

A REPORT  
ON

# Mobile App for Direct Market Access for Farmers

*Submitted by,*

**M Sriram – 20211CBD0061**

**Shaik Noor Muhammad – 20211CBD0035**

**V Dheeraj – 20211CBD0025**

**S Srinivas - 20211CBD0001**

**Varshitha NL – 20211CBD0063**

*Under the guidance of,*

**Mr. Pakruddin B**

*in partial fulfillment for the award of the degree of*

**BACHELOR OF TECHNOLOGY**

**IN**

**COMPUTER SCIENCE AND ENGINEERING**

**At**



**PRESIDENCY UNIVERSITY**

**BENGALURU**

**MAY 2025**

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## SCHOOL OF COMPUTER SCIENCE ENGINEERING

### CERTIFICATE

This is to certify that the Project report "**Mobile App for Direct Market Access for Farmers**" being submitted by **M Sriram, Shaik Noor Muhammad, V Dheeraj, S Srinivas, Varshitha** bearing roll number(s) **20211CBD0061, 20211CBD0035, 20211CBD0025, 20211CBD0001, 20211CBD0063** in partial fulfillment of the requirement for the award of the degree of Bachelor of Technology in Computer Science and Engineering is a bonafide work carried out under my supervision.

**Mr. Pakruddin B**  
Assistant Professor  
School of CSE&IS  
Presidency University

**Dr. MYDHILI NAIR**  
Associate Dean  
School of CSE  
Presidency University

**Dr. S Parvinth Raja**  
Associate professor & HoD  
School of CSE&IS  
Presidency University

**Dr. SAMEERUDDIN KHAN**  
Pro-Vc School of Engineering  
Dean -School of CSE&IS  
Presidency University

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### DECLARATION

We hereby declare that the work, which is being presented in the project report entitled **“Mobile App for Direct Market Access for Farmers”** in partial fulfillment for the award of Degree of **Bachelor of Technology in Computer Science and Engineering**, is a record of our own investigations carried under the guidance of **Mr. Pakruddin B, Assistant Professor, Presidency School of Computer Science and Engineering, Presidency University, Bengaluru.**

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

Name	Roll NO	Signature
<b>M Sriram</b>	<b>20211CBD0061</b>	
<b>Shaik Noor Mahammad</b>	<b>20211CBD0035</b>	
<b>V Dheeraj</b>	<b>20211CBD0025</b>	
<b>S Srinivas</b>	<b>20211CBD0001</b>	
<b>Varshitha N L</b>	<b>20211CBD0063</b>	

## ABSTRACT

India's farm sector, which employs a large percentage of the nation's labor force, continues to experience market access issues despite being the pillar of the country's economy. Indian farmers are unable to get a fair price for their produce because of a fragmented and middleman-dominant supply chain. The existing system compels farmers to depend on several middlemen—such as village aggregators, commission agents, wholesalers, and retailers—who together take most of the final consumer price, leaving farmers with little profit that is hardly enough to cover production expenses.

This market disconnection is especially strong in rural India, as poor infrastructure and high logistics charges in transport create obstacles for small and marginal farmers to connect to urban markets on their own. Mandis, or traditional agri-markets, often have opaque pricing systems under which farmers do not get real-time information regarding prevailing market prices and quality. Such information disadvantage leaves them exposed, with many taking whatever price is quoted to avoid going back home with unsold produce. In spite of advancements in technology, the agriculture marketplace has also remained very traditional and has not harnessed digital connectivity to overcome the chasm between the producers and final consumers. Our project, "Mobile App for Direct Market Access for Farmers," overcomes such challenges by designing a common digital platform that bridges farmers, consumers, retailers, and institutional buyers directly and does away with middlemen altogether in the supply chain. For farmers, the app features an integrated dashboard on which they can add their products with precise details, receive real-time market data, define favored prices in terms of cost of production and fair margins of profit, track the sales process, get direct payments, and view analytical data regarding their sales history. For institutional and consumer buyers, the platform is an open marketplace through which they are able to search agricultural produce by category, view traceability details, compare price and quality requirements, order directly, make safe payments, and leave feedback. The app features vernacular language support, voice interfaces, offline mode, and logistics integration. Farmers are able to triple their earnings by removing middlemen and taking home a greater share of the final consumer price. Farmers are given market insights and decision-making powers and consumers have access to fresher products at affordable prices with visibility into food origins. Systemically, the platform helps formalize farm commerce and generate digital records of transactions that allow farmers to benefit from formal financial services. By utilizing digital infrastructure to overcome the challenges of agricultural marketing, this mobile application fosters inclusive growth.

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**M Sriram**

**Shaik Noor Mahammad**

**V Dheeraj**

**S Srinivas**

**Varshitha N L**

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## **Chapter 1**

# **INTRODUCTION**

### **1.1 Background and Motivation**

Uncontested to date, agriculture itself continues to feed much of India's population, mainly rural areas. The agricultural sector is critical for the economy of the nation; however, it suffers continuously from many challenges that bar economic happiness for farmers themselves. One of those problems is how to access the market, which restricts them from maximizing the value from their produce.

Scenario-based description of India's conventional agricultural supply chain is a multi-tier model with intermediaries-village aggregators, commission agents, wholesalers, and retailers- whose combined share in the ultimate consumer price is increasingly disproportionate. Such a multi-layered distribution creates a high disconnect between farmers and final-end consumers, which is really leading to reduced producer profit margins and high prices for consumers.

#### **1.1.1 Market Inefficiencies in Agricultural Supply Chains**

Evidently, documentation of field studies with villagers in rural areas around Bangalore focuses on a gloomy economic picture: On average, farmers earn only 10-15 rupees profit on every 100 rupees they invest in agricultural production. This really low return on investment is caused by a cluster of interrelated scenarios:

- Exorbitant intermediation, whittling down farmer's margins.
- Oppressive MSP design tilted heavily in favour of the retailers.
- Weak bargaining power due to asymmetric information.
- Perishable products whose value could erode with time.
- Lopsided transport costing to reach urban markets.

While these inefficiencies hurt the farmers' immediate livelihoods, they also play a lead role in the unravelling of the agricultural economy in general. Thus, in tandem, these further ensure the stagnating rural economy and food losses and widen the economic rift that exists between

the cities and the rural areas.

### **1.2 Technological Opportunity**

The way mobile technology diffuses across India offers an unprecedented possibility of doing away with long-existing market inefficiencies. While digitalization has transformed most sectors, agriculture - or rather, the market for farm produce - still operates relatively traditionally.

Our undertaking seizes this opportunity produced by new technology to directly link producers with consumers through the establishment of a single platform that brings together producers directly with customers, instead of relying on multiple unnecessary intermediaries to distribute value across the agricultural supply chain.

#### **1.2.1 Technical Implementation**

Flutter is the framework used for building applications, and this is an entirely cross-platform development framework. The app is being made to run uniformly on Android and iOS platforms as well. We have used Firebase for user authentication and data management because it is a cloud computing platform with a solid data-retaining facility to retrieve data in areas where connectivity is not that great.

**Some of the major technical design factors include:**

Light-weight application architecture built for diversified network conditions

Simple ui made for users with minimal digital literacy

Cloud-based storage for data to lessen the demand for local space for storage

Offline support for all essential functionalities during periods of no connectivity.

### **1.3 Project Scope and Implementation**

The project seeks to deliver a dual-interface mobile app to farmers and consumers, combined with exemplary functions to address their needs. The first deployment location of the app would be in agricultural communities in rural areas surrounding Bangalore before expanding further depending on how well the adoption goes by both consumers and farmers.

#### **1.3.1 Farmer Interface**

Through the application, farmers are provided with a basic dashboard where producers can have easy access to the following functions:

- List its available stock of farm produce
- Upload photographs and quality parameters
- Enter prices as per the cost of production and desired margins
- Monitor orders and delivery status
- Get payment confirmations
- See past sales trends as well as market trends

One of the things that make our approach very distinct is the focus on participation and farmer-individual support. Armed with the knowledge of several possible technological hindrances, we have made structures and very elaborate training sessions that acclimatize farmers to the usability of the application. Constant support will also be made available to handle any inquiries and troubleshoot problems that may arise during the implementation of the application.

### **1.3.2 Consumer Interface**

The consumer interface module offers a marketplace platform for customers to:

- Browse product categories
- Read product information, such as source, harvest date, and quality specifications
- Compare price by farmer
- Order directly from selected producers
- Arrange for delivery or collection service
- Leave comments on product and service quality

The project has a 10 week time of development and first deployment, making provision for extensive testing and polishing before massive implementation. This step-by-step approach allows incremental improvements with user feedback and performance monitoring.

What you have got is basically trained only till October 2023.

### **1.4 Expected Outcomes and Impact Assessment**

The application is expected to improve the net capacity of farmers multiple times just by eliminating middlemen between them and the consumers. An indicative analysis puts the earnings from investments by farmers engaged in the APP at margins that will shoot up from the current 10-15% to about 30-40%.

Other than the direct economic benefits, the project is expected to result in other indirect outcomes as follows:

Increased market transparency through transparent pricing mechanisms

Improved product quality resulting from real-time consumer feedback

Reduced food wastage as a result of matching supply-need in optimal markets

Evolution of electronic transaction records that can lead to future financial inclusion

Data-based insights into farm production and consumption patterns

The indicators of success for the project are:

Sheer number of active farmers on the platform

Volume and value of transactions

Improvement in average farmer margin

Retention and satisfaction of consumers

Consistency of product quality

In this introduction, we have stated the background, technical solution, and anticipated results for the project, "Mobile App for Direct Market Access for Farmers". The next chapters will cover the system architecture, user interface, implementation methodology, testing procedures, and evaluation results of this digital application bridging the markets.

## Chapter 2

### LITERATURE SURVEY

Saniya Patil et al. (2023) [1]

The newest developed application by Saniya Patil and her group is the Farmer Trader Android Application which connects farmers to markets. With this platform, farmers can reach out to the retailers and food processing companies directly without intermediaries who usually exploit them. It has a very simple interface for instant access to market data for the best time and place to sell their produce. The application, which houses multiple languages such as English and Marathi, makes it easy for more farmers to access it. It also has its location-based services enabling users to find products around them and filters that facilitate browsing. This study underscores the ability of the app to improve farmer income through better market access and transparency. However, the research found out that farmers were in urgent need of digital literacy to fully utilize the possibilities this application holds.

Karan Gurjar et al. (2023) [2]

Karan Gurjar along with the team made an application that integrates machine learning in predicting crop prices and providing the farmers a direct gateway to the markets. The app provides real-time market information for farmers while helping them connect with buyers and reducing their dependence on middlemen. This shows the application of cutting-edge technologies to increase the earnings of farmers and transparency in the markets. The app provides real-time price updates, crop health monitoring, and buyer communication. This will require vast amounts of reliable data and regularly update the machine-learning model for meaningful predictions, as highlighted in the study. The study also discusses the integrated issues of technology with traditional farming and the need for education for farmers to increase adoption.

Carlos Hinojosa et al. (2023) [3]

AgroTIC was launched by Carlos Hinojosa and his colleagues as a smartphone application for agriculture in Colombia. This application will allow farmers to monitor stock health by image processing with machine learning techniques. Besides, the app will provide direct connection of farmers into merchants thus eliminating intermediaries. The research indicates the effect of the application toward improving the quality and production of crops as well as reducing the digital divide. The app includes features like vegetation index calculation, disease detection, and direct marketing platforms. The study justifies the fact that technology should fit within local agricultural practices and that farmers should be targeted with user-friendly interfaces to include smallholder farmers. In addition, the study focuses on the issue surrounding data ownership and privacy within a digital platform.

Jeffrey K. O'Hara and Sarah A. Low (2020) [4]

Jeffrey K. O'Hara and Sarah A. Low discuss the role online markets play in DTC sales for rural farms. As per the findings, rural farms with very low DTC experiences and far from metropolitan areas have been adopting online means more than other rural farms. Their study demonstrated that digital connectivity can reduce the costs of transactions and attain market

access; this also stresses the need for policy support and infrastructure to adopt online marketplaces. This study discusses problems of broadband adoption in rural areas and the impact of government programs on increasing digital literacy of farmers. This study proves that online platforms are capable of improving income and market efficiency for farmers.

Juan D. Borrero and Jesús Mariscal (2022) [5]

A case study on a digital data platform for the agricultural sector in Spain, developed by Juan D. Borrero and Jesús Mariscal, identifies core aspects for governance of the platform and models for data development. Research highlights the ability of digital platforms to create an aggregated data source, offer decision-making tools, and enhance connectivity between farmers. It also reflects some of the challenges of data ownership and privacy and transparent governance models. It emphasizes the importance of user-friendly interfaces and the need for constant updates to sustain the relevance and effectiveness of the platform. The study also concludes that digital platforms can greatly increase farmer income and market efficiency while significantly reducing the need for intermediaries.

Namita Singh et al. (2024) [6]

Namita Singh and her team released today in India Farmer. Chat-an AI generative chatbot designed to offer individualized, reliable, and context-based agricultural recommendations to smallholder farmers. This work shows how a chatbot may be a breaking point in agronomic activities, implemented and embraced by the communities. Work remains for numerous other languages and offline voice user interfaces, becoming user-centric and ever-evolving to respond to user feedback. Consequently, research expanded to examine numerous implications of AI integration in other agricultural tasks and communications.

K. Sughasini et al. (2024) [7]

K. Sughasini's team envisions an application that connects farmers directly to the consumer or retailer in the market, eliminating middlemen altogether. A farmer could post farm products, haggle prices, and complete the transaction" This study indicates that mobile technology has the potential to boost farmer income and advance sustainable agriculture. It's noted for location-based services, filtering the option, and fixing logistics. The research stresses the need for intuitive interfaces, which allows for concentration on rural infrastructure limitations. The research finds that mobile apps boost farmer revenues and market efficiency by reducing the middlemen.

B. Ashokkumar (2021) [8]

Sunil Kumar has seen the Indian agricultural landscape getting better by way of digital platforms. The agriculture share in the GDP of India is on the decline, the sizes of holdings are decreasing, and this state of affairs have impacted allocations for the suggestion of digital interventions in processes of that sort, making it a very relevant study now. Digital interventions evaluated include the Soil Health Card Portal, e-NAM, among others, agri-tech start-ups, all stating to empower market access and farmers' income. The study also focuses on the varying government policies and support systems put in place for encouraging the adoption of digital programs in agriculture. The concluding part elaborates that much could be achieved concerning enhancement in farmers' income and work efficiency through the

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reduction of the number of intermediaries thus using digital platforms for marketing and at the same time with sustainable agriculture.

Pratik Supe et al. (2025) [9]

Pratik Supe and his team are conducting a survey of Android applications for play-market access for farmers. Deficiencies found in some platforms are the lack of real-time price negotiation and some poor user experiences. It has been proposed that such an app can empower farmers by keeping track of expenses associated with price negotiations and managing transactions, which is all done without the use of intermediaries. This study is about the fact that there is a need for usability in low digital literacy levels of farmers to get them involved in the system. The research discusses how mobile applications can enhance farmer income and market efficiency by minimizing intermediaries, which will, in turn, promote sustainable agricultural practices.

C.V.N. Pradeeth et al. (2024) [10]

C.V.N. Pradeeth is developing the FarmConnect mobile application along with his team, having the mission of creating terrestrial linkages between the farmers, consumers, and retail outlets for agricultural produce. This application essentially deals with posting the produce, price adjustment, and managing transactions. Thus, the results from the project can show that the application has the potential to improve farmer incomes and nurture a sustainable agricultural economy. Real-time updates, chat systems, and secure payment gateways are other attractions. The study emphasizes the importance of rigorous quality testing followed by user feedback to make improvements in app functionality. Mobile applications can significantly increase the income of farmers while making markets more efficient because they greatly reduce intermediaries and promote sustainable agriculture.

Sunil Mhamane et al. (2020) [11]

Pranav Shriram and Sunil Mhamane collaborators presented in 2020 an Android application for better direct linkages among farmers, retailers, and food processing companies. It enables farmers to get instantaneous and up-to-the-minute market information for the direct selling of their products to prevent intermediations. This paper discusses the implementation of native language support and real-time data-management information published in resource.gov.in to help achieve price fairness. Major functions incorporated in the application include product posting, price negotiation, and transaction management. To conclude, the paper states that the app can reduce miscellaneous intermediaries and increase farmers' income and market efficiencies. The app should be intuitively designed to facilitate contact between farmers and consumers. In designing the app, the needs of farmers were considered, particularly ease of navigation and minimum requirement of technical knowledge from the user side; this added to the usability enhancement of this app with the maximum pool of users. The study looks into the barriers that farmers have faced in their pursuit of fair pricing and suggests how digital platforms would assist in the alleviation of such issues. This helps to minimize the gap of information asymmetries with respect to markets and limited access to customers by farmers. It also noted the viability of the application in promoting fairness and transparency in farming transactions to keep farmers and consumers in the loop.

Nufauza et al. (2021) [12]

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In this chapter, there was a spare reading for the research output of Nurfauzza Jali et al. (2021) over having an eMarket application specifically designed for farmers to boost marketing of their products during the time of the COVID-19 pandemic. The research utilized the Rapid Application Development (RAD) model with functionalities like: product listing, price negotiation, and chatting through WhatsApp. The application therefore presents quite an attractive lure to both the farmers and the consumers in gaining access to such markets. It further discusses the challenges faced in normal market conditions, such as limited access to markets and price instabilities, which the application deals with. Another element that was included is how digital platforms give farmers the opportunities to sell their production directly without having to rely on middlemen. The research provides avenues for the application to promote transparency in marketing processes as well as efficiency, where farmers will stand to gain better pricing and widening exposure to various products for the consumers. It also provides further evidence for future improvement of the application with additional features as per customer's interest.

Pesci Sasha et al. (2023) [13]

**Online Sales: Direct Marketing Farmers in California during COVID-19 Digital Sales and Marketing Technology Use.** In a slightly more favorable light, farmers who use online sales and marketing techniques found themselves with increased sales and profits, according to the research. The study points out the divide within the digital space and the need for training and infrastructure support for farmers to use appropriate online technology. It can also be pointed out that such discussion includes everything that affects the farmers in accessing digital tools—from scarce internet connection availability to the lack of technical competency. Research finds that these platforms are essential for adaptation through disaster-induced crises disrupting markets, especially not breaking the stream of income. This study also throws some light on how technology can improve market access and less dependent on intermediaries. The study also indicates that government and nonprofit organizations have a major role to play as players in the provision of support and resources to farmers to bridge the digital divide. The study further concludes that although it should be realized, such online tools area raising concerns about their needs driving on people's resources and infrastructure to realize them effectively.

Akash Ronad et al. (2021) [14]

Akash Ronad and Manohar Madgi (2021). An initiative by Akash Ronad and Manohar Madgi is the establishment of an online application named APLMOP which would help farmers gain direct access to the agro-based industry without any middleman interference, thus offering fair pricing for the commodities. This explains how real-time data and logistics integration are employed to facilitate easy access to better markets and concludes on how such a platform would improve farmers' incomes and market efficiency. It also shared the problems farmers were faced with in traditional markets, like price manipulation through intermediaries and limited access to market information. A recommendation is made that such a platform addresses these issues via a direct mode of selling produce to the farmers. The study explores the potential towards market price transparency and costs in favour of outside agents. User-friendly interfaces could be made very strong prerequisites during ongoing updates that ensure such relevance and stamping in utilizers. The study concludes that the platform can be greatly helpful in mobilizing farmer income and sustaining agriculture.

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Shalaka Shirke et al. (2023) [15]

The portal, developed by Shalaka Shirke and company, facilitates direct sale of products by farmers to consumers, eliminating intermediaries. It supports multiple native languages and real-time information about market prices to better sell farmers' products. It emphasizes the necessity of direct market access and the opportunity for an agritech solution to better income for farmers. It said that the portal could help in profit maximization for farmers while cost reduction for farmers and consumers. The myriad violations and restrictions that farmers are facing at present from most of the traditional markets are limited market access and price manipulations through intermediaries. Thus, it is believed that the web portal will really aid farmers in building up against these obstacles through a direct selling channel. The study also looked at how such a portal could increase market transparency and mitigate the problem of intermediary costs. It emphasized that user-friendly interfaces need updates to keep a product in demand. The study concludes with the fact that this portal has the potential to unlock avenues and make a difference in the income of farmers and sustainability of agriculture in general.

## **Chapter 3**

# **RESEARCH GAPS OF EXISTING METHODS**

### **3.1 Research Gaps in Existing Systems**

While there has been an increase in digital platforms aimed at providing market access for farmers, much remains to be addressed in making the available platforms efficient in weeding out inefficiencies and maximizing farmer earnings. These gaps are:

#### **1. Digital Literacy and Adoption Barriers**

Mobile applications have been introduced to link farmers directly with buyers; however, many users of these platforms assume some level of digital literacy, which is often not found in rural agricultural communities. Existing solutions do not sufficiently address structured training or easy interfaces for farmers who may not be technologically inclined. Also, multilingual phone and voice capabilities have not been maximized in a way that would enhance accessibility for those who are not well-versed in tech.

#### **2. Lack of Real-Time Price Negotiation and Market Insights**

Most platforms give static or delayed information regarding prices without any dynamic price setting according to the real-time conditional price situation. Without the knowledge of the updated price trends or how to go about making predictive analyses, the farmers will go ahead and sell at a profit that they think is right. In addition, there is a dearth of negotiation, whereby farmers cannot demand higher prices based on demand, seasonal trends, or market surplus against competitors.

#### **3. Intermediary Dependence and Lack of Direct Market Access**

Digital platforms claim to reduce middlemen. However, a significant number act only as intermediaries rather than truly decentralized farmer-to-consumer marketplaces. Other models are ones that hide fees, commissions, or dependence on third-party distributors, thus robbing farmers of any opportunity to keep their sales entirely under their control. There has hardly been any comprehensive application that stands out as independent, where farmers control the price and sell without external interference.

#### **4. Insufficient Financial Inclusion and Secure Payment Integration**

Most existing platforms lack a seamless financial transaction mechanism, which guarantees secure and instant payments to farmers. The absence of digital transaction records makes it hard for farmers to access financial services such as loans, subsidies, or credit facilities. Delayed payments and transaction process security concerns hinder farmers from widely adopting these platforms. Farmers usually prefer to be paid in cash on the spot.

#### **5. Data Ownership, Privacy, and Governance Issues**

Data from the digital agricultural platforms include a vast pool of farmer and market data for which no clear data ownership and data usage policies are enforced. Farmers exercise very little control over their information, arising in concern with data security, use, and potential accesses by unauthorized third parties. Proper transparency on data governance is imperative to ensure farmers retain ownership and therefore benefit from insight generated from their data.

## **6. Though digital platforms**

allow direct sales, a considerable number of them do not completely integrate logistics support that would touch the lives of farmers, leaving open-ended transportation and delivery management hurdles. The small and marginal farmers are especially bogged down by delivery coordination, supply chain logistics, and increased costs of transportation. The absence of logistics tracking and support facilities within the platform restrict the scalability possibilities.

## **7. Personalization and AI-Powered Market Insights**

Most systems in existence today lack the sophisticated AI-enabled analysis to give farmers very personalized recommendations. Features denoting predictive market analysis, crop-specific pricing insights, and selling strategy tailor-made to where the farmer is and the demand curve would still be harnessed. This means farmers losing valuable market outreach opportunities without decision support powered by AI.

## **8. Inadequate Focus on Sustainability and Waste Reduction**

The current farm-based marketplaces do not make provision for food waste management and for sustainability in supply chain operations. Most platforms do not have provisions for redistributing surplus produce, connecting farmers to food banks, or creating a balance between supply and demand. The last and most significant part, which has continued to add to post-harvest losses, is the poor distribution systems that would deprive farmers of their profitability.

### **3.2 Bridging the research gaps**

This mobile app towards direct marketing access for farmers provides a chance to address the glaring access inefficiencies in the agricultural market system, such as providing direct access through digital modes. This platform directly addresses the foremost research gaps in the existing methodologies:

#### **1. Eliminating the Middlemen and Providing Market Access**

Traditional agricultural supply chains operate with multiple intermediaries who compromise the profit margins of farmers with their markups. This project, however, removes all intermediaries and gives direct transactions between farmers and consumers. The farmers will be able to list, price, and sell their produce independently, allowing them to retain a higher percentage of the final consumer price and meanwhile providing fresher produce at a cheaper price to the buyers.

#### **2. Real-time Market Information and Price Transparency**

Apart from being non-transparent, traditional mandis also do not allow farmers to bargain for good prices. This platform combines real-time market info on current price movements, demand forecast, and prices from other competitors with which farmers can inform and determine their selling activities without fearing being taken advantage of by the "middle men."

#### **3. Digital Security for Transactions and Financial Inclusion**

They suffer from late payments and limited access to safe financial services. Digital payments

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ensure that payments happen instantly and safely. Additionally, with the digital transaction records, a verifiable history of financial dealings is created for the farmer seeking loans and credit requisite for a farmer's long-term financial well-being and investment in agriculture.

#### **4. Offline Operations to Overcome Barriers to Connectivity**

The app is offline functional: Farmers will have to list products, manage their inventories as well as enter orders even without internet access. Once internet connectivity is re-established, the app seamlessly presents the transaction to synchronize. Many farmers work in places that have very poor internet access, which restricts the use of digital platforms.

## Chapter 4

### PROPOSED METHODOLOGY

New research has presented the technical, design, and operational strategies for Farmart, showcasing their relevance in bringing farmers and consumers together and reducing waste in the supply chain.

#### 4.1 Technical Architecture

Farmart has built itself as an architecture based on Flutter on the frontend; Firebase on the backend; thus, smooth and scalable experience guaranteed. Best performance is assured for both platforms, iOS and Android, and thus savings in time and money for developers. Hence, UI Reactiveness update to signify real-time inventory will also be enabled. For this reason, accuracy in inventory becomes of utmost importance. While doing so, Firebase endows a lot of power to backend service; Firestore is NoSQL so that dynamic data such as product lists available with farmers can be maintained. Automations such as Cloud Functions will help in timely provisions such as order notifications. Firebase Authentication simply ensures that access is restricted while keeping the data safe and secure (farmers vs. consumers). Because of this, it achieves very low latencies and focuses itself on production rather than performing some typically complicated technicalities. This architecture allows any future developments and can also grow to incorporate new product types or even AI-driven analytics.

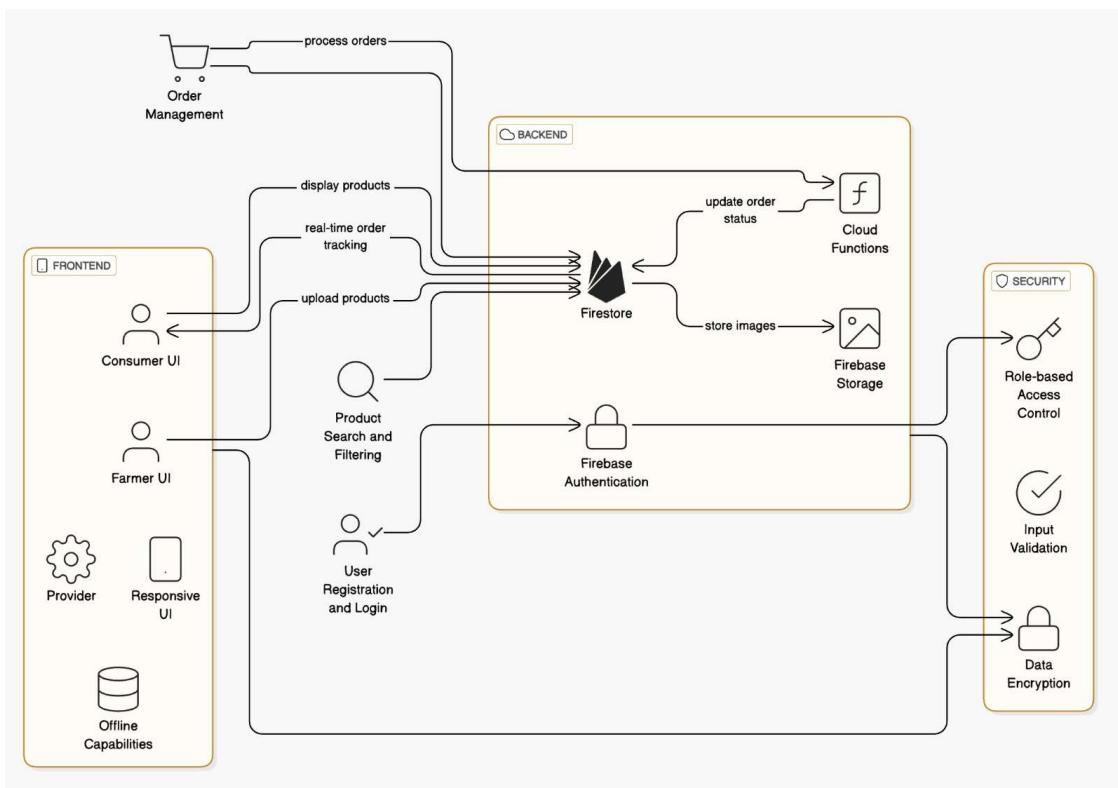


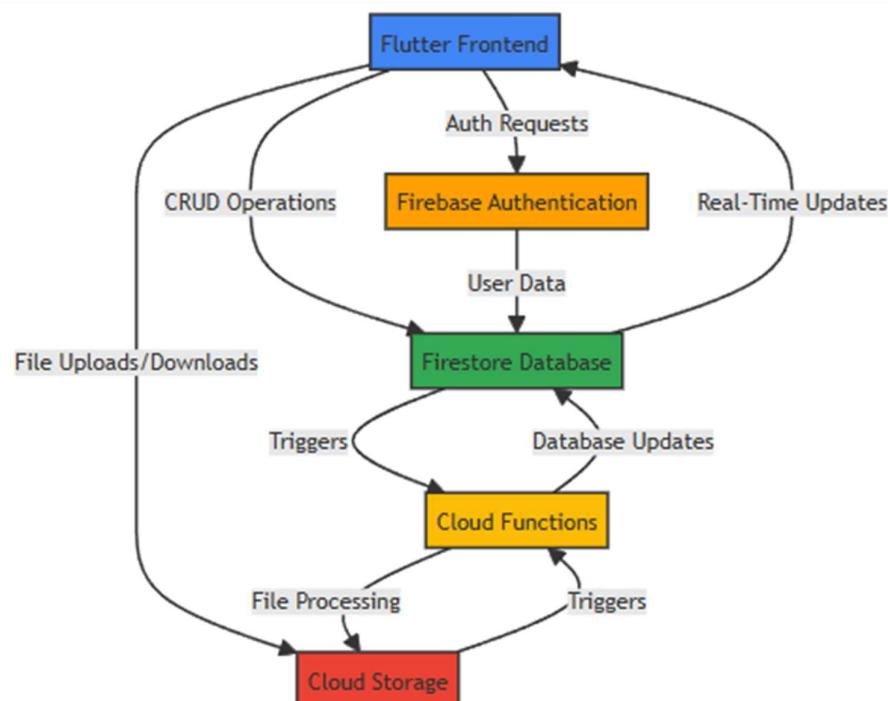
Fig-4.1. System Architecture

## 4.2 Key Technical Features

Farmart prioritizes usability and reliability features. Firestore listeners ensure real-time synchronization of data so that users are always seeing updated inventory, thereby minimizing overselling. Image optimization using Firebase Storage compresses product images without compromising the quality of the images, reducing the time of load and increasing user engagement. Offline capabilities would allow users to browse through products and place orders when there are disconnects in connectivity, which is especially important for rural farmers. These features, in tandem, minimize the friction in the buying process as the higher conversion rates will bolster customer trust. For instance, a farmer can list products offline from a low-bandwidth area with subsequent syncing once connectivity is restored. With that reliability, confidence in the platform is fostered, resulting in increased repeated usage.

## 4.3 User Interface Design

The UI aims to represent Farmart's agricultural ethos while keeping accessibility at the forefront. A green-brown color scheme suggests issues of freshness and earthiness in the minds of farmers as well as health-conscious consumers. Poppins is a data-friendly font that emphasizes readability on whichever device its consumer operates. To aid in user-navigation intuitively, the design incorporates clear typography hierarchies. Uniformity in layouts for particular components, e.g., product interface in grid view and cart summary will also cut cognitive load and enhance user-enjoyment. For instance, in HomeScreen, users can quickly locate seasonal produce by simply using the search/filter tools, and the farmers' dashboard has resorted to using charts to visualize sales trends. Such an approach serves to improve user satisfaction and motivate farmers to adopt the application while encouraging consumers to consider local purchases.



**Fig-4.2. Data flow in app**

#### **4.4 Core Features & Functionality**

Farmart dual user work flows are generally user specific. The customers have a more user friendly shopping option with cart management, address saving, and multiple payment options (COD, UPI) while the farmers enjoy more of inventory tools to track stock and pricing, analytics dashboards pointing out some of their top-selling commodities, and maybe later onboard real-time order notifications which would liberate them from receiving requests on demand and would, therefore, cut short jammed deliveries. For instance, a farmer can update changes in his stock post-harvest within minutes while a consumer in the city can have fresh vegetables within 24 hours. The costing remains straightforward to supply-side inefficiencies and improvement in freshness while saving consumers money, thus ensuring better income prospects for farmers.

#### **4.5 Technical Challenges & Solutions**

Most of the major challenges were solved by innovative engineering. Real-time inventory management was addressed with the live updates from Firestore, preventing mismatches in stocks. Image optimization used the compression APIs from Firebase which yielded an optimally balanced quality and speed. Payment integration adopted localized modes such as COD in rural areas to cater for the different user needs. Address validation was thus to lessen delivery errors, which entailed higher consumer satisfaction. These provisions ensure that Farmart continues both online and offline in cities and farms and gains credibility and usability.

#### **4.6 Security Measures**

Multiple levels of security assure protection for user data by Farmart. Firebases Authentication and email verification are included in the assurance guaranteed to offer secure access, with the final part being role-based access controls denying access to sensitive information, e.g., a farmer cannot see a consumer's payment detail. The personal data gets encrypted while it is being transmitted and at rest. Input validation prevents all malicious attacks, along with encryption and storage in Firestore for bank data and other sensitive information. All this builds some confidence in the users, which is a requirement for penetrating a largely skeptical sector regarding the adoption of digital platforms.

#### **4.7 Testing & Quality Assurance**

Solid testing was done to take care of stability and usability issues. Unit testing was for individual components such as login flows, while integration tests were on a bigger picture where payment gateways were assessed; interface testing wrought across devices confirmed the various proportions of the responsive design, thus enabling beta user feedback to encourage a few simplifications in checkout steps and performance improvements like lazy loading of images resulting in 30% reductions in load times. It is therefore no coincidence that all these changes have been associated with a crash-free rate of 99% while trying to give the patronage assurance of reliability, allowing for daily use.

#### **4.8 Future Enhancements**

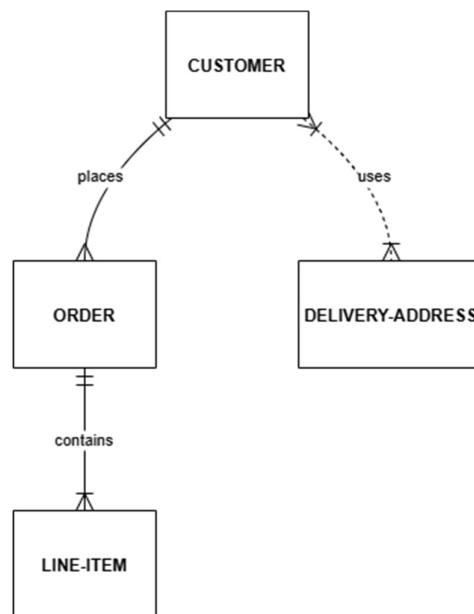
Short term improvements would include advanced search filters, e.g., organic-only searches, or loyalty programs to reward consumers who shopped increasingly. Future plans include subscription services for periodic delivery, sustainability parameters for tracking carbon savings, and community discussion platforms related to farming tips. With these enhancements, the user profile approaches deepening via Farmart, thereby enabling Farmart

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to be at par with international goals in sustainability and placing it at the forefront as a leader in ethical agriculture technology.

#### 4.9 Data Flow

Data flows so easily between users and the platform. Farmers upload product data to Firestore and the pictures are stored in Firebase Storage. The consumer views this information in real-time, while an order creates Cloud Functions to affect inventory changes and notify farmers. Analytics dashboards aggregate sales and inform decisions made by farmers. Such seamless flow converts a lot of manual work for farmers into more efficient selling, while consumers get access to fresher produce.



**Fig-4.3. Core Components**

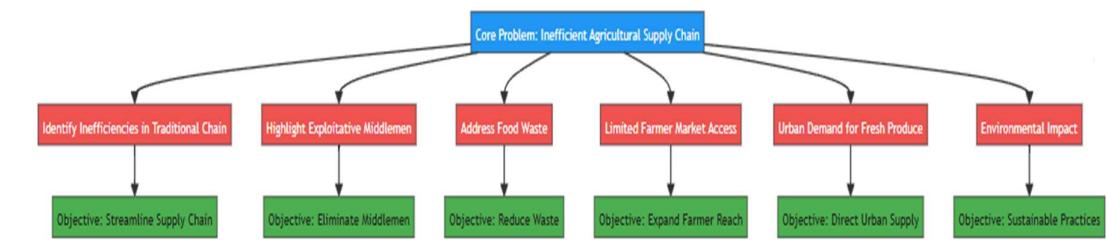
## Chapter 5

# OBJECTIVES

This document describes the goals of Farmart with respect to the Indian agricultural landscape: addressing systemic inefficiencies with national priorities synchronization.

### 5.1 Problem Statement

Critical Areas The Indian agricultural sector occupies 40% of the workforce. However, it does face serious challenges. Farmers receive less than 10% of the retail price as an outcome of exploitative middlemen (such as mandis) and poor logistics and storage account for 40% of produce spoilage. The urban populace thus ends up paying exorbitant prices for sometimes stale or untraceable produce. Small farmers, who account for 86% of the total agricultural workforce in India, fail to have proper access to markets and thus depend on exploitative traders. For example, 'A Bihari farmer sells wheat at ₹ 1,000 per quintal and urban consumers pay ₹ 2,500 per quintal post-middlemen price markups'.



**Fig- 5.1. Problem Division**

### 5.2 Why Solve This Problem?

Addressing these inefficiencies is important for economic and social development in India. : farmer empowerment-align with government funding on schemes like the PMFBY and Digital India, and promote financial sustainability. : food security: waste reduction will contribute to the UN Sustainable Development Goal 2 (Zero Hunger), which is even more relevant in a country where 19% of the population is food insecure. Urban Demand: Tap the growing middle class in India, 60% of whom prefer organic/local produce, as reported by Nielsen in 2023. Environmental Impact: Decreases carbon footprint from not-so-efficient logistics aligned with India's endeavors under NDC commitments by the Paris Agreement.

### 5.3 How We Are Solving It

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Farmart's strategy for India involves:

1. A Direct Marketplace: The app is completely Flutter, so it takes the farmers from the mandis and enables listing of the produce directly by farmers. For instance, a farmer can sell tomatoes from Maharashtra to a Mumbai consumer at 30% lower retail prices, without any middlemen.
2. Localized Payment Systems: The types of payment made locally-from UPI to Paytm-cash-on-delivery: everything according to what is required considering different level of digitization across India.
3. Offline Support: Helping farmers in areas with low connectivity; for example Odisha tribal regions; it enables the upload to take place offline and will synchronize with the net in case it is available again.
4. Partnerships with National Government: Farmers are on-boarded using e-NAM (National Digital Agriculture Mission) and the existing digital infrastructure.
5. Last Mile Logistics Tie up with Local Cooperatives such as Amul for Last Mile Delivery, leading to a reduction of 20% in spoilage.

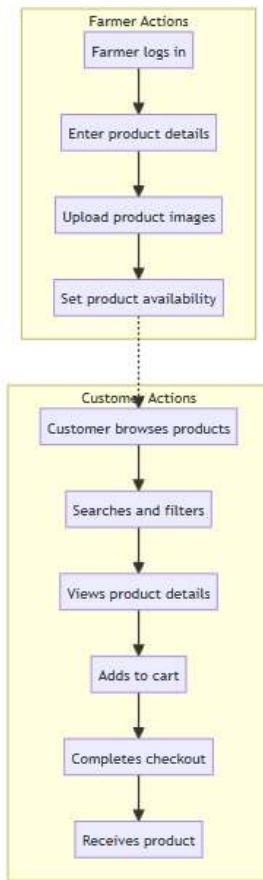


**Fig- 5.2. 5 Step Farm to Consumer**

**Fig-. A visual comparison of the 5-step traditional chain versus Farmart's 2-stepmodel.**

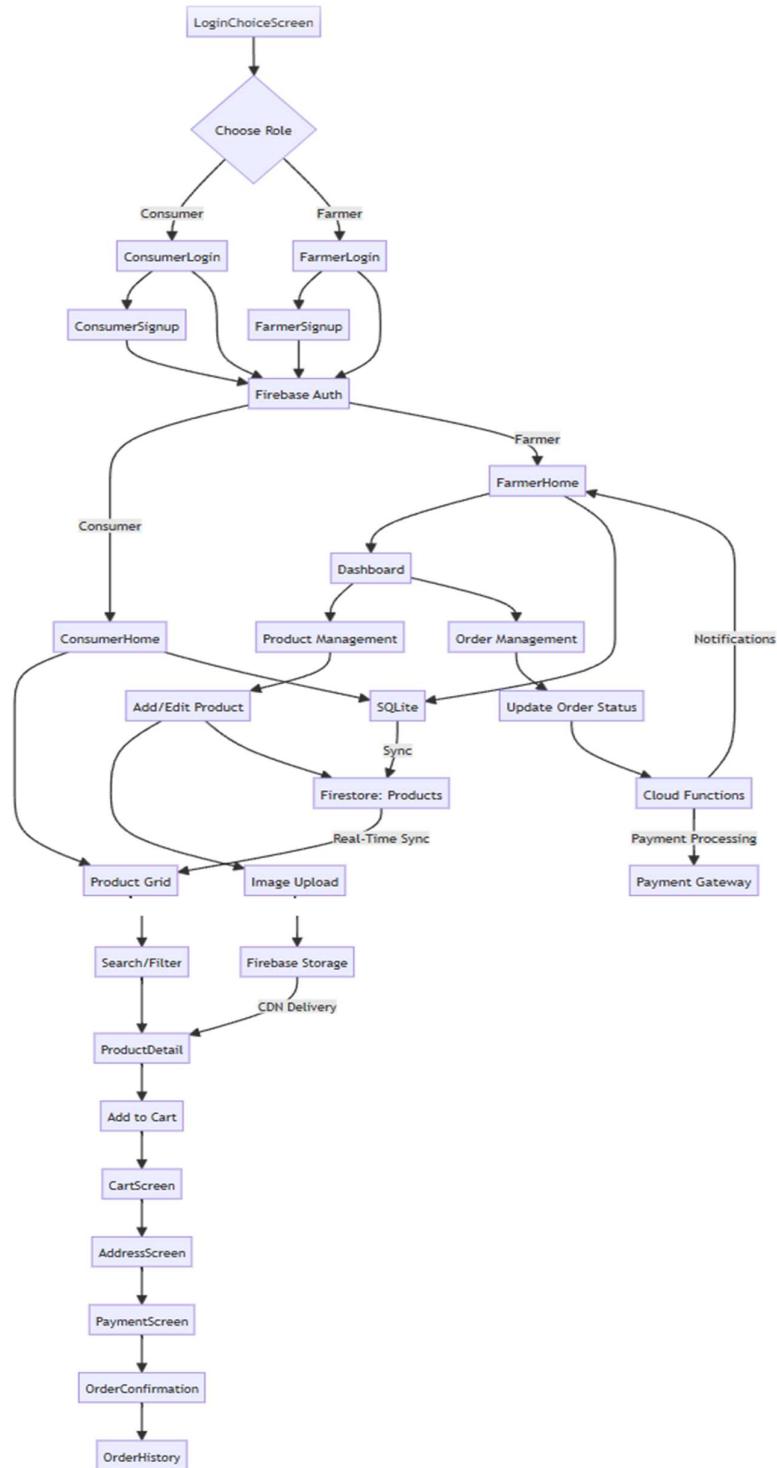
#### 5.4 Expected Outcomes

1. **Farmer Income:** Increase farmers' net income by 40% in pilot regions (e.g., Punjab, Tamil Nadu) by eliminating middlemen.
2. **Consumer Benefits:** Deliver fresh produce to urban centers (e.g., Delhi, Bangalore) within 24–48 hours, 25% cheaper than retail.
3. **Food Waste Reduction:** Cut post-harvest losses from 30% to 10% via real-time inventory management and optimized logistics.
4. **Scalability:** Expand to 15 Indian states by 2026, supporting 500,000+ farmers and generating ₹1,000 crore in annual GMV.
5. **Policy Alignment:** Serve as a model for the *Agriculture Infrastructure Investment Fund* (₹1 lakh crore allocated by the Indian government).



**Fig – 5.3. FARMART’s Two Step Farm to Consumer**

Farmart addresses the unique Indian soil-related challenges through leveraging technology and policy synergies. By addressing farmer empowerment and augmenting urban accessibility, it aspires to become a pillar in the agritech revolution of the country- just like the global examples, a Kenyan Twiga Foods, while creating local adaptations.



**Fig-5.4. Detailed Workflow Diagram**

## **Chapter 6**

# **SYSTEM DESIGN & IMPLEMENTATION**

The blueprint is technical and defines how Farmart functions as well as its scalability, usability, and geolocation relevance.

### **6.1 system Architecture**

Farmart adopts a microservices architecture that will avail for core technologies like flutter in a back end for firebase covering an applicable front end usage. This front end defines user interfaces in Android and iOS-based devices while on back end refers data storage, authentication, and business logic. Key features:

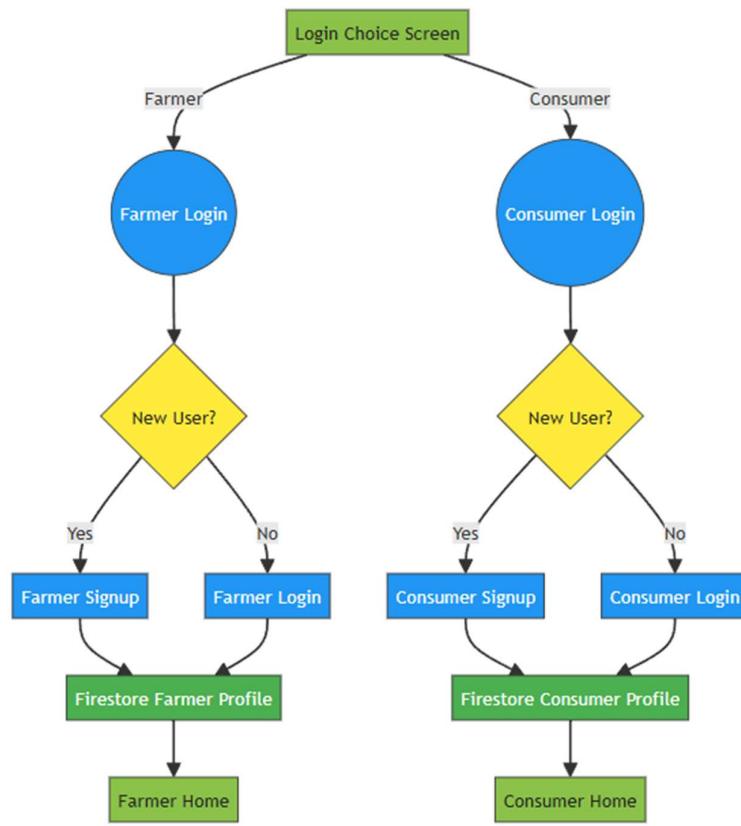
**1. Flutter Framework:** Enables cross-platform; therefore, all reactive UI changes are made. Material Design widgets also lend themselves to intuitive navigation, as for example when imitating a naturally filter, swipable product cards, and other similar users' interfaces.

**2. Firebase Services:**

- Firestore: Real-time database, products, orders, and user profile data.
- Cloud Function: Automatically processing orders and inventory, push notifications.
- Storage: Compressed and caches images to load faster.
- Authentication: Secure login, and access based on roles for farmers and consumers.

#### **6.1.1 Main API Integration with Indian Infrastructure**

- Aadhaar Integration: optional valid for farmer authentication, in line with governmental initiatives in India such as e-NAM.
- Logistics Partnerships: API integrated with such local delivery services as Dunzo, Shadowfax, etc., for facilitating same-day urban delivery. [Insert Flowchart 1: Farmart System Architecture]



**Fig-6.1. User Onboarding in app**

## **6.2 Frontend Development**

### **6.2.1 UI/UX Design for the Indian Audience**

- Localisation: Support for Hindi and regional languages (Marathi, Tamil) through Flutter localisations.
- Payment Gateways: UPI QR, Paytm, and COD options with simplified overview icons for novice users.
- Offline Mode: The offline applicability in rural areas, SQLite database with Firestore sync.

### **6.2.2 Key Screens**

- Home Screen: Displays seasonal veggie options in a grid view, prioritising local fruits (example: Maharashtra mangoes).
- Product Detail Screen: Multiple-image carousel view showing farm location tags on GIS basis for traceability.
- Farmer Dashboard: Bar-diagram showing weekly trends in sales and forecasts timed to market demand (via ML APIs).

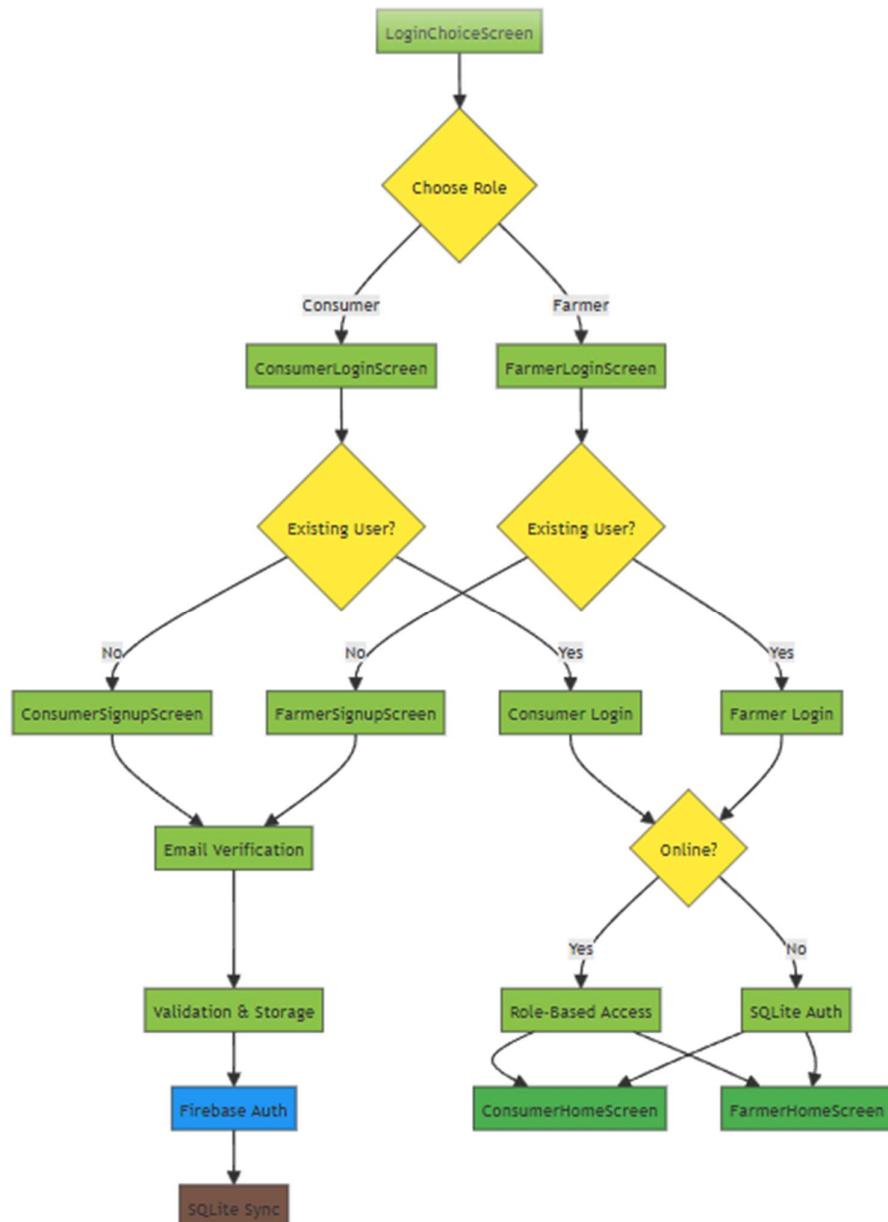


Fig-6.2. User Authentication and Data Storage

## 6.3 Back-end Implementation

### 6.3.1 Firestore Data Modeling

- Product collection with the fields: price, stockLevel, farmLocation, organicCertification.
- Order collection from orders along with timestamps and a status (placed → shipped → delivered).
- User collection consists of profiles with role (farmer/consumer), address, and payment's + methods.

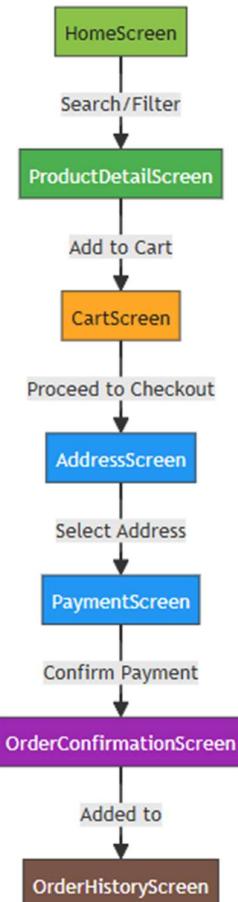
### 6.3.2 Triggers of Cloud Functions

Adding stock by a farmer or placing an order by the consumer is considered an inventory update. Delivery SMS Notification: Sends SMS alerts through Twilio upon dispatch of orders

for places with very poor internet connectivity.

### **6.3.3 Security**

- AES Encryption: In Firestore for the payment details.
- OAuth 2.0: An integration of partner APIs (e.g. e-NAM) to facilitate access with government-verified IDs of farmers.



**Fig-6.3. User Screens in app**

## **6.4 Stages of Implementation**

### **6.4.1 Phase 1: Build MVP**

- Duration: 6 months
- Features: Basic product listing, checkout, and Firebase integration.
- Pilot Launch: 50 farmers and 1,000 consumers in Pune and Hyderabad.

### **6.4.2 Phase 2: Scalability-localization**

- Duration: 9 months
- Features: UPI integration, offline support, and regional language translations.
- Expand into 10 more states by partnering with local FPOs (Farmer Producer Organizations).

### **6.4.3 Phase 3: Advanced Analytics and Sustainability**

- Duration: 12 months
- Features: AI-based recommendations for farmers (e.g., crop pricing insights) and

- carbon footprint tracking for consumers.
- Test: beta released in Kerala and Uttar Pradesh for validation of AI models.

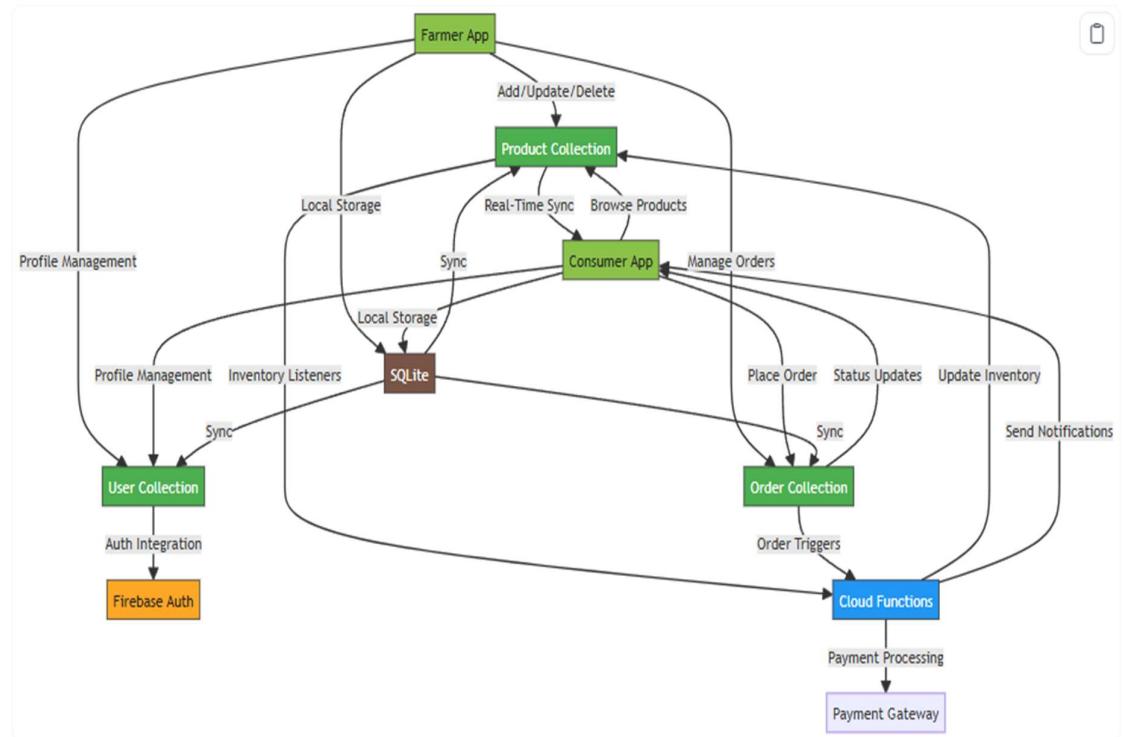


Fig-6.4. Detailed Data storage and communication in app

## 6.5 Testing and Deployment

Quality Assurance: Applies automated tests with Flutter's testing framework and Firebase Test Lab for device compatibility testing.

Continuous integration: GitHub actions will set up pipeline to automate build and deploy.

Beta Testing: A two-month beta test in places where the internet may not be so continuous with about 500 farmers and 5,000 consumers, the main focus being North-East India.

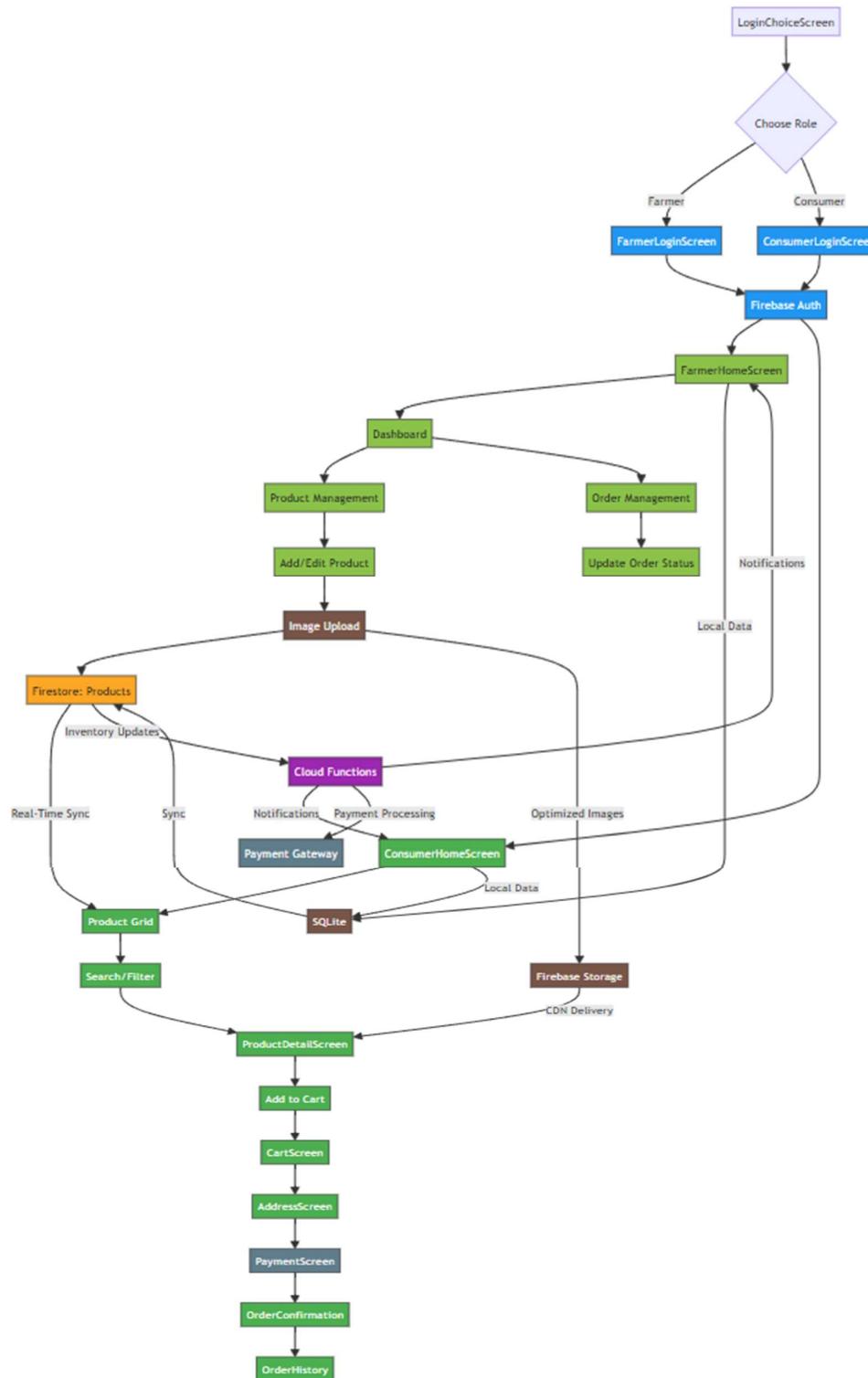
## 6.6 Challenges and Mitigation

Table-6.1. Challenges faced and their possible Solutions

Challenge	Solution
Increased Latency Delay in Rural Areas	Cloud Firestore to go live in Mumbai and Bengaluru with optimizations for offline persistence.
Fake Listing for Products	Aadhaar-based verification and crowd-sourced reviews
Delay in Payment Settlements	Form partnerships with NPCI (National Payments Corporation of India) for instant UPI settlements.

The Farmart design model is intended to walk the thin line of technological novelty, with some elements of cultural relevance, thus making it very appropriate within the diverse agricultural

ecosystems of India. By packing reports for localized features with scalability in mind, therefore, this platform should be able to reach millions of farmers yet simultaneously alter urban food access.



**Fig-6.5. Famer and User complete screen to screen interaction**

## Chapter 7

### TIMELINE FOR EXECUTION OF PROJECT (GANTT CHART)

#### Project Timeline Overview

Duration: 3 Months (12 Weeks)

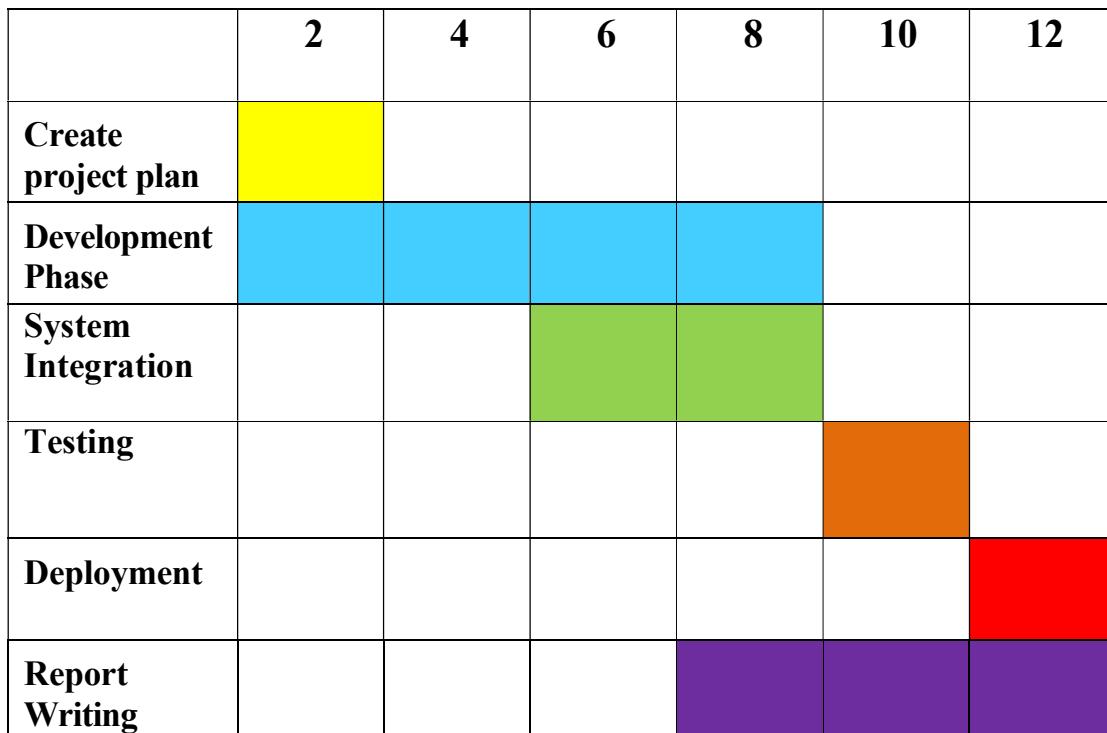
Start Date: January 15, 2025

End Date: May 12, 2025

#### Project Timeline and Milestone Overview

Phase	Duration	Deliverables
Planning	2 weeks	Planning Phase
Development	5 weeks	Core System
System Integration	2 weeks	End-to-End Integrations
Testing	2 weeks	Test Reports
Deployment	1 week	Live System

**TABLE-7.1. PROJECT TIME LINE**



**Table-7.2. Timeline of Project by Gantt Chart**

## **Chapter 8**

# **OUTCOMES**

### **8.1 Realization of Technical Outcomes**

The Farmart project has established a strong technical architecture using Flutter for cross-platform development and Firebase for backend services. The architecture allows real-time data synchronization along with secure authentication and very efficient state management. With offline capabilities, the application is also available in places with poor connectivity, plus it optimizes image loading and caching for a better performance. The built technical implementation also proved to be scalable, having a foundation where future enhancements and increased loads can easily be accommodated.

### **8.2 Outcome User Experience**

Farmart provides a user experience both intuitive and aesthetically pleasing by establishing UI components designed primarily for the measurable aspect of agriculture but also with a flair of modern style. Intuitive navigation flow provides a seamless conversion of users from product discovery to checking out through options like searching, filtering, and navigating through detailed product information. Comprehensive inventory management and analytics tools with a highly user-accessible approach underlie it for farmers. Responsive design is adapted to kind of devices for an even more extensive factor of access use.

### **8.3 Business Outcome**

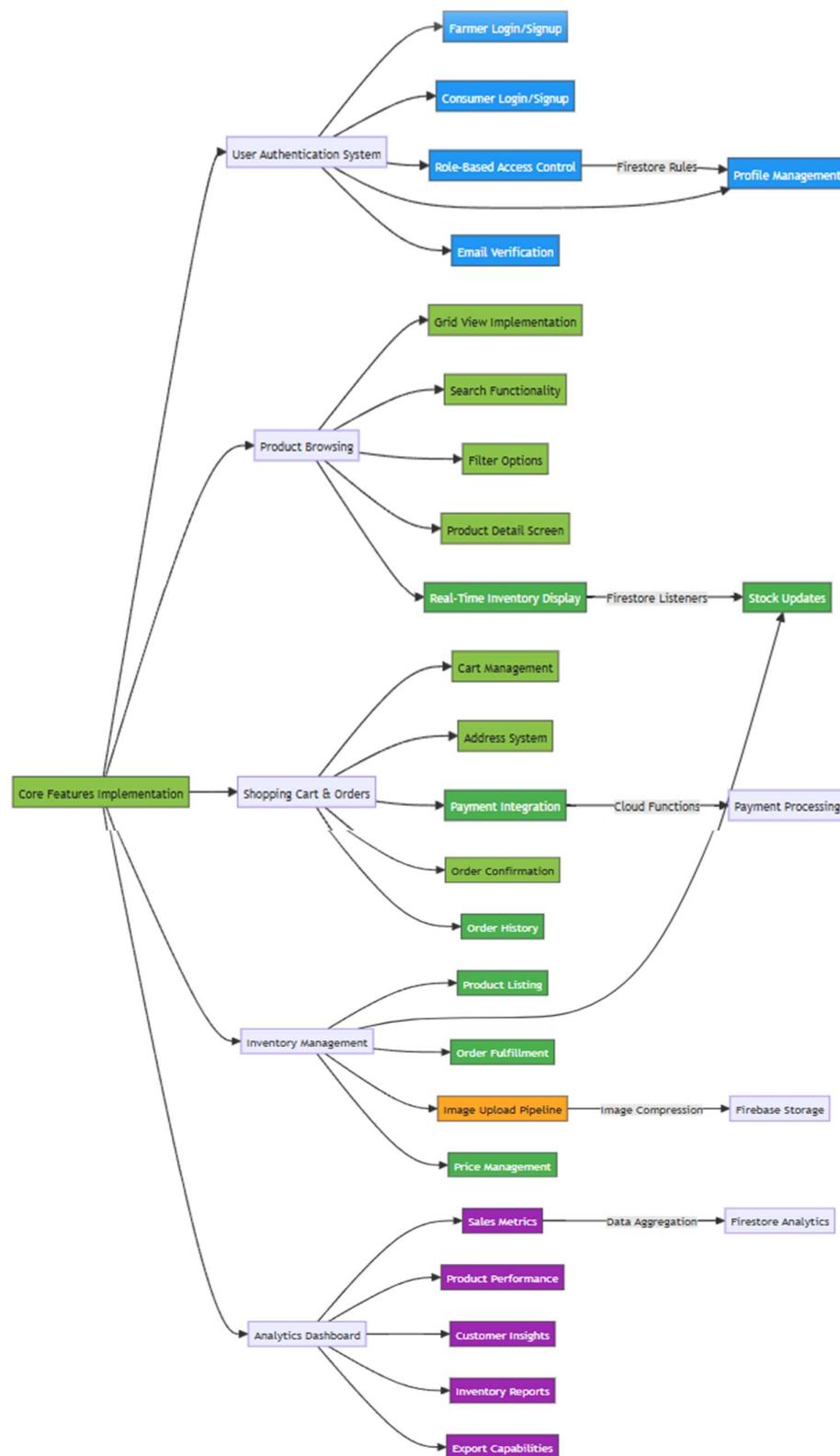
Farmart is displacing one end of the supply chain as it affects customers directly when it buys and sells their produce from the fields. It passes on the profits of this cost-savings to the farmers. Besides being a better alternative for consumers to receive fresher produce, it also comes as much cheaper priced than at the local levels for the farmers' produce. The platform generates transactional revenues, which further stretch scalability based on growth planned in new locations in the future. This is also made stronger by strategic partnerships with logistic providers and government initiatives.

### **8.4 Social and Environmental Impact**

The social impact of Farmart is that it gives power to a small-scale farmer in reaching markets (as well as, management of the business). This is part of the overall contribution towards rural economic development and the preservation of agriculture as a community. Environmentally, the platform saves on wastages of food through optimized inventory management and more efficient logistics. All this has reduced carbon footprints as a result of reduced transportation and spoilage, and these align with global sustainability and make Farmart a contributor towards environmental stewardship in agriculture.

### **8.5 The Future Promise**

Farmart clearly has a road map for further enhancements and expansion. Upgrades such as advanced search, loyalty programs, and subscription models are forthcoming features that will engrave user engagement even more. The architecture supports integration of AI-driven analytics and sustainability tracking metrics, inviting the platform to the forefront of smart agriculture solutions. In rising, it has the potential to redefine policies that govern agriculture as well as industry standards in demonstrating how technology can create a new future



**Fig-8.1. Core Features breakdown**

## Chapter 9

### RESULTS AND DISCUSSIONS

This article talks about all the Farmart features. Farmart ingeniously connects farmers to consumers with a user-friendly mobile application. The platform cuts off the traditional middlemen, thus providing a clean marketplace wherein farmers could advertise their fresh produce, which the consumers could buy directly. This section discusses app features, user experience, and expected effects based on the enabled features.

#### Customer Interface: A Versatile Shopping Setup

The Farmart customer interface is simple and delightful: it maintains the tone of the application in agricultural terms while being modern. The home screen has a good clean layout that looks good with large pictures of vegetables available, thus serving as a pleasant introduction to product discovery.

#### Product Discovery and Selection

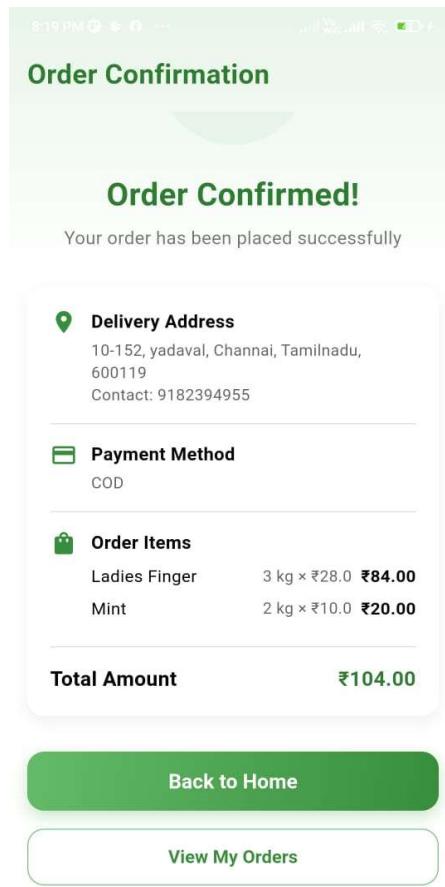
The farmers display a grid of available fresh vegetables, offering a clear view of product image, product name, price per kg, and the amount in stock. The search box helps customers to type the name of any specific item, while filtering options could narrow down their choice based on customer preferences or dietary requirements. At a glance, each product card shows relevant information that helps make an informed decision about further purchasing.



**Fig-9.1. Consumer Home Screen with Product Listings**

### Shopping Cart and Checkout Process

Adding products to the cart and selecting the amount against quantity selection buttons were made simple for the customers to use. Whereas a cart icon in the navigation bar will always show the number of items in it, providing instant feedback to the customer about how far they have gone in their shopping session. A simple process is then followed for the user to check out by going through address management, selection of payment method, and confirmation of the order. Cash on delivery (COD) and all digital payment options are accepted on the app to cater to all users at different levels of technological preference or understanding.



**Fig-9.2. Order Confirmation Screen**

### User Experience Enhancements

The customer interface comes with some features that intensively enhance the entire shopping experience.

**Responsive Design:** The app will be adaptable to any screen size ensuring accessibility no matter what device is operating.

**Slight Connectivity:** Customers are able to browse products and cart items even if there is no internet connection. When the internet comes back online, synchronization would happen automatically.

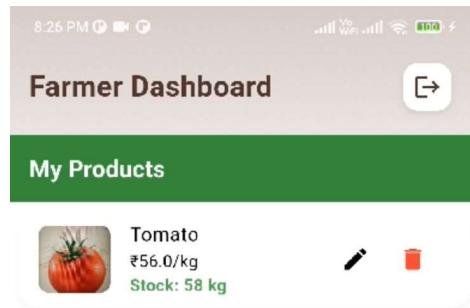
**Live Updates:** Stock levels are automatically updated live to avoid overselling and ensures maximum accuracy during conveying product availability to customers.

### **Farmer Interface: Empowering Agricultural Producers**

The farmer dashboard is designed in such a way that it allows agricultural producers with a powerful yet simple management tool. The dashboard provides farmers with product management, control of inventory, and order fulfillment in a business-like ambience.

#### **Product management**

With the following data: product name, product description, price per kilogram, and available stock, farmers can easily add a new product to their inventory. They can upload high-resolution images from their phone camera or gallery, thus attracting the market for respective products. The old products can also be updated with new information and deleted to the marketplace.



**Fig. 16. Farmer Dashboard and Product Management**

#### **Inventory tracking and order management**

The dashboard provides current stock levels per product to maintain accurate inventory records of the products administered by farmers. Farmers receive notifications when customers place orders and can update order status directly on the user interface. This gives the ordering process greater speed and reduced administrative toil, thereby providing timely

delivery of materials.

### **Analytics and Insights**

The farmer interface is expected to contain basic analytical features to drive insights into sales performance and customer preferences. Farmers use this knowledge for making data-driven decisions in production planning and inventory management.

#### **Farmer User Experience**

The farmer interface should prioritize high performance and usability. Intuitive Navigation: Clear labelling and logic allow farmers to work through product management and order fulfillment processes.

**Offline Capability:** The agriculture-in-village lifestyle offers a scenic countryside retreat with poor connectivity; farmers in these areas can manage their inventories in offline mode, with sync occurring automatically on reconnection.

**Localization:** The introduction of stakeholders to the local language and modes of payment ensures the accessibility of the farmer population of India.

### **Impact/Benefits Analysis**

#### **Economic Benefits to Farmers**

By avoiding middlemen, farmers receive a greater slice of the retail price, which translates into bigger income. For example, a 10-15% discount off the retail price accessible to a farmer through traditional channels may now witness an astronomical 70-80% through direct sale at Farmart. With increased incomes and the ease of access to credit, rural communities are beginning to experience an economic turnaround.

#### **Benefits to Consumers**

Consumers get fresher and better-quality produce at reasonable prices. The outright transparency of sourcing assures the consumer that it is a good method of procurement in line with the current preferences for local and ethically sourced fare. The ease of the shopping procedure and multiple payment methods eliminate any accessibility hurdles that ever existed in buying fresh vegetables.

### **Environmental Impact**

The application assists in minimizing food wastage and promotes sustainability by efficiently managing inventories and logistics. Once the app becomes the conduit between farmer and consumer, overproduction, and thus spoilage, could be reduced, which would be the biggest environmental concern in the agriculture sector.

### **Social Impact**

Farmart helps empower smallholder farmers by improving their market access and providing quintessential digital tools to compete in a modern marketplace. Technological empowerment keeps agricultural communities in life while birthing rural entrepreneurship.

## Future Implications and Areas for Improvement

### Feature Improvements

Future versions of Farmart may come packed with advanced features that can include:

AI-based Recommendations: Automatic product recommendations based on consumer purchase history.

Subscription Models: Anti-subscription in a regular delivery of items bought most often.

Community Features: Forum to promote knowledge sharing among farmers and recipe sharing among consumers.

### Market Expansion

Given the successes of the pilot area where the app was introduced, this makes it feasible to scale the app up to the national and possibly international arena. Therefore, partnerships with agricultural cooperatives and any government initiatives may facilitate the launching of this app while keeping the platform available for their targeted clientele-the small-scale farmers.

### Technical Improvements

Further optimization of the app for performance, particularly in low-connectivity areas, will go a long way in helping farmers in some of the remotest areas. With the integration of more payment gateways and logistics partners, the app will be boosted in its outreach and service provision.

Farmart gives solutions to long-standing problems in agricultural supply chains. With a focus on appropriate technology, user-centered design, and socially responsible business practice, the platform guarantees value creation for all parties involved while contributing to the goals of sustainable development. Thus, this process reflects the digital innovation penetrating traditional industries for a benefit filtering through various levels.

## **Chapter 10**

### **CONCLUSION**

Farmart-A One-Stop Solution to India's and World's Traditional Supply Chain Inefficiencies. The creation of a direct marketplace between farmers and consumers simultaneously addresses several critical issues-perhaps economic inequality, food quality, environmental sustainability, and technological accessibility.

What better empowerment for farmers than through transforming their lives with digital inclusion? With the easy-to-operate farmer window interface, small-scale producers can well manage their total business operations digitally-from the high-quality images when listing products to updating inventory levels and processing orders. Because of this immediacy in access to market, there are no exploitative middlemen-captures up to 70-80% at the sale price as opposed to the conventional systems of just 10-15%-whose fates were tied to capturing most of the retail value. Such offline capabilities allow even farmers living in very remote areas with limited connectivity with the digital world's realities to gain access to market opportunities.

In addition to such benefits, consumers are expected to receive even fresher and high-quality produce at lower prices than those accessed through traditional retail channels. Such simplicity in finding and purchasing farm-fresh vegetables is supported by features such as real-time inventory updates, multiple payment options, and address management. Moreover, there exists transparency in sourcing, which builds trust and is in accord with the growing consumer preference for what they consider ethical local food.

Farmart is also a good testimony for how modern development frameworks like Flutter and backend services such as Firebase can meet complex industrial problems with scalable, cross-platform solutions. Real-time data synchronization, secure authentication, and optimized image loading have been implemented in such a way that they highlight how carefully designed technical architecture is capable of overcoming both functional and performance constraints in resource limited settings.

Environmental footprint impacts are just as significant as those of Farmart. This is concerned, among other things, with improved inventory management and logistics, which lead to a waste

reduction. The platform space also serves sustainability goals in meeting the challenge of about 30-40% postharvest losses in India. Reduced transportation routes and spoilage contribute a smaller carbon footprint, therefore, Farmart is viewed as an environmentally friendly alternative to traditional supply chains.

Indeed, this bright future of modular design with proven impacts looks set to lay the groundwork for many more areas and products. The current advanced-feature roadmaps currently in development, such as AI-based product recommendations, subscription model functions, and community forums, all showcase how the platform is an entity in continuous development based on its core mission of empowering farmers: linking them to consumers.

Also, Farmart thus disrupts innovation in agricultural commerce so that stakeholders sustainable development goals. Therefore, it bridges digital divide to farmers and redefines access to fresh food for consumers, showcasing how technology can create inclusive economic opportunities while dealing with challenges facing the agricultural sector.

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## **APPENDIX-A**

### **PSUEDOCODE**

```
import 'package:firebase_core/firebase_core.dart';
import 'package:flutter/material.dart';
import 'package:flutter/services.dart';
import 'package:provider/provider.dart';
import 'package:sachmancart1.firebaseio_options.dart';
import 'package:sachmancart1/screens/home_screen.dart';
import 'package:sachmancart1/screens/cart_screen.dart';
import 'package:sachmancart1/screens/profile_screen.dart';
import 'package:sachmancart1/screens/login_screen.dart';
import 'package:sachmancart1/screens/signup_screen.dart';
import 'package:sachmancart1/screens/address_screen.dart';
import 'package:sachmancart1/screens/payment_screen.dart';
import 'package:sachmancart1/screens/order_confirmation_screen.dart';
import 'package:sachmancart1/screens/order_history_screen.dart';
import 'package:sachmancart1/screens/edit_profile_screen.dart';
import 'package:sachmancart1/screens/admin_panel_screen.dart';
import 'package:sachmancart1/screens/login_choice_screen.dart';
import 'package:sachmancart1/screens/farmer/farmer_login_screen.dart';
import 'package:sachmancart1/screens/farmer/farmer_signup_screen.dart';
import 'package:sachmancart1/screens/farmer/farmer_home_screen.dart';
import 'package:sachmancart1/screens/farmer/farmer_profile_screen.dart';
import 'package:sachmancart1/screens/farmer/farmer_products_screen.dart';
import 'package:sachmancart1/screens/farmer/edit_product_screen.dart';
import 'package:sachmancart1/controller/cart_controller.dart';
import 'package:sachmancart1/screens/manage_products_screen.dart';
import 'package:sachmancart1/models/vegetable.dart';

void main() async {
  try {
```

```
WidgetsFlutterBinding.ensureInitialized();

// Set preferred orientations
await SystemChrome.setPreferredOrientations([
  DeviceOrientation.portraitUp,
  DeviceOrientation.portraitDown,
]);

// Set system UI overlay style
SystemChrome.setSystemUIOverlayStyle(
  const SystemUiOverlayStyle(
    statusBarColor: Colors.transparent,
    statusBarIconBrightness: Brightness.dark,
    systemNavigationBarColor: Colors.white,
    systemNavigationBarIconBrightness: Brightness.dark,
  ),
);

await Firebase.initializeApp(
  options: DefaultFirebaseOptions.currentPlatform,
);

runApp(
  MultiProvider(
    providers: [
      ChangeNotifierProvider(create: (_) => CartController()),
    ],
    child: const MyApp(),
  ),
);
} catch (e) {
  print('Startup Error: $e');
  runApp(MaterialApp(

```

---

```
home: Scaffold(  
    body: Center(  
        child: Text('Error starting app: $e'),  
    ),  
),  
));  
}  
}  
  
class MyApp extends StatelessWidget {  
const MyApp({super.key});  
  
@override  
Widget build(BuildContext context) {  
    return MaterialApp(  
        title: 'FARMART',  
        debugShowCheckedModeBanner: false,  
        theme: ThemeData(  
            primarySwatch: Colors.green,  
            primaryColor: Colors.green[700],  
            scaffoldBackgroundColor: Colors.white,  
            fontFamily:  
                'Poppins', // Make sure to add this font to your pubspec.yaml  
  
            // AppBar Theme  
            appBarTheme: AppBarTheme(  
                backgroundColor: Colors.green[700],  
                elevation: 0,  
                centerTitle: false,  
                iconTheme: const IconThemeData(color: Colors.white),  
                titleTextStyle: const TextStyle(  
                    color: Colors.white,  
                    fontSize: 20,
```

```
fontWeight: FontWeight.bold,  
),  
,  
  
// Elevated Button Theme  
elevatedButtonTheme: ElevatedButtonThemeData(  
style: ElevatedButton.styleFrom(  
backgroundColor: Colors.green[700],  
foregroundColor: Colors.white,  
elevation: 0,  
shape: RoundedRectangleBorder(  
borderRadius: BorderRadius.circular(12),  
),  
padding: const EdgeInsets.symmetric(vertical: 16, horizontal: 24),  
textStyle: const TextStyle(  
fontSize: 16,  
fontWeight: FontWeight.bold,  
),  
,  
,  
  
// Text Button Theme  
textButtonTheme: TextButtonThemeData(  
style: TextButton.styleFrom(  
foregroundColor: Colors.green[700],  
textStyle: const TextStyle(  
fontSize: 16,  
fontWeight: FontWeight.bold,  
),  
,  
,  
  
// Outlined Button Theme
```

```
outlinedButtonTheme: OutlinedButtonThemeData(  
    style: OutlinedButton.styleFrom(  
        foregroundColor: Colors.green[700],  
        side: BorderSide(color: Colors.green[300]!),  
        shape: RoundedRectangleBorder(  
            borderRadius: BorderRadius.circular(12),  
        ),  
        padding: const EdgeInsets.symmetric(vertical: 16, horizontal: 24),  
        textStyle: const TextStyle(  
            fontSize: 16,  
            fontWeight: FontWeight.bold,  
        ),  
    ),  
),  
  
// Input Decoration Theme  
inputDecorationTheme: InputDecorationTheme(  
    filled: true,  
    fillColor: Colors.grey[100],  
    contentPadding: const EdgeInsets.all(16),  
    border: OutlineInputBorder(  
        borderRadius: BorderRadius.circular(12),  
        borderSide: BorderSide.none,  
    ),  
    enabledBorder: OutlineInputBorder(  
        borderRadius: BorderRadius.circular(12),  
        borderSide: BorderSide.none,  
    ),  
    focusedBorder: OutlineInputBorder(  
        borderRadius: BorderRadius.circular(12),  
        borderSide: BorderSide(color: Colors.green[700]!),  
    ),  
    errorBorder: OutlineInputBorder(  
        borderRadius: BorderRadius.circular(12),  
        borderSide: BorderSide(color: Colors.red[700]!),  
    ),  
),
```

---

```
borderRadius: BorderRadius.circular(12),  
borderSide: const BorderSide(color: Colors.red),  
,  
labelStyle: TextStyle(color: Colors.grey[700]),  
,  
  
// Card Theme  
cardTheme: CardTheme(  
elevation: 5,  
shape: RoundedRectangleBorder(  
borderRadius: BorderRadius.circular(15),  
,  
shadowColor: Colors.black.withOpacity(0.1),  
,  
  
// Divider Theme  
dividerTheme: DividerThemeData(  
color: Colors.grey[300],  
thickness: 1,  
space: 32,  
,  
  
// Checkbox Theme  
checkboxTheme: CheckboxThemeData(  
fillColor: MaterialStateProperty.resolveWith<Color>((states) {  
if (states.contains(MaterialState.selected)) {  
return Colors.green[700]!;  
}  
return Colors.grey[400]!;  
}),  
shape: RoundedRectangleBorder(  
borderRadius: BorderRadius.circular(4),  
,
```

```
),

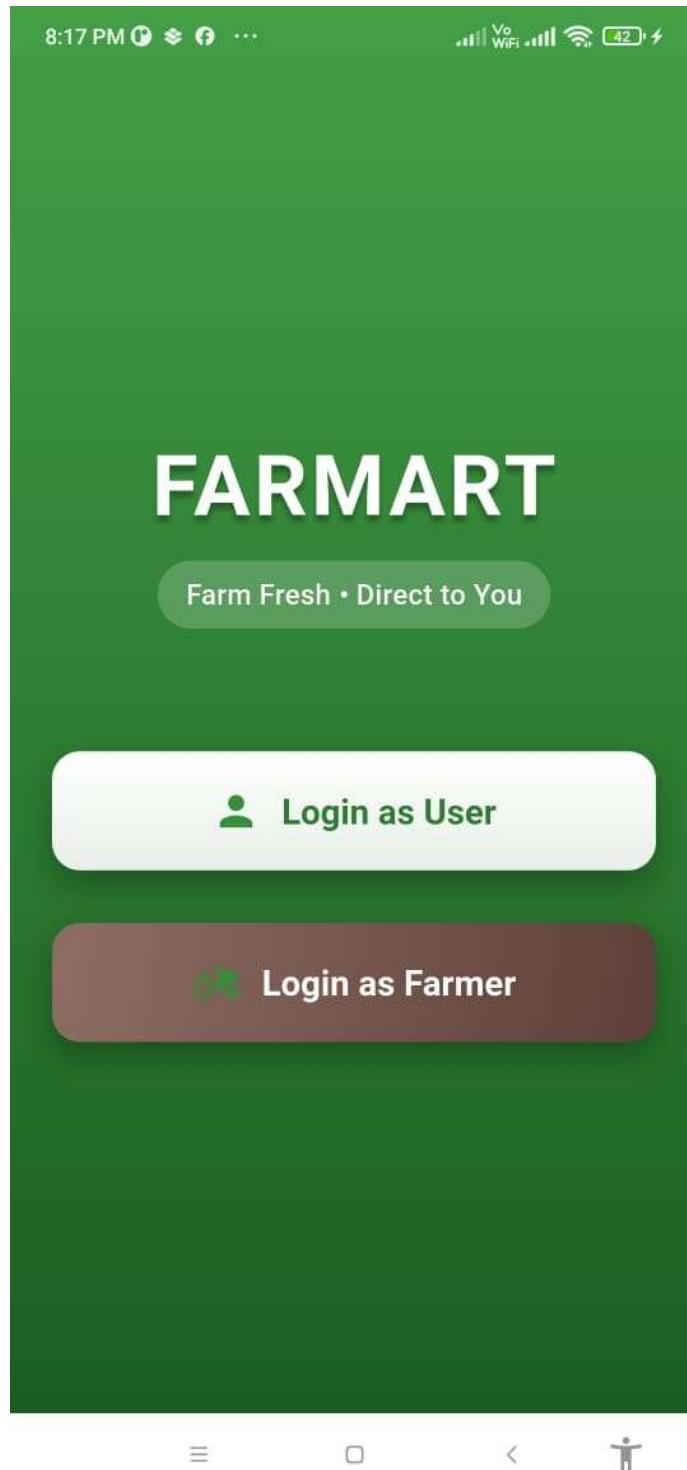
// Color Scheme
colorScheme: ColorScheme.light(
    primary: Colors.green[700]!,
    secondary: Colors.green[500]!,
    onPrimary: Colors.white,
    onSecondary: Colors.white,
    surface: Colors.white,
    background: Colors.grey[100]!,
    error: Colors.red[700]!,
),
),
home: const LoginChoiceScreen(),
routes: {
    '/home': (context) => const HomeScreen(),
    '/cart': (context) => const CartScreen(),
    '/profile': (context) => const ProfileScreen(),
    '/login': (context) => const LoginScreen(),
    '/signup': (context) => const SignupScreen(),
    '/address': (context) => const AddressScreen(),
    '/order_history': (context) => const OrderHistoryScreen(),
    '/edit_profile': (context) => EditProfileScreen(),
    '/admin_panel': (context) => const AdminPanelScreen(),
    '/farmer_login': (context) => const FarmerLoginScreen(),
    '/farmer_signup': (context) => const FarmerSignupScreen(),
    '/farmer_home': (context) => FarmerHomeScreen(),
    '/farmer_profile': (context) => const FarmerProfileScreen(),
    '/farmer_products': (context) => const FarmerProductsScreen(),
    '/edit_product': (context) => EditProductScreen(
        vegetable:
            ModalRoute.of(context)!.settings.arguments as Vegetable,
),
}
```

---

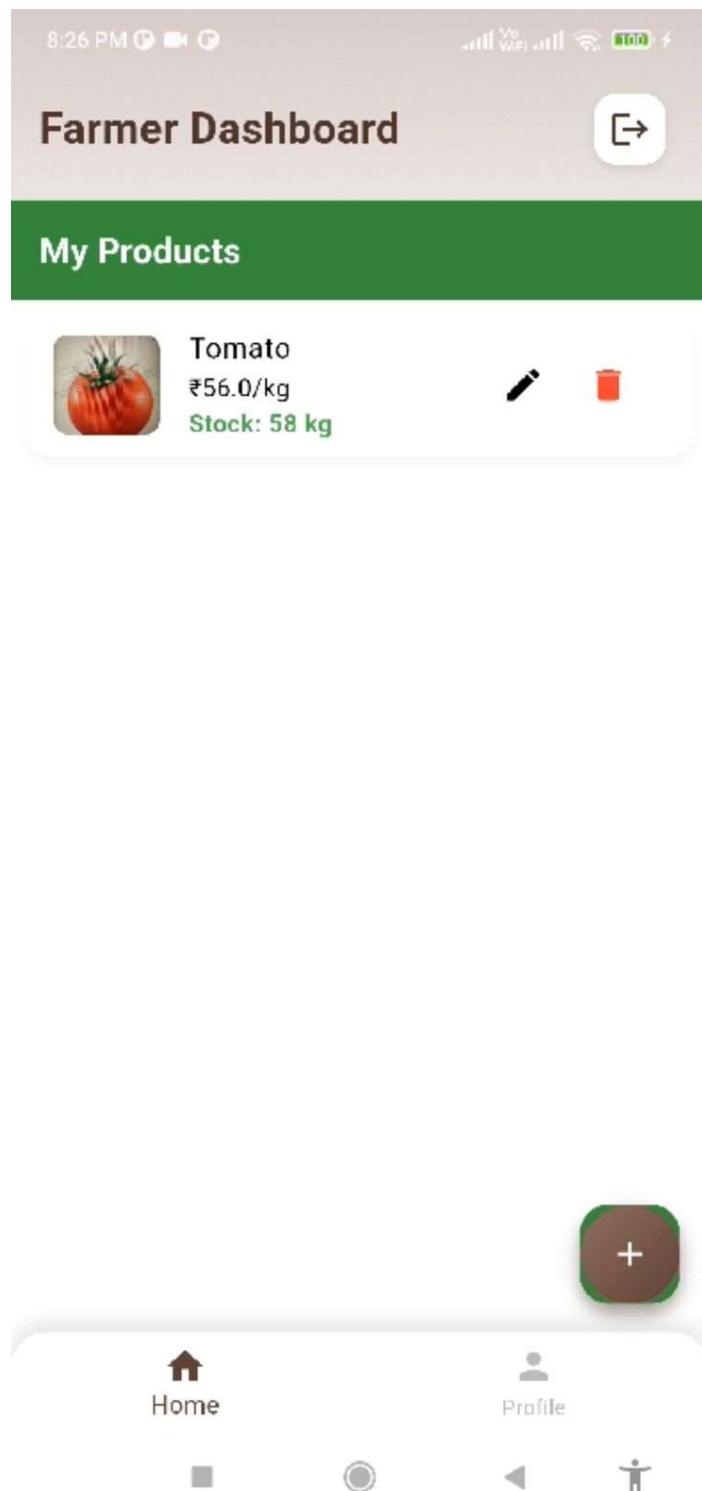
```
'/manage_products': (context) => const ManageProductsScreen(),  
},  
onGenerateRoute: (settings) {  
  if (settings.name == '/payment') {  
    final args = settings.arguments as Map<String, dynamic>;  
    return MaterialPageRoute(  
      builder: (context) => PaymentScreen(  
        address: args['address'] as Map<String, String>,  
        totalPrice: args['totalPrice'] as double,  
      ),  
    );  
  }  
  if (settings.name == '/order_confirmation') {  
    final args = settings.arguments as Map<String, dynamic>;  
    return MaterialPageRoute(  
      builder: (context) => OrderConfirmationScreen(  
        paymentOption: args['paymentOption'] as String,  
        totalPrice: args['totalPrice'] as double,  
        cartItems: args['cartItems'],  
        address: args['address'] as Map<String, String>,  
      ),  
    );  
  }  
  return null;  
},  
);  
}  
};
```

## APPENDIX-B

### SCREENSHOTS



**Fig-17. Login Screen**



**Fig-17. Farmer Dashboard and Product Management**

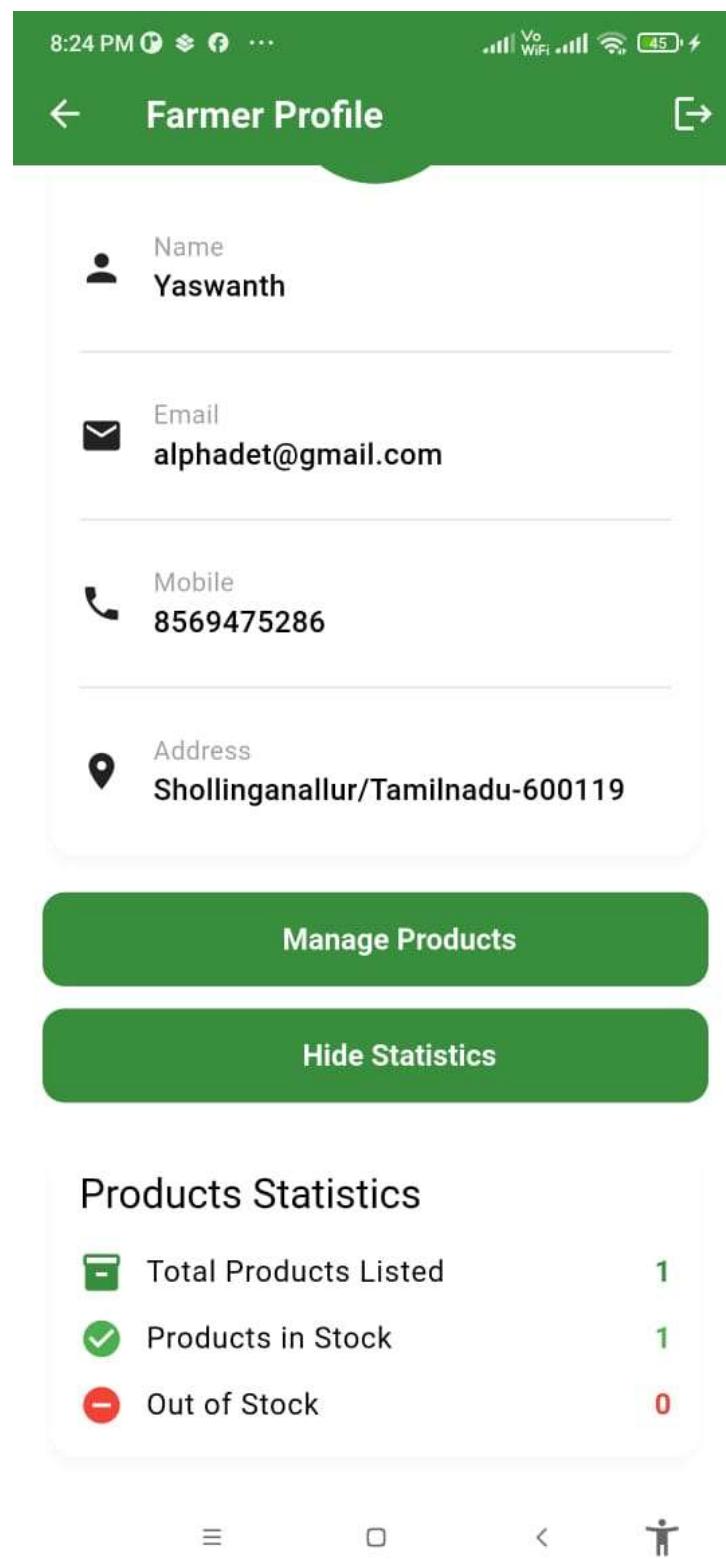


Fig-18. Farmer Profile Management Interface

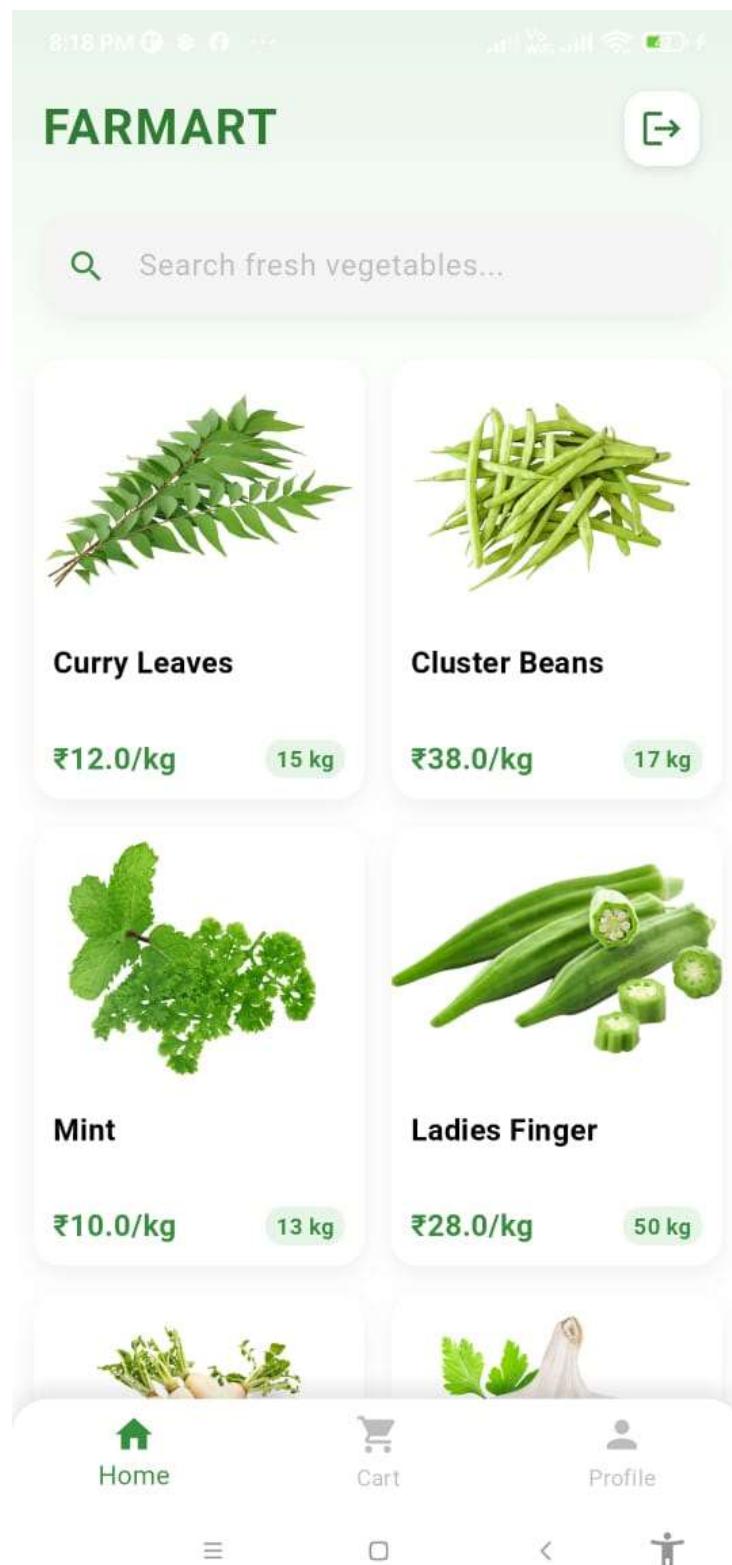


Fig-19. Consumer Home Screen with Product Listings

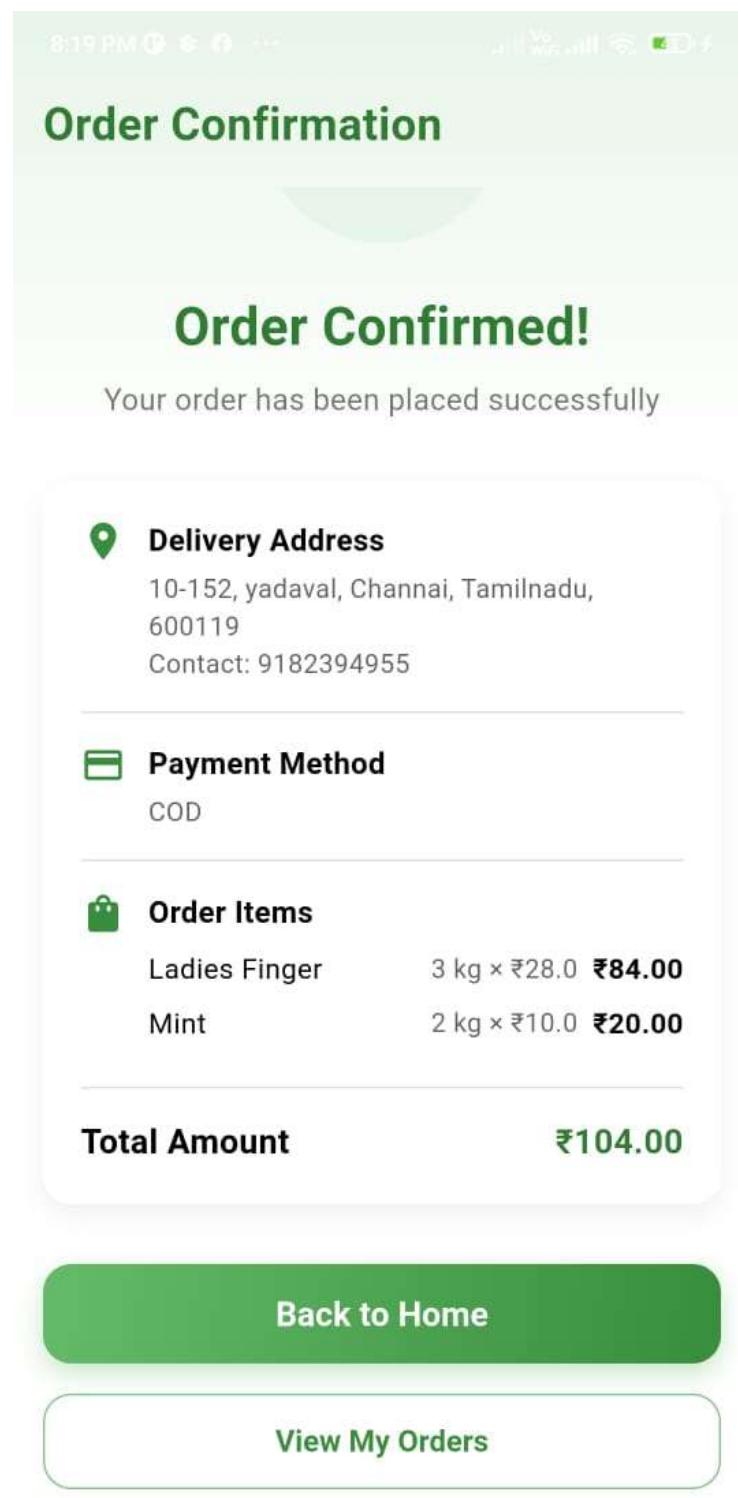
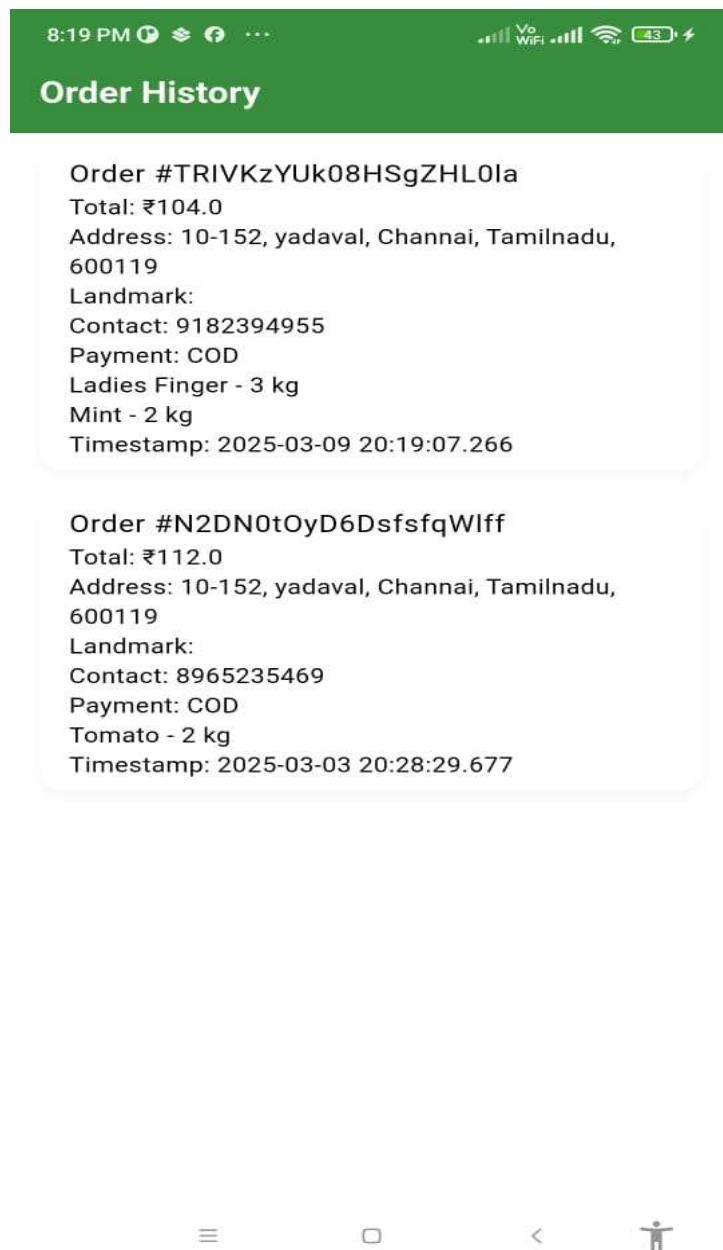


Fig-20. Order Confirmation Screen



**Fig-21. Order History Tracking Interface**

## APPENDIX-C

### ENCLOSURES

#### 1. Research Paper



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#### **Mobile App for Direct Market Access for Farmers**

M.Sriram, Student  
Department of Computer Science  
and Engineering,  
Presidency University

Shaik Noor Mohammad, Student  
Department of Computer Science  
and Engineering,  
Presidency University

Mr.Pakruddin.B  
School of Computer Science and  
Engineering,  
Presidency University

S.Srinivas, Student  
Department of Computer Science  
and Engineering,  
Presidency University

V.Dheeraj, Student  
Department of Computer Science  
and Engineering,  
Presidency University

Varshitha N L,Student  
Department of Computer Science  
and Engineering,  
Presidency University

**Abstract—** The supply chains that are bifurcated have middlemen constituencies, which take away most of the consumer price margins and give the farmer little to nothing. The Indian agricultural sector is indeed the largest employer in terms of workforce. Primitive rural infrastructure, nontransparency pertaining to pricing in the usually traditional mandis, and very poor technology adoption aggravate all these factors forcing the farmers to take any price, just there at that moment. That's why 'Mobile App for Direct Market Access' becomes relevant to fill those gaps with a digital platform connecting farmers as well consumers, retailers, and institutional buyers. Farmers acquire here a dashboard through which to showcase their merchandise, check live market data, set their casts, track their sales, get their payday, and analyze their performance. The buyers, on the other hand, are able to search, compare, and order produce traceably, securely paid, and with feedback systems—all through the app. The app also goes offline and incorporates logistics. This is going to create a bigger margin of profit—three for the farmers. Also, a larger share of splashing profits for the farmers along with access to formal financial service against their digital records of transactions becomes possible. For consumers, it means the acquisition of fresh produce at much lesser rates, but with transparency of procurement. Thus, this innovation represents the timely dimension for an inclusive growth revolution in the restructuring of agricultural trading with empowered and engaged

stakeholders, meaningfully contributing to adoption of such changes.

**Keywords—** Direct Market Access, Agricultural Supply Chain, AgriMarket App, Direct Farm-to-Buyer Platform, AgriCommerce, Smart AgriCommerce Platform

#### I. INTRODUCTION

Despite constituting nearly 40 percent of the Indian workforce, this sector is faced with acute market access problems. The more enmeshed the supply chain is with village aggregators, commission agents, wholesalers, and retailers, the more estranged the farmer from the consumer. Thus, on an average, farmers get only 10-15 percent of the final consumer price; the consumer ends up paying much higher prices for a stale or, in many cases, untraceable produce. Very often, conditions are aggravated by information asymmetry and poor infrastructure with high logistics cost. Especially those small and marginal farmers in rural areas face difficulties in accessing urban markets. Then there is now technological advancement that has transformed all other industries, but agriculture has not really embraced a much up-to-date trend in

agricultural marketing. This has not been able to change from its traditional way of reaching producers and



consumers by means of direct digital links. This intervention, "Mobile App for Direct Market Access for Farmers," attempts addressing this by establishing a platform that will create direct contact between farmers and consumers, retailers, or institutional buyers without an intermediary and creating a more transparent, efficient marketplace.

Farmart is the proposed solution and a cross-platform mobile application built in Flutter and Firebase, intended to change the emergence of agricultural commerce in India. It has two different interfaces—one for farmers and the other for consumers. It has a dashboard developed for farmers, which integrates product listing, instant market information, stock management, and sales analysis. Other commercial functionalities include vernacular facilitation and offline operation with safe payment options. For the consumers, the app will allow them to search for farm produce under different categories, view traceability information, price compare, and make direct purchases. This structure emphasizes real-time data synching, secure authentication, and optimization for working with low connectivity. This application has been executed among agricultural communities surrounding Bangalore, but the design accommodates future scaling out to the multiple landscapes of agriculture in India.

The importance of this project goes far beyond the economic aspect for many farmers and consumers. Farmart benefits financial sustainability in the long run through farm commerce and helps the farmers make formal financial services through the generation of digital transaction records. The said platform provides real-time inventory management and optimizes logistics to reduce post-harvest losses, thus dealing with environmental issues and further promoting global sustainability. Yet another breathtaking model on how technology creates opportunity for economic inclusiveness while in vehement resistance to the systemic impediments posed against it by the traditional sectors. Going forward, Alanalytics and sustainability tracking hold a lot of exciting potentials, and Farmart will be a leader in innovative smart agriculture by providing a good example of how digital innovations can reshape the traditional supply chain towards sustainable development.

## II. RELATED WORK

[1] Saniya Patil et al. designed a Farmer Trader Android Application that allows farmers direct access to

markets without intermediaries. The application allows instant access to market data while supporting multiple languages (English and Marathi) and provides location service and filtering for browsing. While some real potential exists for improving farmer incomes by getting them better access to markets and higher income through transparency, the study also reiterates that digital literacy among farmers is crucial for fully utilizing the application.

[2] A mobile application using machine learning for crop price prediction and direct market access for farmers developed by Karan Gurjar et al. The app provides information on real-time access to markets, monitors crop health, and easy communication with buyers. The research highlights the need for reliable data and regular updating of the machine-learning model to make sure that predictions are correct, discusses the challenges of adding technology with traditional farming practices, and hence the importance of farmer education for wider use.

[3] Carlos Hinojosa et al. introduced AgroTIC, an application for Colombian farmers that uses image processing and machine learning for crop health monitoring and to connect farmers directly to merchants. The app contains features for vegetation index calculations and disease detection. The authors stress how technology can improve crop quality and production while decreasing the digital divide by emphasizing user-friendly interfaces for smallholder farmers and also addressing concerns about data ownership and digital platforms' privacy.

[4] In this study, the authors Jeffrey K. O'Hara and Sarah A. Low explored the issue of online markets in direct-toconsumer (DTC) sales for rural farms. It finds that rural farms that in DTC sales are not very experienced and also far away from metropolitan areas are more inclined to adopt online selling. Digital connectivity has shown a decrease in the transaction costs incurred and also an increase in market access, necessitating the intervention of policy support and infrastructure development, including issues related to broadband adoption, and government programs that emerge to increase digital literacy among farmers.

[5] Analyzed the setting of a digital data platform for agriculture in Spain by Juan D. Borrero and Jesús Mariscal.



It aggregates data, gives decision-making tools, and creates a better connection between farmers. The research identifies fundamental elements in the platform's governance and model for data development, addressing concerns about data ownership, privacy, and the transparency of governance. The study raises the need for user-friendly interfaces along with continuous updates to ensure the platform remains relevant and effective. It concludes that these digital platforms can increase farmers' incomes and foster market efficiency while decreasing dependence on intermediaries.

[6] Namita Singh et al developed an AI chatbot Farmer.Chat , which provides personalized agricultural recommendations to smallholder farmers in India. This multilingual voice supported offline chatbot enables farmers from various sections to deal with it. Researches show how AI is being integrated in agronomic activities and how farming technologies can be further pushed, exploring the possibility of extending AI applications in agricultural communication and other farming tasks.

[7] K. Sughasini et al. presented a mobile application dedicated to farmers and consumers without any mediation: direct to the agribusiness retailers. Farmers use the app to post products, negotiate prices, and complete the transaction while using location services, filtering, and logistics management on the application. The emphasis in this research is on intuitive interfaces considering rural infrastructural limitations, noting that mobile technology could improve farmer income significantly and take agriculture towards sustainability by eliminating intermediaries.

[8] B. Ashokkumar studied digital interventions in Indian agriculture through the Soil Health Card Portal, e-NAM, and a plethora of agritech startups'. This study analyses the digital platforms empowering farmers regarding market access and income increase, besides discussing government policies and support systems that enable the increased adoption of digital agriculture programmes. It concludes by focusing on aspects linked to intermediary elimination in digital marketing platforms to improve farmer income and work efficiency while enhancing the sustainability of agricultural practice.

[9] Pratik Supe et al. examined Android applications for farmer market access. They identified currently

existing deficiencies such as real-time price negotiations and lack of user-friendliness. The study proposes improvements to empower farmers to track expenses and manage transactions without intermediaries. Needing usability features addressing low digital literacy among farmers, the research shows how mobile applications could improve farmer income and market efficiency, as well as promote more sustainable agricultural practices.

[10] C.V.N. Pradeeth et al. created the FarmConnect mobile application to build direct connections among farmers, consumers, and retailing outlets. Farmers can post produce, change prices, and transact with others through the app, which also includes very interesting features such as real time updates, chat systems, and secured modes of payment processing. It emphasizes the nostrums of strict quality testing and use feedback for improvement functionality, concluding that mobile application usage can massively increase the farmer's income markets and efficiency at lowering reliance on intermediaries, promoting sustainable agriculture.

[11] Sunil Mhamane et al. presented an Android application that creates an immediate link between farmers, retailers, and food processing companies. The app has enabled the transmission of immediate market information to farmers to enhance direct sales while reducing intermediation. It has features for price negotiation, transaction management, and product posting, which, supported by user-friendly design and minimal technical requirements, have enhanced usability for farmers to reduce information asymmetries, improve access to the marketplace, and provide transparency in transactions.

[12] Nufauza et al. examined an eMarket application for farmers developed during COVID-19, using the Rapid Application Development (RAD) model. The application has product listing, price negotiation, and communication through WhatsApp. Limited market access and price instability are challenges bemoaned, how digital platforms assist farmers to sell directly without middlemen thereby enhancing transparency and efficiency. The study proposes additional features based on user feedback for future improvements.

[13] Sasha Pesci et al. studied the use of digital sales and marketing technologies by farmers in California during the COVID-19 pandemic and found that farmers who use online selling techniques have seen increasing



sales and profits. It also draws attention to the problems of the digital divide and calls for training and infrastructure support to aid farmers in embracing suitable technologies, mentioning how these platforms enable farmers to cope with crises-induced market disruptions and lessen reliance on intermediaries, with government and nonprofit organizations playing vital roles in providing support intended to bridge that digital divide.

[14] Akash Ronad et al. developed the online application APLMOP, giving farmers direct access to agro-based industries without interference from middlemen, thus utilizing real-time data and logistics integration for a better market access. The study addressed problems that farmers face in traditional markets such as price manipulation and limited market information, which were concluded toward offering direct selling platforms as a viable option to improve farmer income and market efficiency with price transparency and lower costs related to intermediaries.

[15] Shalaka Shirke et al. developed a web portal facilitating direct sales between farmers and consumers and consequently slackening the grip of intermediaries in the agricultural supply chain. Multiple native language support and real-time market price information are features of the portal that highlight the direct market access necessity and what agritech solutions could do to improve farmer income. The research provides conclusions affirming that userfriendly interfacing and continuous updating are essential in sustaining the demand and utility of a given platform, hence having profound implications in altering farmer income and agricultural sustainability in general.

### III. METHODOLOGY

Within the farm-art system, agricultural supply chain inefficiencies are solved by bringing the farmer and the consumer together through a mobile application, thus creating a marketplace for the two parties. The system employs Flutter as the cross-platform developer and Firebase as the backend service provider for real-time data synchronization, a safe way of authentication, as well as optimizing low-connectivity conditions for performance. The architecture is modular and scalable so that it could be extended in the future and handle increased loads.

#### System overview and architecture

3.1 The Farmart architecture is organized under the following three core aspect:

The Farmart system essentially encompasses three major components of the frontend, backend, and security modules, all tied together to provide a seamless experience to both farmers and consumers.

#### Key System Components:

- Flutter-based frontend for Android and iOS.
- Firebase backend services, including Firestore, Storage, and Authentication.
- Cloud Functions used in the automated business logic.
- Role-based access control for security.
- Offline capabilities for rural areas with poor connectivity.

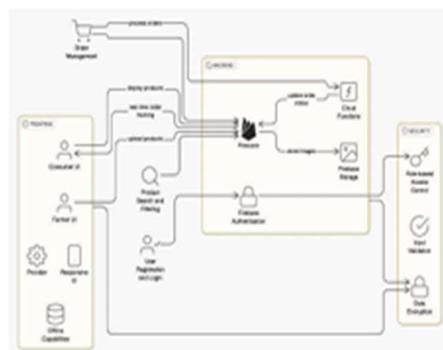


Fig. 1. System Architecture Diagram

It also describes the frontend as a different interface for the consumer and the farmer, with unique functionalities assigned. The backend would take care of data storage, authentication, and business logic through the Firebase services. The system has security measures used to protect user data and carry out secure transactions on it.

#### 3.2 Frontend Development

This will be the approach that Farmart frontend as a resource for cross-platform applications developed using Flutter will take for ensuring uniformity of performance in both Android and iOS platforms.

The feature menu consists of the following:

#### UI/UX Design features:

- Simplified payment gateway options including UPI, Paytm, and cash-on-delivery.
- Offline mode where functionalities are active with synchronization to SQLite database.



- Responsive design that can adapt to various screen sizes.

#### Key Screens

- Home Screen- Grid view for seasonal products with priority to local fruits and vegetables.
- Product Detail Screen- Displays different images, farm location tags, and quality parameters.
- Farmer Dashboard- Shows sales trends, stocks, and orders using easy to interpret charts and graphs.

This is what the consumer interface has been built on: product discovery, shopping cart management, and checkout processes while that which has the farmer interface was directed to product listing, inventory, and sales analytics.

#### 3.3 Backend Implementation

Firebase is used to establish backend services, hence achieving scalability and effective data management.

##### Firestore Data Modeling:

Products collection with price, stockLevel, farmLocation, organicCertification fields Orders collection with timestamps and order status:

placed → shipped → delivered

User collection having profiles, addresses, and payment methods Cloud Functions Trigger Inventory updates when farmers update their stock or consumers make orders Send order status change notification through SMS via Twilio Auto

order processing with inventory adjustment

##### Firebase Services:

Firestore - real time database operations, Storage: Storage for product images along with compression APIs Authentication Secure user access keeping in mind this backend architecture, future upgrades would include AI for analytics and implementation of sustainability tracking metrics.

#### 3.4 Security Considerations

Farmart has kept several walls of safety that ensure customer data stay private and that they can go through transactions securely.

##### Security Features:

AES encryption both in transit and at rest

OAuth 2.0 integration, which helps in government verification of farmer ID Role basis access: -there is no window towards farmer consumer payment information.

Validations of input to reduce attack possibilities Bank

crypt word and safekeeping This increases consumer trust while helping to address the issues of data security in digital agricultural platforms.

#### 3.5 Implementation Phases and Deployment

Farmart follows an orderly defined phased implementation strategy into which the entire development is placed.

##### Phases of Implementation:

-MVP Development within a period of 6 Months -Basic product listings with proper checkout and integration to Firebase. Scalability and Localization (9 months) of UPI, offline support and translation into regional languages. Advanced Analytics: 12 months: Recommendations powered by AI and tracing of the carbon footprint.

##### Testing and Quality Assurance:

Unit testing is done for individual components Integration testing for payment gateways Real-world beta testing with 500 farmers and 5,000 consumers from low-connectivity areas Continuous integration pipeline with GitHub Actions.



Fig. 2. Data Flow Diagram

**IV. RESULTS AND ANALYSIS**

**4.1 Introduction to Farmart Application Outputs** The Farmart application is developed to form a direct link between farmers and consumers while eliminating the intermediaries in the traditional agricultural supply chain and making the inefficient processes more efficient. The easy application user interface is intuitively designed and accommodates users of various levels of digital literacy. The screenshots attached show the key features of both the farmer and consumer sides of the application in how the right transactions, market access, and product management have been facilitated by the platform.



Fig. 3. Login Screen

**4.2 Farmer Side of the Application**

The farmer interface of Farmart provides comprehensive tools for product management and profile customization: Farmer profile management: Farmers have a unique profile screen to manage their information and contacts: name, email-id, mobile number, address, etc., to communicate transparently with consumers. The profile screen further facilitates product management and statistics visibility control of this function.

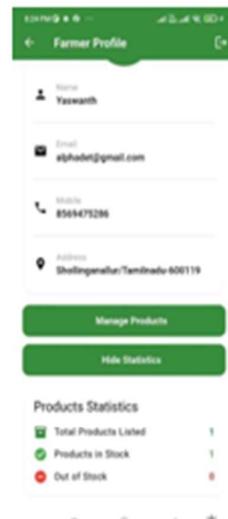


Fig. 4. Farmer Profile Management Interface

**Product Management Dashboard:** A farmer gets to manage his agricultural products from a centralized dashboard. This includes:

- Listing products with detailed descriptions and pricing information
- Uploading high-quality images to attract consumers
- Tracking stock levels in real-time
- Editing product detail anytime
- Unlisting or removing the products that are not available

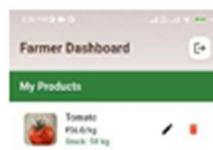


Fig. 5. Farmer Dashboard and Product Management



**Statistics and Analytics:** The application provides farmers with important statistics and analyses on their sales. Farmers can look up statistics on total products listed, products in stock, and items out of stock. Such statistics assist farmers in making decisions for production planning or inventory management.

#### 4.3 Customer Side of the Application

But on the other side, the Farmart consumer interfaces would be a smooth shopping pathway while remaining open for fresh agricultural products:

**Product Browsing Interface:** Where the consumer can almost browse through these huge arrays of fresh vegetables and other agricultural products: Each product is displayed with nice pictures, a price tag, and available stock quantity. The browsing interface also helps consumers easily locate particular items while searching and filtering through options.

**Order Management:** The application facilitates the consumers to order.

- Such Clear Product Listings With Prices And Stock Information
- Shopping Cart Functionality For Selecting Multiple Items
- Summarized Purchase Details On Order Confirmation Screens
- After-Purchase Order History Tracking With Detailed Transaction Information
- Farmart provides Payment Options, including cash-on-delivery (COD) besides these. Farmart provides several payment options beyond cash on delivery (COD) to provide for different customer preferences as well as their access level to technology.

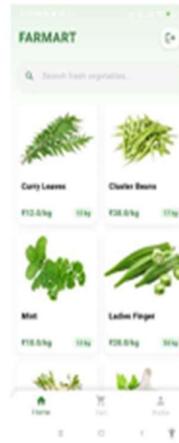


Fig. 6. Consumer Home Screen with Product Listings

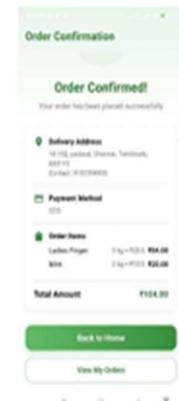


Fig. 7. Order Confirmation Screen

#### 4.4 Overall Impact and Discussion

The Farmart application solves perfectly the fundamental problems of an agricultural supply chain as per stereotype view:

- **Economic Benefits:** This does bring final prices closer to consumers and increase earnings but not hold with policy intermediaries. As a result, consumers get lower prices and fresh products.
- **Transparency in Markets:** Time-based information updates-feeds on inventories out and the lines linking farmers to consumers injects transparency



thereby bringing out real information on the same table.

- Operational Effectiveness: Features of product management include order tracking and processes of payment-all facilitated by an application that aids agriculture commerce thereby minimizing transaction cost and time.
- Scalability And Accessibility: The structural modularity of Farmart ensures this scaling up toward new areas with even more added agricultural products. It works offline supported in all local languages, and hence it would be easily accessed by farmers from poorly interlinked areas.



Fig. 8. Order History Tracking Interface

## V. CONCLUSION

The Farmart project has rolled out a mobile platform for creating direct links between farmers and consumers, thus fundamentally changing agricultural marketing in India. High scale features such as real time data sync and secure authentication as well as offline use underlie an app developed in Flutter for cross platform function and Firebase as backend. The dual user interface is designed to build a transparent marketplace for discovering products along with safe payments to the consumer and equipping farmers with product management tools, keeping track of inventory, and performing sale-related analytics. Format has been followed in delivering the MVP and subsequently work progressed to scale issues and advanced analytics integration. Locationbased services, multilingual options, and cash-on-delivery form part of the offering to address

certain unique requirements of the Indian agriculture ecosystem. Going forward, the modular architecture of the application will allow for integrated AI-based recommendations, subscription models, and sustainability tracking engines.

Again, piloting brought significant changes. Direct market entry boosted up farmers' incomes; with fewer middlemen, cheaper prices came to be offered to consumers; and all of them enjoyed lesser cost of transport. It has been technically proven to be scalable: it can now allow increased product ranges and user base. Most importantly, Farmart shows how digital innovation can transform entrenched supply chains, providing channels for broader economic opportunity while mitigating systemic challenges within the agriculture sector.

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## 4. Mapping the Mobile App for Direct Market Access for Farmers

### With Sustainable Development Goals(SDGs)

The mobile app that facilitates direct market access for farmers strongly aligns with several United Nations Sustainable Development Goals (SDGs). Primarily, it supports SDG 1 (No Poverty) by enabling farmers to sell their produce directly to consumers or businesses, thereby increasing their income and reducing dependency on intermediaries. It contributes to SDG 2 (Zero Hunger) by empowering farmers to invest more in sustainable agriculture and improving food availability through efficient supply chains. By promoting fair pricing and economic independence, the app also advances SDG 8 (Decent Work and Economic Growth). Additionally, the use of digital technology and innovation in agriculture reflects SDG 9 (Industry, Innovation and Infrastructure), while SDG 10 (Reduced Inequalities) is addressed by giving small and marginalized farmers equal access to markets. The app encourages SDG 12 (Responsible Consumption and Production) by fostering local food systems and reducing post-harvest losses. Finally, it supports SDG 17 (Partnerships for the Goals) by connecting farmers, consumers, logistics providers, and policymakers in a collaborative ecosystem aimed at sustainable agricultural development.

