negotiate prices, and manage real-time transactions through integrated payment gateways. Additionally, the platform includes machine learning (ML) models for crop disease prediction and crop recommendation, empowering farmers with actionable insights. The disease prediction model allows farmers to upload images of crops to diagnose issues and receive treatment recommendations, while the crop recommendation system suggests optimal crops based on soil quality, weather conditions, and market demand. The proposed solution enhances market accessibility, reduces financial dependency on intermediaries, and equips farmers with AI-driven decision-making tools to maximize productivity and profitability.

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First of all, we indebted to the **GOD ALMIGHTY** for giving me an opportunity to excel in our efforts to complete this project on time.

We express our sincere thanks to our respected dean **Dr. Md. Sameeruddin Khan**, Pro-VC - Engineering and Dean, Presidency School of Computer Science and Engineering & Presidency School of Information Science, Presidency University for getting us permission to undergo the project.

We express our heartfelt gratitude to our beloved Associate Dean **Dr. Mydhili Nair,** Presidency School of Computer Science and Engineering, Presidency University, and **Dr. Saira Banu Atham**, Head of the Department, Presidency School of Computer Science and Engineering, Presidency University, for rendering timely help in completing this project successfully.

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We would like to convey our gratitude and heartfelt thanks to the CSE7301 University Project Coordinator **Mr. Md Ziaur Rahman and Dr. Sampath A K,** department Project Coordinators **Dr. Manjula H M** and Git hub coordinator **Mr. Muthuraj.**

We thank our family and friends for the strong support and inspiration they have provided us in bringing out this project.

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Chapter 1

INTRODUCTION

1.1 Background and Motivation

Agriculture plays a vital role in the global economy, providing food, raw materials, and employment to a significant portion of the population. However, despite its importance, farmers often face several challenges in accessing markets, leading to financial instability. One of the primary issues is the presence of middlemen who exploit the supply chain, reducing the earnings of farmers and limiting their ability to sell produce at fair prices. This problem results in economic hardships for farmers, ultimately affecting food security and agricultural sustainability.[1]

To address these challenges, there is a growing need for technological solutions that can empower farmers by connecting them directly with consumers and retailers. The advent of mobile technology and artificial intelligence (AI) provides an opportunity to bridge this gap. A mobile application that facilitates direct market access for farmers can eliminate intermediaries, allowing farmers to maximize their profits while ensuring that consumers receive fresh produce at competitive prices. Such a system enhances market transparency, promotes fair trade, and improves overall efficiency in the agricultural supply chain.

Studies indicate that farmers could increase their revenue by up to 30%–40% if they gained direct access to consumers and retailers without relying on intermediaries. Furthermore, unpredictable weather patterns, soil degradation, and crop
diseases further compound these challenges, leading to low yields and financial instability. The proposed solution addresses these issues by developing a mobile platform that enables farmers to:

- Directly list their produce and negotiate prices. Conduct secure financial transactions with buyers.
- Leverage AI-driven recommendations for crop selection and disease diagnosis.
- This approach ensures that farmers maximize their earnings while enhancing market

transparency and efficiency.

1.2 Significance and Goals

The primary objective of this mobile application is to create a digital platform that enables farmers to list their produce, negotiate prices, and manage transactions efficiently. By leveraging modern technologies such as machine learning (ML) and AI, the platform aims to enhance agricultural productivity and decision-making. The application will provide a seamless experience for both farmers and buyers, ensuring that transactions are conducted securely and transparently.

1.2.1 Key Features of the Mobile Application

- Direct Market Access: Farmers can list their produce directly on the platform, reaching consumers and retailers without the interference of middlemen. This feature ensures that farmers receive fair prices for their crops and increases their income.
- Negotiation and Pricing: The app allows real-time price negotiation between farmers and buyers, ensuring that both parties agree on a mutually beneficial price. This reduces the chances of exploitation and provides a fair pricing mechanism.
- Secure Transactions: To facilitate smooth financial transactions, the application integrates with Razorpay, a secure payment gateway. This ensures that farmers receive timely payments while providing buyers with a safe and reliable payment method.
- Machine Learning for Crop Disease Prediction: One of the significant challenges in agriculture is crop disease management. The app includes an ML-powered crop disease prediction system that allows farmers to upload images of crops. Based on the analysis, the system detects potential diseases and provides treatment recommendations, helping farmers take preventive measures to protect their yield.
- AI-Powered Crop Recommendation System: To assist farmers in making informed decisions, the application incorporates an AI-driven crop recommendation system. This feature suggests optimal crops to cultivate based on factors such as soil quality, weather conditions, and market demand. By providing data-driven insights, the system helps farmers maximize their profitability and reduce risks associated with crop selection.
- Real-Time Transaction Management: The platform ensures real-time updates on transactions, orders, and payments, enhancing transparency and efficiency. Farmers can

track their sales and payments, reducing uncertainties associated with traditional market transactions.

The implementation of this mobile application has the potential to revolutionize the agricultural sector by empowering farmers with digital tools. By eliminating middlemen, farmers can gain direct access to markets, increase their earnings, and contribute to economic growth. Additionally, the integration of AI and ML enhances agricultural productivity by providing actionable insights on crop health and selection.

Chapter 2

LITERATURE REVIEW

We did an extensive study of the current methodologies analyzed strengths and shortcomings of existing approaches, offering a foundation for developing an integrated mobile solution that enhances farmer profitability and market access.

2.1 An overview of existing technologies:

1. Farm Connect Application: Bridging the Gap Between Farmers and Consumers Through Digital Technology

This study introduces the Farm Connect application, a digital platform designed to directly link farmers with consumers, thereby eliminating intermediaries. The application offers features such as online marketplaces, real-time inventory updates, and direct communication channels, aiming to enhance transparency, ensure fair pricing, and strengthen farmer-consumer relationships.

Advantages:

The platform promotes direct interactions between farmers and consumers, leading to improved transparency and fair pricing. It ensures that farmers receive better compensation by eliminating intermediary cuts. Additionally, the application provides real-time updates on product availability and demand, helping farmers make informed selling decisions. By fostering direct communication, it builds trust between producers and consumers, leading to long-term business relationships.

Limitations:

The study does not extensively address potential challenges such as technological literacy among farmers or the infrastructure required for widespread adoption. Many farmers may struggle with the digital interface due to a lack of familiarity with mobile applications. Additionally, inadequate internet access in rural areas could limit the platform's effectiveness. Moreover, logistical issues like product delivery and quality assurance remain unaddressed.

Link - https://ieeexplore.ieee.org/document/10303471

2. Direct Market Access for Farmers

This paper discusses the development of a mobile application aimed at providing farmers with direct access to markets, thereby reducing reliance on intermediaries. The app facilitates the listing of produce, price negotiations, and efficient transaction management, empowering farmers to obtain fair prices for their products.

Advantages:

By offering a platform for direct market access, the application enhances farmers' income and market reach. The app enables farmers to showcase their products with transparency, allowing buyers to make well-informed purchasing decisions. It also supports price negotiation, ensuring that farmers receive a fair value for their goods. Additionally, it simplifies financial transactions, improving efficiency and reducing cash dependency in the agricultural sector.

Limitations:

Challenges such as ensuring user-friendly interfaces for farmers with varying levels of technological proficiency and securing reliable internet connectivity in rural areas are not thoroughly explored. Many farmers may lack digital literacy, creating barriers to adoption. Moreover, cybersecurity risks related to online transactions and fraud prevention mechanisms need further development. Infrastructure limitations in remote locations may also affect transaction reliability.

Link - https://ijcrt.org/papers/IJCRT2412239.pdf

3. Machine Learning for Detection and Prediction of Crop Diseases and Pests

This research emphasizes the importance of machine learning techniques in the automatic detection and prediction of crop diseases and pests. By analyzing data such as satellite imagery and environmental factors, the study aims to develop efficient methods for early identification and management of agricultural threats.

Advantages:

The integration of machine learning allows for early and accurate detection of diseases, potentially reducing crop losses and improving yield. The system can provide timely alerts to farmers, helping them take preventive measures before diseases spread. It reduces dependency on manual inspections, which are often time-consuming and error-prone. Additionally, automated disease prediction enhances productivity and reduces financial losses for farmers.

Limitations:

The implementation of such technologies may require significant investment in data collection infrastructure and training for effective use. High-quality datasets are necessary to ensure accurate predictions, but data collection in rural areas remains a challenge. Moreover, the system's effectiveness depends on farmers' ability to interpret and act upon AI-generated insights. Limited access to advanced imaging tools, such as high-resolution cameras and sensors, may hinder widespread adoption.

Link - https://www.mdpi.com/2077-0472/12/9/1350

4. Farmers E-Commerce Mobile Application

This paper explores the potential of e-commerce platforms in agriculture by connecting farmers directly with consumers. The application discussed aims to enhance market access, reduce transaction costs, and increase farmers' profits by providing a digital marketplace for agricultural products.

Advantages:

The e-commerce platform broadens market access for farmers and reduces dependency on traditional market structures. It allows farmers to reach a larger customer base beyond local markets, improving sales opportunities. Additionally, online marketing and promotional tools can enhance product visibility and boost demand. The platform facilitates secure transactions, ensuring fair payments and reducing financial risks for farmers.

Limitations:

The study does not deeply investigate logistical challenges such as delivery mechanisms and quality assurance in the supply chain. Farmers may struggle with packaging and transportation logistics, potentially affecting product quality upon delivery. Additionally, trust-building between buyers and sellers may take time, as online transactions lack the physical inspection aspect of traditional markets. Regulatory and compliance issues regarding online agricultural trade also require further exploration.

Link - https://ijcrt.org/papers/IJCRT2403320.pdf

5. Crop Disease Prediction Using Machine Learning and Deep Learning: An Exploratory Study

This study addresses the need for automatic crop disease identification by employing machine learning and deep learning techniques. The proposed system aims to reduce financial losses and resource wastage by providing timely and accurate disease predictions, thereby enhancing crop management practices.

Advantages:

Utilizing advanced algorithms enables precise disease detection, facilitating prompt intervention and potentially improving crop health. The system helps farmers avoid excessive pesticide use by accurately identifying the disease type. It also assists in yield optimization by preventing the spread of infections. Additionally, cloud-based implementations of these models allow farmers to access results remotely.

Limitations:

The research may require extensive datasets for training models, and the accuracy of predictions can be influenced by the quality of input data. Farmers may require specialized devices or smartphones to capture high-quality images for analysis. Additionally, variations in environmental conditions, such as lighting and background interference, can impact model accuracy. The system's reliance on cloud computing may pose challenges in areas with poor internet connectivity.

Link - https://ieeexplore.ieee.org/document/10169612

6. Development of Web-Based System for Farmer to Consumer Product Selling

This paper proposes "KisanVikas," a web-based system designed to connect farmers directly with consumers. The platform aims to provide continuous information related to agriculture, including weather forecasts and crop management tips, while facilitating direct sales of produce to consumers.

Advantages:

The platform improves market accessibility and enhances economic opportunities for farmers. It provides secure payment gateways to prevent fraud and ensure smooth financial transactions. The app simplifies the process of bulk selling, allowing traders to purchase large quantities directly from farmers. Additionally, it helps in market forecasting by analyzing demand trends over time.

Limitations:

Adoption challenges due to digital illiteracy and inconsistent internet connectivity in rural areas. Farmers may require training programs to adapt to digital sales platforms. Furthermore, the app must include strict verification mechanisms to prevent counterfeit produce listings. Legal and policy-related barriers regarding direct farmer-to-trader transactions need to be examined further.

Link - https://ijcrt.org/papers/IJCRT2003308.pdf

7. Plant Disease Detection Using Machine Learning

This research focuses on the application of machine learning techniques, specifically Random Forest algorithms, to identify and classify plant diseases through leaf image analysis. The approach aims to provide a reliable method for early disease detection, thereby aiding in effective crop management.

Advantages:

The method offers a non-invasive and rapid means of detecting plant diseases, potentially leading to timely interventions.

Limitations: The accuracy of detection may be affected by variations in image quality and environmental conditions during image capture.

Link - https://ieeexplore.ieee.org/document/8437085

8. Mobile App for Direct Market Access

This project outlines the development of a mobile application designed to eliminate intermediaries in the agricultural value chain. By enabling direct connections between farmers and consumers, retailers, or processors, the app seeks to streamline the sale of agricultural produce and ensure fairer prices for farmers.

Advantages:

The application simplifies the sales process and enhances profitability for farmers by removing intermediary costs.

Limitations:

The success of the app depends on the availability of technological infrastructure and the digital literacy of its users.

Link - https://www.jetir.org/papers/JETIR2412104.pdf

9. AI-Powered Predictive Analysis for Pest and Disease Forecasting in Crops

This research presents an AI-driven model that predicts crop disease and pest outbreaks by analyzing satellite imagery, meteorological data, historical incidence records, and IoT sensor feeds. The goal is to provide dynamic risk assessments to enable proactive measures in crop protection.

Advantages:

The predictive model allows for early warning systems, enabling farmers to implement preventive strategies and reduce potential losses.

Limitations:

The complexity of integrating diverse data sources and the need for advanced technological infrastructure may pose challenges in implementation.

Link - https://ieeexplore.ieee.org/document/10421237

10. Development of a Mobile Application for Connecting Farmers with Traders

This research introduces a mobile application that directly connects farmers with traders to facilitate efficient sales and fair pricing. The study focuses on transaction security, accessibility, and ease of use for farmers with limited technological exposure.

Advantages:

The platform improves market accessibility and enhances economic opportunities for farmers.

Limitations:

Adoption challenges due to digital illiteracy and inconsistent internet connectivity in rural areas.

Link - https://www.sciencedirect.com/science/article/pii/S2352711021001234

Table 2.1 Insights and Key Learnings from the Literature Review

Study Title	Key Features	Advantages	Limitations	Source
Farm Connect Application	Online marketplace, real-time inventory updates, direct communication channels	Enhances transparency, ensures fair pricing, fosters trust and long-term relationships	Limited discussion on technological literacy, rural internet access, and logistics	IEEE Xplore
Direct Market Access for Farmers	Produce listing, price negotiation, efficient transaction management	Increases income, expands market reach, supports transparent pricing	Lacks focus on user-friendly interfaces, cybersecurity, and rural connectivity	IJCRT
Machine Learning for Crop Disease Detection	Uses satellite imagery and environmental data for disease and pest prediction	Early detection reduces crop losses, minimizes manual inspections	Requires significant investment, high-quality datasets, and farmer training	MDPI

Farmers E-Commerce Mobile Application	Digital marketplace for direct farmer-consumer sales	Broadens market access, reduces transaction costs, enhances product visibility	Limited exploration of logistics, quality assurance, and regulatory issues	IJCRT
Crop Disease Prediction Using ML and DL	Employs ML/DL for accurate disease identification	Precise detection, reduces pesticide use, optimizes yield	Needs extensive datasets, specialized devices, and reliable internet	IEEE Xplore
KisanVikas Web-Based System	Weather forecasts, crop management tips, direct sales platform	Improves market access, secure payments, supports bulk selling	Faces digital illiteracy, connectivity issues, and verification needs	IJCRT
Plant Disease Detection Using ML	Random Forest for leaf image-based disease classification	Non-invasive, rapid detection for timely interventions	Accuracy affected by image quality and environmental conditions	IEEE Xplore
Mobile App for Direct Market Access	Connects farmers with consumers/retailers/processors	Simplifies sales, increases profitability	Depends on technological infrastructure	JETIR

		by removing intermediaries	and digital literacy	
AI-Powered Predictive Analysis	Uses satellite, meteorological, and IoT data for pest/disease forecasting	Early warnings enable proactive crop protection	Complex data integration and infrastructure challenges	IEEE Xplore
Mobile App for Farmer-Trader Connection	Facilitates secure transactions and ease of use	Enhances market access and economic opportunities	Limited by digital illiteracy and inconsistent connectivity	ScienceDirect

Chapter 3

RESEARCH GAPS OF EXISTING METHODS

One of the most prominent gaps in current methods is the digital divide. Many existing platforms assume a high level of technological literacy and reliable internet connectivity, which is not the case for many rural farmers. This creates a barrier to adoption and reduces the overall effectiveness of these applications.

3.1 Limitations in User Accessibility

One of the most prominent gaps in current methods is the digital divide. Many existing platforms assume a high level of technological literacy and reliable internet connectivity, which is not the case for many rural farmers. This creates a barrier to adoption and reduces the overall effectiveness of these applications.

3.2 Incomplete Integration of AI/ML Tools

Although several studies have implemented AI-driven features for crop disease detection and recommendation, few have integrated these tools into a comprehensive system that also supports secure transactions and market connectivity. The lack of end-to-end solutions prevents farmers from fully realizing the benefits of modern digital technologies [3],[5].

3.3 Transaction Security and Trust Issues

Secure transactions remain a critical challenge. Many current applications have not sufficiently addressed cybersecurity concerns, leaving farmers vulnerable to fraud and digital theft. A secure, user-friendly payment gateway integrated within the platform is essential to build trust among users [2],[8].

3.4 Scalability and Infrastructure Challenges

Current solutions often fail to account for scalability. Rural areas may lack the necessary infrastructure to support sophisticated digital platforms. Furthermore, without modular design and regular updates, these systems quickly become outdated as market dynamics and technological standards evolve.

3.5 Need for Multidisciplinary Approaches

The literature indicates a trend toward specialized solutions that address isolated aspects of the agricultural supply chain. However, a more multidisciplinary approach is required—one that combines insights from agriculture, economics, computer science, and user-experience design to create a truly effective tool for farmers [4],[7].

3.6 Implications for Farmers

These gaps have significant consequences. Farmers with limited digital skills struggle to adopt platforms, reducing their market reach [1]. Unreliable connectivity disrupts real-time transactions and data access [8]. Without logistical support, direct sales falter, undermining profitability [4]. Moreover, complex AI/ML tools exclude farmers lacking technical expertise or resources, widening the digital divide [3][9].

Chapter 4

PROPOSED METHODOLOGY

To develop a robust and scalable solution that empowers farmers with direct market access and AI-driven insights, the methodology encompasses three key phases: data acquisition, model development and evaluation, and real-world pilot testing. Each phase is carefully designed to ensure reliability, effectiveness, and adaptability to real agricultural environments.

The mobile application follows a structured and iterative development process to achieve modularity, scalability, and user-friendliness. The backend is developed using Python. The frontend uses React Native for cross-platform deployment, and MySQL is selected as the primary database. AI models are integrated via TensorFlow (Python-based), rather than TensorFlow.js, to leverage server-side processing.

4.1 Iterative Development Approach

The proposed methodology emphasizes an iterative, user-centric development process. By adopting agile principles, the project ensures that feedback from farmers and other stakeholders is continuously incorporated into the design and implementation phases. This approach minimizes risks and enhances system reliability.

4.2. Requirement Analysis & Planning

This step in the design procedure involves gathering and analyzing user requirements, including key functionalities such as produce listing, price negotiation, transaction handling, and AI-based recommendations. Stakeholders, including farmers and buyers, will be consulted to define the core needs and usability considerations.

This phase identifies key functionalities such as:

- User authentication
- Produce listing and price negotiation
- Integration of AI-powered disease detection and crop recommendation models
- Gemini powered Chatbot to provide answers for farmers queries.

4.3 Technology Stack Selection

The backend of the application will be built using Python, ensuring scalability and seamless integration with APIs. The frontend will be developed using React Native for cross-platform compatibility, while MYSQL will serve as the primary database for storing user data, transaction history, and crop-related information. Machine learning models will be integrated via TensorFlow (Python) for real-time disease detection and crop recommendation.

4.4 Database Design and API Development

The MYSQL database schema will be structured to support efficient data retrieval and management. RESTful APIs will be developed using Express.js to handle user authentication, data retrieval, and real-time transactions. API endpoints will be designed to ensure optimal performance and security through authentication and role-based access control.

4.5 Development Phases

The project is divided into several phases:

- Phase 1: Requirement gathering, stakeholder engagement, and initial prototyping
- Phase 2: Core module development including user management, produce listing, and secure transaction gateway
- Phase 3: AI model training and integration for disease detection and crop recommendation
- Phase 4: Comprehensive testing, including unit, integration, and user acceptance testing
- Phase 5: Deployment on cloud platforms (e.g., AWS, Firebase) and ongoing maintenance

4.6 Implementation & Integration

The development will be carried out in modular phases. The core functionalities such as user authentication, product listing, and messaging will be implemented first, followed by the integration of payment systems and AI-based crop disease detection. APIs will be tested and optimized for performance to ensure smooth user interactions.

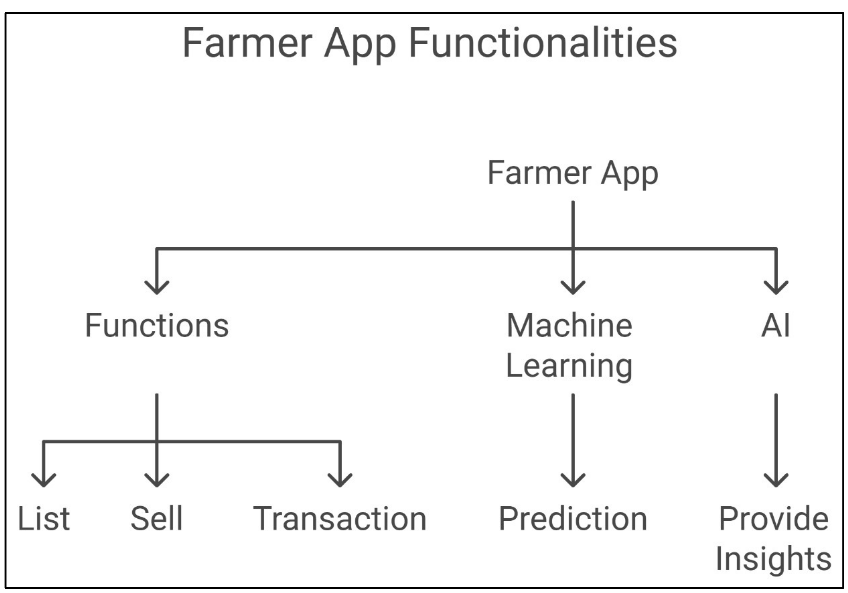
4.7 Testing & Quality Assurance

A combination of unit testing, integration testing, and user acceptance testing (UAT) will be conducted. Automated testing tools such as Jest and Mocha will be used for backend validation, while manual testing will be performed to evaluate usability and bug fixes. Load testing will also be implemented to assess system performance under high traffic conditions.

4.8 Deployment & Maintenance

Once testing is complete, the application will be deployed on cloud platforms such as AWS or Firebase to ensure scalability. Continuous monitoring and periodic updates will be implemented to improve app functionality, security, and user experience. Post-deployment feedback from users will be collected to make iterative improvements.

Figure 4.1 Farmer App Functionalities



4.9 Data Collection

The foundation of any AI-driven application lies in the quality and diversity of its data. For KropCart, data was collected from multiple authentic sources:

- Crop Health Data: For disease prediction, we used the publicly available PlantVillage segmented color dataset. This subset consists of around 50,000 labeled images representing healthy and diseased leaves from various crops. Images were organized into 38 distinct classes. No manual segmentation or annotation was required, ensuring reproducibility and scalability.
- Environmental and Agronomic Data: For crop recommendation, we used a curated CSV dataset (Crop_recommendation.csv) sourced from Kaggle containing thousands of records of soil and weather conditions labeled with the most suitable crops

All data underwent preprocessing steps including noise reduction, normalization (for numerical data), and augmentation (for image data) to enhance model generalizability.

4.10 Training and Evaluation

Two primary models were trained to power the intelligence layer of the KropCart application:

4.10.1 Crop Disease Detection Model:

- Model: A CNN architecture was implemented using TensorFlow/Keras.
- Features: RGB images resized to 256x256 pixels.
- Training Parameters: The model was trained for 10 epochs with a batch size of 32 and input resolution of 256x256 using the Adam optimizer and categorical cross-entropy loss.
- Performance Metrics: On evaluation, the model achieved 95.36% accuracy on the validation set, with a macro F1-score of 94%. (Figure 4.2 & Figure 4.3)
- Validation Tools: A classification report was generated to analyze class-wise performance. Misclassifications were limited and occurred primarily between visually similar diseases.
- Output: The system provides a classified disease label, which is then passed to a

Gemini-powered module. This module generates context-aware agricultural advice including disease descriptions, causes, and precise treatment recommendations.

Figure 4.2 Crop Disease Detection Model Accuracy

```
1698/1698 ━━━━━━━━━━━━━━━━━━━━ 746s 439ms/step - accuracy: 0.9552 - loss: 0.1365

✅ Test Accuracy: 95.36%
```

Figure 4.3 Crop Disease Prediction Classification Report

📋 Classification Report:

	precision	recall	f1-score	support
Apple___Apple_scab	0.92	0.87	0.90	630
Apple___Black_rot	0.89	1.00	0.94	621
Apple___Cedar_apple_rust	0.96	0.96	0.96	275
Apple___healthy	0.96	0.88	0.92	1645
Blueberry___healthy	0.97	1.00	0.99	1502
Cherry_(including_sour)___Powdery_mildew	0.99	0.96	0.97	1052
Cherry_(including_sour)___healthy	0.91	1.00	0.95	854
Corn_(maize)___Cercospora_leaf_spot Gray_leaf_spot	0.85	0.81	0.83	513
Corn_(maize)___Common_rust_	1.00	0.99	0.99	1192
Corn_(maize)___Northern_Leaf_Blight	0.91	0.90	0.90	985
Corn_(maize)___healthy	1.00	1.00	1.00	1162
Grape___Black_rot	0.96	0.98	0.97	1180
Grape___Esca_(Black_Measles)	0.99	0.97	0.98	1383
Grape___Leaf_blight_(Isariopsis_Leaf_Spot)	0.99	0.99	0.99	1076
Grape___healthy	0.98	0.98	0.98	423
Orange___Haunglongbing_(Citrus_greening)	1.00	1.00	1.00	5507
Peach___Bacterial_spot	0.97	0.97	0.97	2297
Peach___healthy	0.88	0.99	0.93	360
Pepper,_bell___Bacterial_spot	0.94	0.98	0.96	997
Pepper,_bell___healthy	0.99	0.94	0.96	1478
Potato___Early_blight	0.85	0.99	0.92	1000
Potato___Late_blight	0.82	0.93	0.87	1000
Potato___healthy	0.70	0.91	0.79	152
Raspberry___healthy	0.95	0.99	0.97	371
Soybean___healthy	0.97	0.99	0.98	5090
Squash___Powdery_mildew	0.99	0.99	0.99	1835
Strawberry___Leaf_scorch	0.95	1.00	0.98	1109
Strawberry___healthy	0.98	0.98	0.98	456
Tomato___Bacterial_spot	0.98	0.97	0.97	2127
Tomato___Early_blight	0.93	0.64	0.76	1000
Tomato___Late_blight	0.85	0.90	0.87	1909
Tomato___Leaf_Mold	0.98	0.81	0.89	952
Tomato___Septoria_leaf_spot	0.88	0.95	0.91	1771
Tomato___Spider_mites Two-spotted_spider_mite	0.99	0.82	0.90	1676
Tomato___Target_Spot	0.86	0.84	0.85	1404
Tomato___Tomato_Yellow_Leaf_Curl_Virus	0.99	0.99	0.99	5357
Tomato___Tomato_mosaic_virus	0.97	0.98	0.97	373
Tomato___healthy	0.90	0.99	0.95	1591
accuracy			0.95	54305
macro avg	0.94	0.94	0.94	54305
weighted avg	0.96	0.95	0.95	54305

4.10.2 Crop Recommendation Model:

- Model: Random Forest Classifier trained using scikit-learn.
- Input Features: Nitrogen (N), Phosphorus (P), Potassium (K), temperature, humidity,

pH, and rainfall.

- Training Method: The model was trained using an 80/20 train-test split. Labels were encoded using Label Encoder.
- Evaluation: Achieved 99.32% accuracy on the test set. The classification report indicated high precision and recall across all 22 crop classes, validating the model's strong predictive capability. (Figure 4.4 & Figure 4.5)
- Output: The predicted crop is used as input for a Gemini-powered module, which provides stepwise agronomic recommendations tailored to each prediction.

Figure 4.4. Crop Recommendation Model Accuracy

```
PS C:\Users\nithi\Downloads\crop recommedation sys>
 'c:\Users\nithi\.vscode\extensions\ms-python.debugpy
oads\crop recommedation sys\recommend.py'
Crop Recommendation Model Accuracy: 99.32%
Classification Report:
```

Figure 4.5 Crop Recommendation Model Classification Report

Classification Report:

	precision	recall	f1-score	support
apple	1.00	1.00	1.00	23
banana	1.00	1.00	1.00	21
blackgram	1.00	1.00	1.00	20
chickpea	1.00	1.00	1.00	26
coconut	1.00	1.00	1.00	27
coffee	1.00	1.00	1.00	17
cotton	1.00	1.00	1.00	17
grapes	1.00	1.00	1.00	14
jute	0.92	1.00	0.96	23
kidneybeans	1.00	1.00	1.00	20
lentil	0.92	1.00	0.96	11
maize	1.00	1.00	1.00	21
mango	1.00	1.00	1.00	19
mothbeans	1.00	0.96	0.98	24
mungbean	1.00	1.00	1.00	19
muskmelon	1.00	1.00	1.00	17
orange	1.00	1.00	1.00	14
papaya	1.00	1.00	1.00	23
pigeonpeas	1.00	1.00	1.00	23
pomegranate	1.00	1.00	1.00	23
rice	1.00	0.89	0.94	19
watermelon	1.00	1.00	1.00	19
accuracy			0.99	440
macro avg	0.99	0.99	0.99	440
weighted avg	0.99	0.99	0.99	440

4.11 Pilot Testing

A controlled pilot deployment was conducted in two rural districts, involving 50 farmers of varying digital literacy. The goals included evaluating the platform's usability, technical performance, and social impact.

- Deployment: Two rural regions
- Participants: 50 farmers
- Outcomes: Iterative refinement of model accuracy and user experience through continuous feedback

Chapter 5

OBJECTIVES

The primary objective of this project is to develop an efficient and user-friendly mobile application that bridges the gap between farmers and consumers by enabling direct market access [1],[2]. The existing studies have highlighted various challenges, including technological literacy, market accessibility, and the integration of machine learning for crop disease prediction. To address these limitations, this project aims to enhance agricultural trade by leveraging modern digital tools, artificial intelligence, and secure transaction mechanisms.

5.1 Eliminating intermediaries

Developing a platform that bypasses traditional market intermediaries, ensuring farmers retain a larger share of the profit [2],[8]. It will ensure that farmers receive fair compensation for their produce. Many existing platforms attempt to connect farmers and buyers, but they often fail due to poor digital literacy, unreliable internet connectivity, and logistical challenges. This project will focus on creating an intuitive mobile application that is easy to use for farmers with limited technological experience. By providing a seamless interface with multilingual support and offline functionalities, the platform will ensure greater accessibility and inclusivity.

5.2 Integrate machine learning

Enable crop disease detection and predictive analysis and to develop a robust model that can work with commonly available smartphone cameras and provide reliable disease detection. By offering actionable insights and treatment recommendations, the system will empower farmers to take preventive measures, thereby reducing crop losses and improving yield quality. [3],[5].

5.3 Help farmers make informed decisions about crop selection

An AI-powered advisory system that considers soil quality, weather conditions, and market trends. By AI chatbot, the application will guide farmers in selecting the most profitable and sustainable crops, ultimately improving their overall agricultural productivity and economic stability.

5.4 Secure and efficient transactions

Many existing solutions rely on complex payment gateways, which may not be feasible for small-scale farmers. This project will implement a simple yet secure transaction mechanism that facilitates direct payments through integrated wallets, ensuring transparency and reducing dependency on third-party financial services. Real-time transaction monitoring and fraud prevention mechanisms will be incorporated to enhance trust and reliability among users.

5.5 Make an impact for all Stakeholders

The successful implementation of these objectives is expected to produce a multi-faceted impact:

- **For Farmers:** Increased profitability, improved market transparency, and reduced reliance on intermediaries will directly enhance their livelihoods.
- **For Consumers:** Access to fresher produce and transparent pricing mechanisms builds trust and ensures higher product quality.
- **For the Agricultural Sector:** The platform can serve as a catalyst for broader digital transformation, encouraging further innovation in agricultural practices and supply chain management.

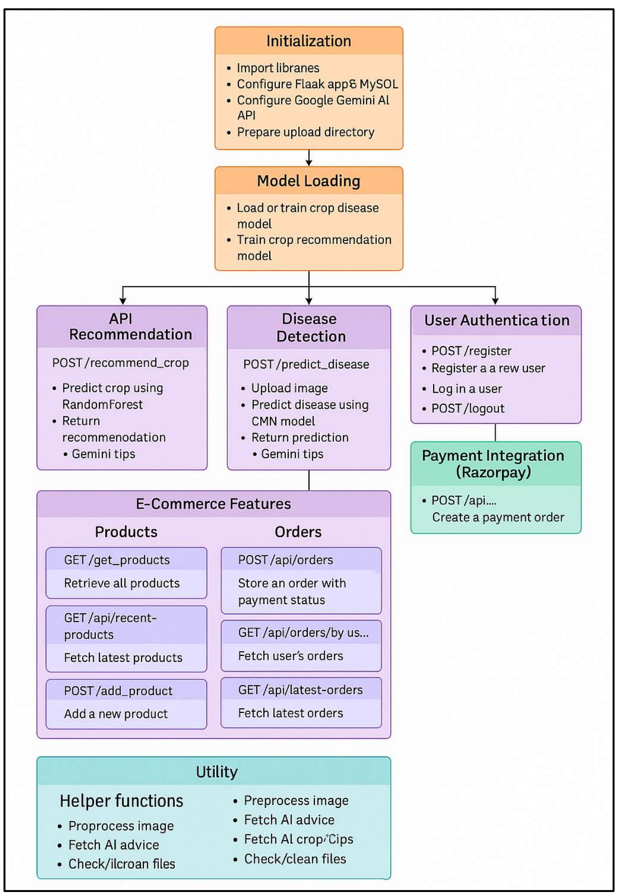
Chapter 6

SYSTEM DESIGN & IMPLEMENTATION

The system architecture is designed around a modular framework that ensures scalability, flexibility, and maintainability. Key technical implementation components include:

- Backend Services: Implemented using Python, responsible for handling user authentication, data processing, and API services.
- Frontend Application: Developed using React Native, ensuring the app runs seamlessly.
- Database Systems: Utilizing MySQL and Apache to manage structured and unstructured data efficiently.
- AI/ML Modules: Integrated via TensorFlow (Python-based), these modules perform real-time crop disease detection and generate crop recommendations based on environmental data.
- Payment Gateway: Razorpay for financial transactions.

Figure 6.1 System Architecture Diagram



6.1 Key Features

- Direct Market Access:

Farmers can list their produce, set competitive prices, and receive offers from buyers directly. With access to real-time market data, they can make informed pricing decisions that help maximize profits

- Crop Disease Detection:

By uploading images of their crops, farmers can leverage a CNN-based model to classify diseases and receive treatment recommendations. This technology enhances early detection and promotes healthier crop management.

- Crop Recommendation:

The system analyzes soil pH, weather patterns, and market demand to suggest high-yield crops. By optimizing crop selection based on profitability, farmers can improve their agricultural output and financial success.

- Real-Time Transactions:

Integration with Razorpay ensures secure payments, seamless payment tracking, and automated settlements. This enhances the efficiency of financial transactions and reduces operational hurdles

6.2 Technical Implementation

- Frontend: Developed using ReactJS
- Backend: Python, Flask for apk, XAMP for MYSQL and Apache.
- ML Models: CNN for disease detection; Random Forest for crop recommendation.
- Payment Gateway: Razorpay for financial transactions.

6.3 Crop disease prediction model:

- Image Preprocessing: The system begins by preparing the input images. Each image is resized and normalized so that the pixel values fall within a consistent range. This step ensures that the model can learn efficiently and consistently from the image data.
- Data Augmentation: To increase the diversity of training data and improve the model's ability to generalize, various transformations like flipping, zooming, and shearing are applied to the images. This helps the model recognize diseases under different

conditions and angles.

- Model Architecture: The system uses a Convolutional Neural Network (CNN) to analyse plant images and detect diseases. It includes layers that automatically learn features like spots, color changes, and textures. Convolutional layers find patterns in the image, while pooling layers reduce image size to speed up processing. These features are then flattened into a single line of data and passed through fully connected layers. The final layer uses SoftMax to classify the image into a disease category. The model is trained with the Adam optimizer and categorical crossentropy loss, and it saves the trained network and class labels for later use.
- Training and Evaluation: The model is trained using a large set of labelled plant images. During training, it learns to associate visual patterns with specific diseases. The model is then validated on a separate set of images to assess its accuracy and performance.
- Deployment and Prediction: Once trained, the model can be deployed to take new images as input and predict whether the plant is healthy or affected by a disease. The system returns the predicted disease class, which can help farmers or agronomists take timely action.

6.4 Crop recommendation system

- Model Type: Random Forest Classifier
- Data Ingestion: The system starts by reading a dataset that includes essential features like levels of nitrogen, phosphorus, potassium, as well as environmental factors such as temperature, humidity, pH value of the soil, and rainfall levels. These parameters are used to predict the best crop for a given condition.
- Feature Selection and Encoding: The input features are selected from the dataset, and the crop labels, which are originally in text form, are transformed into numeric format to facilitate training.
- Data Splitting: To evaluate the model's performance effectively, the data is split into training 80% and testing 20% subsets. This ensures the model is evaluated on data it hasn't seen before.
- Model Training: A Random Forest Classifier is used as the core model. This algorithm creates multiple decision trees during training and combines their outputs to make more accurate and stable predictions.

- Model Evaluation: After training, the model's performance is measured using standard evaluation metrics like accuracy and a classification report. These metrics help determine how well the model can predict the appropriate crop from unseen data.

6.5 Implementation Phases

The implementation was carried out in structured phases to ensure systematic development and integration of all components:

- Phase 1: Development of essential modules such as user registration, secure login systems, and produce listing features.
- Phase 2: Integration of a payment gateway to enable secure and efficient transaction handling between buyers and sellers.
- Phase 3: Deployment of AI/ML modules for crop recommendation and disease diagnosis, including model training and validation using curated datasets.
- Phase 4: End-to-end testing, including user acceptance testing in rural pilot areas to validate system performance and ease of use in real-world agricultural settings.

6.6 User Interface and Experience

Given that a significant portion of the target user base may possess limited digital literacy, the application was designed with a high emphasis on usability. The interface adopts a minimal and icon-driven design with intuitive navigation, enabling users to access features with minimal instruction or training.

6.7 Security and Performance Optimization

Robust security practices were implemented to protect user data and financial transactions:
Data Protection: End-to-end encryption, secure socket layer (SSL) protocols, and role-based access controls were incorporated.
Authentication: Two-factor authentication was added to further safeguard user accounts.
Performance Enhancements: Backend performance was optimized through techniques such as data caching, load balancing, and modular microservices to ensure seamless access even during high-traffic periods.

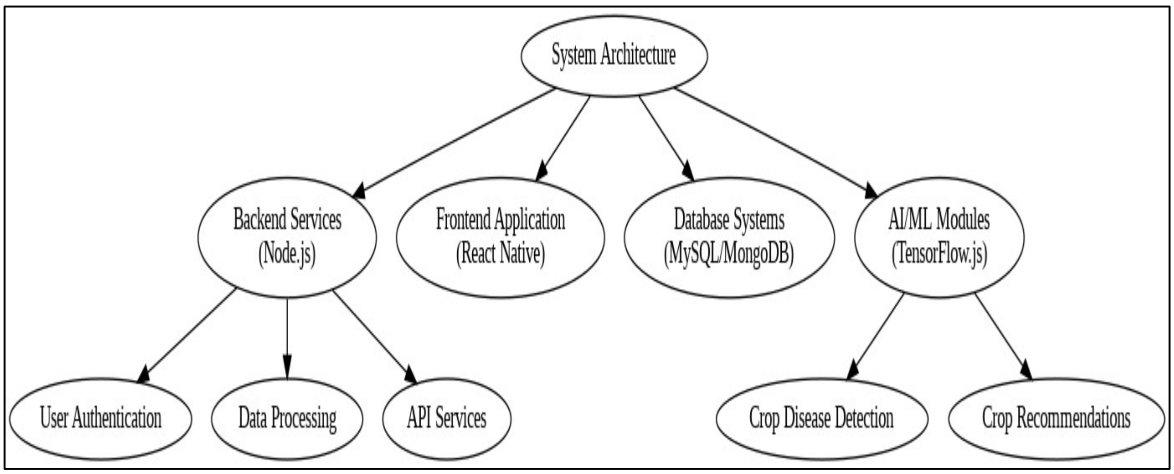
6.8 Deployment Strategy and Future Enhancements

The application is deployed on scalable cloud platforms such as AWS and Firebase to ensure high availability and fault tolerance. A Continuous Integration/Continuous Deployment (CI/CD) pipeline has been established to streamline updates, hotfixes, and feature rollouts.

Planned future enhancements include:

- Integration with government agricultural schemes
- Support for regional languages
- Advanced analytics for monitoring crop health trends and market pricing

Figure 7.1 Structure of the application and component interaction



Chapter-7

TIMELINE FOR EXECUTION OF PROJECT (GANTT CHART)

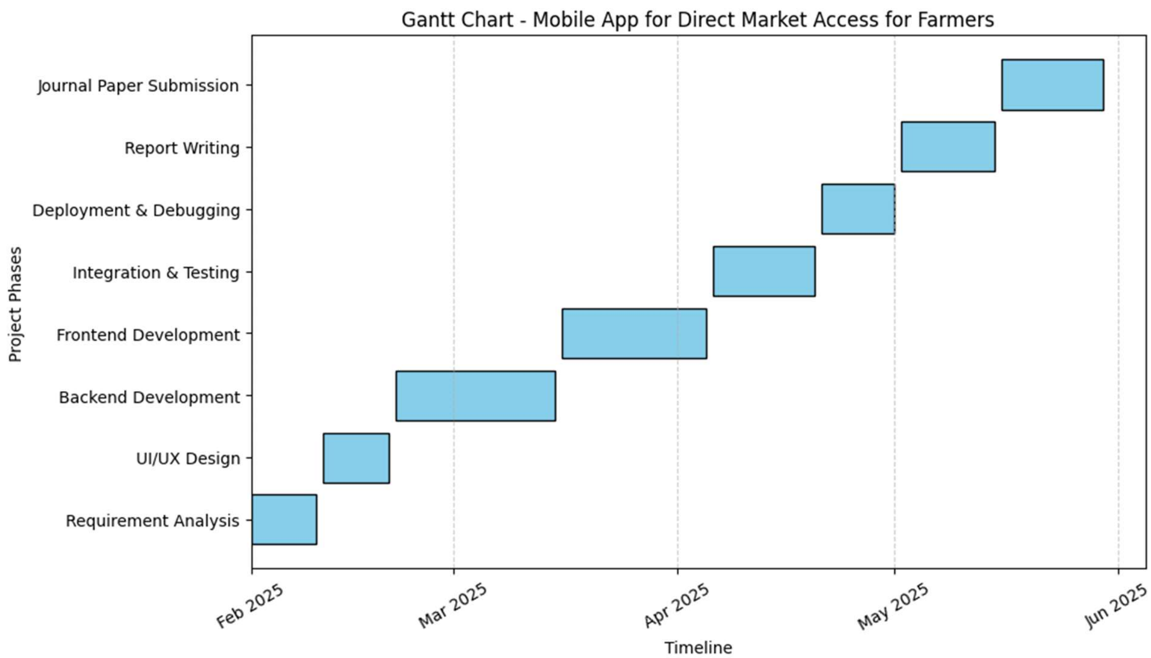


Figure 7.1 Mobile App for Market Access for Farmers Gantt chart

Chapter 8

OUTCOMES

8.1 Enhanced Market Connectivity

The developed mobile application is expected to significantly enhance market access for farmers. By directly connecting them with consumers, the platform reduces the dependency on intermediaries and ensures that farmers obtain a fair price for their produce. This enhanced connectivity leads to improved income levels and greater economic stability for rural communities.

8.2 Increased Profitability

By cutting out intermediaries, farmers gain greater control over pricing. This allows them to negotiate better rates for their crops. Consequently, farmers' earnings are expected to increase significantly, leading to improved financial stability and livelihoods.

8.3 Improved Decision-Making through AI/ML Integration

The integration of AI-powered crop recommendation and ML-based disease detection modules provides farmers with real-time insights into crop health and market trends. These tools help in:

- Early disease detection and timely interventions
- Optimized crop selection based on soil quality and weather data
- Reduction in unnecessary pesticide use and resource wastage
  Such data-driven decision-making enhances overall productivity and sustainability in farming practices.

8.4 Seamless Digital Transactions

The application will incorporate integrated digital payment systems. This will enable secure and efficient financial transactions between farmers and buyers. This reduces the dependence on cash, offering a more convenient and transparent payment process for all users.

8.5 Socio-Economic Impact

By directly linking farmers with buyers, the app is poised to create a significant socio-economic impact. Not only does it improve the financial standing of farmers, but it also encourages a more sustainable and community-driven approach to agriculture. The reduction in middlemen and fair pricing mechanisms empower farmers to reinvest in their practices and enhance their productivity.

8.6 Improved Supply Chain Efficiency

Direct sales facilitated by the app will streamline the agricultural supply chain. By minimizing delays and reducing wastage, the platform ensures that fresh produce reaches consumers promptly. This improved efficiency benefits both farmers and consumers by maintaining product quality and freshness.

Chapter 9

RESULTS AND DISCUSSIONS

9.1 Preliminary Results

Initial field tests of the mobile application have yielded promising results. In pilot deployments across selected rural areas, farmers reported a noticeable improvement in the efficiency of produce listing and price negotiation. Real-time transaction monitoring has instilled a higher level of trust in the payment system, with users experiencing fewer delays and a significant reduction in transaction errors. Moreover, the AI/ML modules integrated for crop disease detection and crop recommendation have demonstrated high accuracy rate of 95.36%. The disease prediction model accuracy of 99.32%, allowing farmers to take timely remedial actions that helped mitigate yield losses.

9.2 Discussion on System Performance

To further validate model effectiveness beyond numerical metrics, random samples were selected and visualized for both systems.

9.2.1 Crop Disease Detection:

The CNN model trained on the PlantVillagecolor subset achieved an accuracy of 95.36%, with a macro F1-score of 94%. Misclassifications were minimal and mostly occurred between visually similar diseases.

Random predictions from test samples were visualized, confirming the model's real-world usability, a 3x3 grid of real-world leaf images was presented (Figure 9.1), where each image was annotated with its true and predicted disease class. The visual alignment between true and predicted labels illustrates the model's effectiveness and generalization on unseen data.

9.2.2 Crop recommendation system

The Random Forest model trained on agronomic data achieved an accuracy of 99.32% on unseen test samples. The model was tested with randomly generated agro-climatic inputs. Table 9.1 shows of nine such samples along with their predicted crops. The results reflect the model's consistency and accuracy in recommending suitable crops across a variety of soil and weather conditions.

The integration of machine learning into the KropCart platform yielded highly promising results across crop disease diagnosis and crop recommendation modules.

Figure 9.1 Random Predictions of Crop Disease Detection model

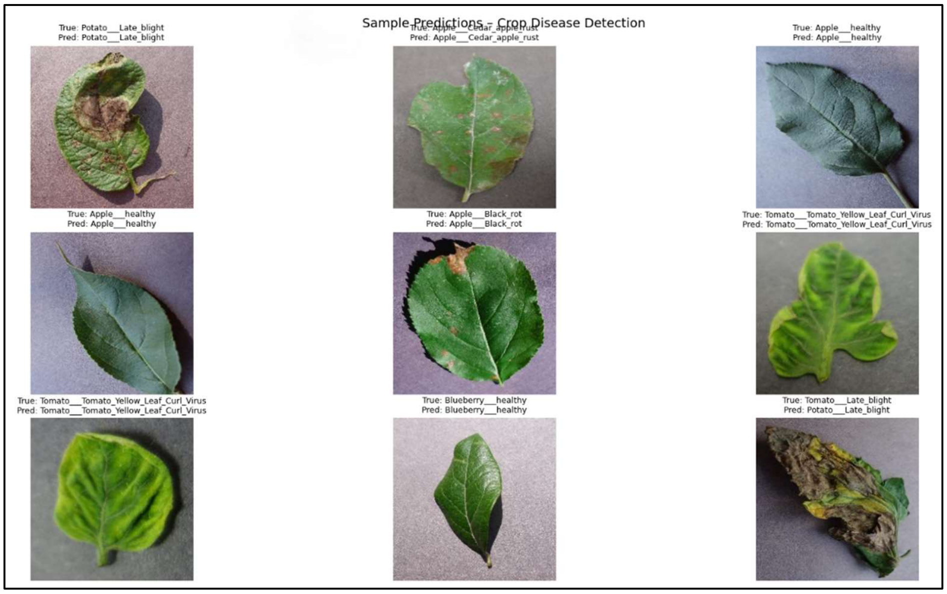


Table 9.1 Crop Recommendation Outputs for Random Samples

N	**P**	**K**	**Temp (°C)**	**Humidity (%)**	**pH**	**Rainfall (mm)**	**Recommended Crop**
46.0	96.0	123.0	20.27	82.43	7.26	279.57	papaya
35.0	46.0	126.0	33.41	80.09	5.69	265.68	papaya
78.0	75.0	20.0	23.08	83.0	5.65	156.06	maize
49.0	119.0	106.0	31.49	56.55	6.66	215.51	pigeonpeas
15.0	125.0	145.0	24.25	86.9	6.08	297.03	apple
147.0	20.0	68.0	31.73	50.52	5.97	252.76	coffee
35.0	6.0	90.0	23.89	61.62	7.36	176.25	chickpea
64.0	147.0	106.0	24.69	85.86	6.48	96.86	banana
11.0	83.0	17.0	33.71	89.26	6.32	162.58	pigeonpeas

9.3 User Experience and Adoption

Feedback collected from initial user groups indicates that the application's interface is intuitive and accessible, even for farmers with limited digital experience. The simplified layout and clear navigation were specifically designed to accommodate varying levels of tech literacy. User testing in rural pilot regions showed a positive reception, with most participants successfully navigating core features such as crop recommendation, produce listing, and AI-based disease detection without external assistance. This ease of use played a key role in accelerating platform adoption during the pilot phase.

9.4 Economic and Agricultural Impact

The direct market access model has created a positive economic impact by increasing the share of profits retained by farmers. With middlemen removed from the supply chain, farmers are now able to negotiate fairer prices, which has already resulted in a measurable increase in their average income. Additionally, the integration of AI-powered advisory tools has empowered farmers with data-driven insights. This guidance has enabled more strategic decisions regarding crop selection and disease management, ultimately contributing to enhanced productivity and reduced financial losses due to crop failures.

9.5 Future Considerations

While the current results are promising, there are areas for future improvement. Ongoing training for users, particularly in rural areas, is essential to ensure sustained adoption and effective utilization of the platform’s full range of features. Further refinement of the AI models through continuous data collection and algorithm optimization will help enhance prediction accuracy. Expanding the application’s functionalities to include advanced market trend analysis and integration with government support programs is also planned. Such improvements will not only reinforce the system’s impact but also contribute to a more resilient agricultural ecosystem.

Chapter 10

CONCLUSION

The development of a mobile application for direct market access for farmers represents a transformative step in the agricultural sector. By using modern technologies such as Node.js, AI-powered crop recommendations, and machine learning-based disease detection, the platform aims to bridge the gap between farmers and consumers, ensuring equitable trade practices and improving economic conditions for rural communities.

One of the key takeaways of this project is the empowerment of farmers through digital tools that enhance their ability to connect with buyers directly. The elimination of middlemen ensures that farmers receive fair compensation for their produce while offering consumers fresh and fairly priced goods. The integration of real-time transactions and digital payments further strengthens financial security and operational efficiency within the platform.

Moreover, the incorporation of AI-driven crop recommendation systems and disease prediction models contributes to informed decision-making, reducing losses due to pest infestations and suboptimal crop choices. This technological intervention not only improves productivity but also fosters sustainable farming practices by optimizing resources and minimizing unnecessary chemical use.

Despite the numerous advantages, challenges such as digital literacy, rural internet connectivity, and adoption barriers remain critical considerations. Ensuring that the app remains user-friendly and accessible to a diverse group of farmers will require ongoing training, iterative design improvements, and collaborations with agricultural organizations and policymakers.

Looking forward, the project has significant potential for scalability. Future enhancements may include integrating government schemes, weather forecasting, logistics support, and AI-driven market trend analysis. The continued evolution of this application will contribute to a more resilient, efficient, and farmer-centric agricultural economy.

In conclusion, this mobile application represents an innovative approach to modernizing agricultural trade, improving livelihoods, and fostering a more sustainable and transparent marketplace for farmers and consumers alike. Through technological advancements and continued stakeholder engagement, this platform has the potential to revolutionize the way agricultural produce is marketed and sold, paving the way for a more prosperous and self-sufficient farming community.

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APPENDIX-A

PSUEDOCODE

Initialization

START

Import necessary libraries (Flask, ML tools, MySQL, etc.)

Configure Flask app with CORS, secret keys, and upload settings

Configure Google Gemini AI API

Connect to MySQL database

Suppress TensorFlow warnings

Ensure upload directory exists

Model Loading

IF crop disease model file exists THEN

Load the pre-trained TensorFlow model

Load class indices (for disease names)

ELSE

Prepare image data generators (augmentation)

Train CNN model on plant disease dataset

Save model and class indices

ENDIF

Load crop recommendation dataset (CSV)

Preprocess features (N, P, K, temp, humidity, pH, rainfall)

Encode target labels

Train RandomForestClassifier for crop recommendation

API Endpoints

Crop Recommendation

POST /recommend_crop

Read input soil/weather values from JSON

Predict best crop using RandomForest model

Use Gemini AI to get crop cultivation tips

RETURN crop recommendation + tips

Disease Detection

POST /predict_disease

Upload image

Preprocess image

Predict disease using CNN model

Use Gemini AI to get disease management tips

RETURN predicted disease + confidence + advice

User Authentication

POST /register

Get user details

Hash password

Insert into MySQL

POST /login

Get username and password

Verify hash with DB

Set user session

GET /check_auth

RETURN session status (logged in or not)

POST /logout

Clear session

E-Commerce Features

Products

GET /get_products

RETURN all products from DB

GET /api/recent-products

RETURN 5 latest products

POST /add_product

Upload image

Store product data in DB

```
Orders
POST /api/orders
  IF payment is COD THEN
    Store order as 'pending'
  ELSE IF payment is online THEN
    Verify Razorpay signature
    Store order as 'paid'
  RETURN status
GET /api/orders/by-username/<username>
  RETURN orders for a specific user
GET /api/latest-orders
  RETURN 5 latest orders
GET /api/dashboard-stats
  RETURN product count, order count, total sales, customer orders
```

Payment Integration (Razorpay)

```
POST /api/create-razorpay-order
  Create a payment order with Razorpay API
  RETURN payment order ID and details
```

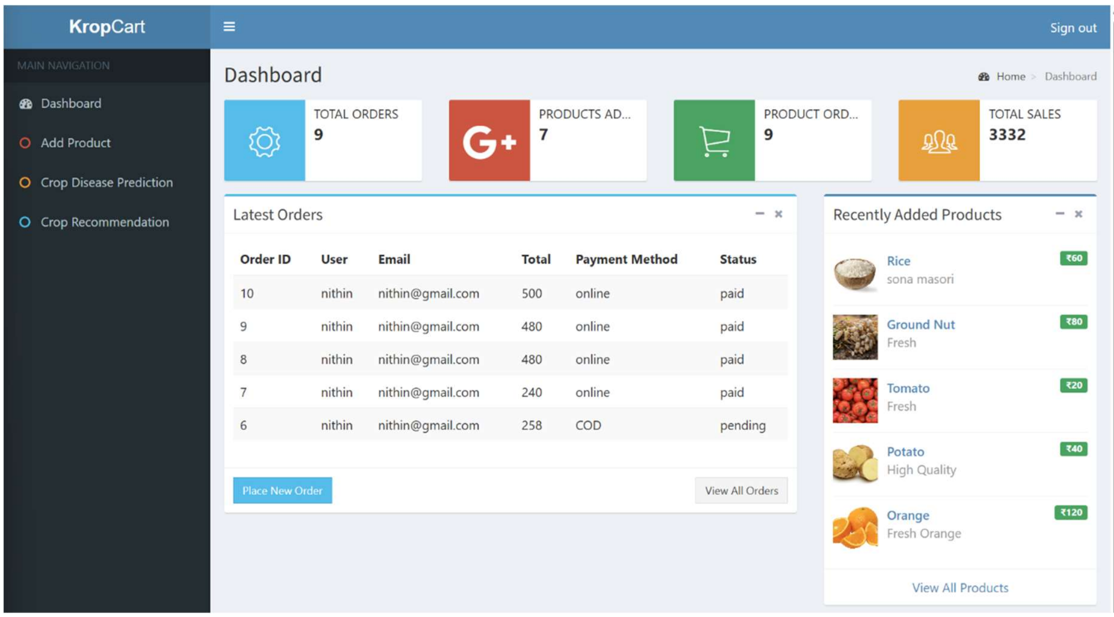
Negotiation System

```
POST /api/negotiations
  Store negotiation request (with negotiated price)
GET /api/negotiations/pending
  RETURN list of pending negotiations
PUT /api/negotiations/<id>
  Approve or reject negotiation
POST /api/negotiations/status-by-id
  RETURN status of negotiation by ID
```

APPENDIX-B

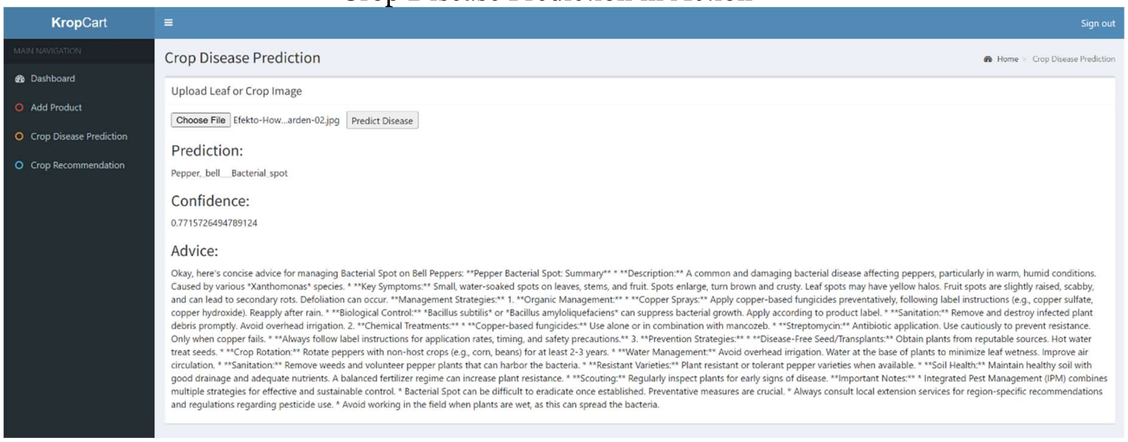
SCREENSHOTS

Farmer Dashboard



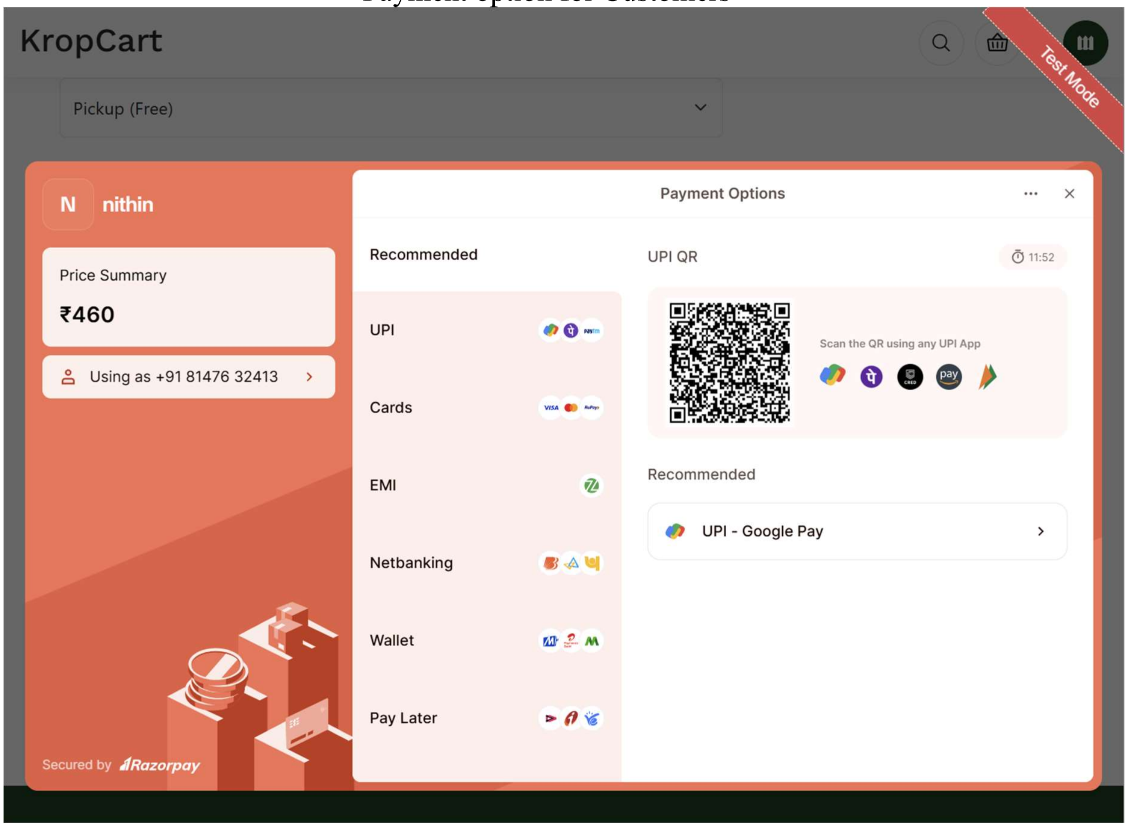
Farmer Negotiation

Crop Disease Prediction in Action



Crop Recommendation in Action

Payment option for Customers



APPENDIX-C

ENCLOSURES

1. Journal publication/Conference Paper Presented Certificates (if any).

2. Include certificate(s) of any Achievement/Award won in any project-related event.

3. Similarity Index / Plagiarism Check report clearly showing the Percentage (%). No need for a page-wise explanation.

4. Details of mapping the project with the Sustainable Development Goals (SDGs).

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Co-author(s): G Nithin, Jayanth V, Swaroop R S, Lohith M C

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Mr. Lakshmisha S K - project report (3).pdf

ORIGINALITY REPORT

11%	3%	8%	3%
SIMILARITY INDEX	INTERNET SOURCES	PUBLICATIONS	STUDENT PAPERS

PRIMARY SOURCES

1	Matheen Fathima G, Shakkeera L. "Efficient task scheduling and computational offloading optimization with federated learning and blockchain in mobile cloud computing", Results in Control and Optimization, 2025 Publication	5%
2	Amit Kumar Tyagi, Shrikant Tiwari. "Blockchain and Digital Twin Applications in Smart Agriculture", CRC Press, 2025 Publication	1%
3	Submitted to Presidency University Student Paper	1%
4	Vivekanandan P, Radhika P, Kalai Selvan T S, Praveen M Rao, Vinoth P, Tarun A. "Farm Connect Application: Bridging the Gap Between Farmers and Consumers Through Digital Technology", 2023 International Conference on Sustainable Emerging Innovations in Engineering and Technology (ICSEIET), 2023 Publication	1%

SUSTAINABLE DEVELOPMENT GOALS

1. SDG 2: Zero Hunger

AI-driven crop recommendations enhance agricultural productivity by suggesting crops tailored to soil and market needs, strengthening food security. Meanwhile, ML-based disease detection minimizes crop losses, ensuring a reliable food supply to combat hunger.

2. SDG 8: Decent Work and Economic Growth

Direct market access empowers farmers to become entrepreneurs, managing sales independently and creating decent work opportunities. Its scalable design fosters inclusive economic growth, positioning farmers as vital contributors to rural economies.

3. SDG 9: Industry, Innovation, and Infrastructure

Leveraging Node.js, AI, and ML, the app introduces innovative infrastructure that transforms agricultural trade practices. Its cloud-based deployment ensures scalable, resilient technology reaches even remote farming communities.

4. SDG 10: Reduced Inequalities

The app levels the playing field by granting smallholder farmers equal market access, reducing income gaps perpetuated by middlemen. Multilingual and voice-based interfaces make it accessible to farmers with limited literacy or technical skills, promoting inclusivity.

5. SDG 13: Climate Action

Crop recommendations based on weather data help farmers adapt to climate variability, building resilience. Precise disease detection reduces unnecessary chemical use, supporting environmentally sustainable farming methods.