

Empowering farmers through a digital platform for direct linkage with consumers and workers.

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Abstract

Agriculture remains the primary source of livelihood in rural areas, but traditional marketing systems controlled by middlemen reduce farmers earnings and raise consumer prices. This study proposes a digital platform that directly connects farmers with consumers, cutting unnecessary costs and increasing transparency. The platform offers secure payment options, real-time data analysis, and predictive tools that help farmers forecast prices and demand, enabling smarter decisions and higher profits. In addition to these core features, our research introduces innovative services such as farm visits for consumers, rental of modern agricultural equipment, and a worker hiring facility. These added features not only enhance trust and engagement between farmers and consumers but also provide practical support for farm operations, reducing labor and resource challenges. Survey results show that most farmers are open to using such tools for market activities and farm management. By combining advisory services, innovative features, and actual sales execution, the system empowers farmers with greater independence while ensuring consumers receive fresher and more affordable products. Overall, the research demonstrates how digital solutions can boost farmer incomes, promote fairness in the food supply chain, and create a scalable pathway toward sustainable agriculture.

1.INTRODUCTION

Agriculture remains an essential driver of both economic growth and social progress across numerous developing nations, with India being a prominent example. In India, nearly 60% of the population depends on agriculture as their primary livelihood[12]. Despite their crucial contribution to food systems and rural economies, farmers often earn the least from their efforts. A primary reason for this disparity is the conventional marketing model, which includes multiple intermediaries such as middlemen, brokers, and wholesale agents who take a substantial share of the profits[17]. This results in low earnings for farmers while retail consumers continue to pay high prices for agricultural goods. This imbalance between producers and consumers generates several socio-economic challenges. Farmers frequently

struggle to cover their basic production expenses, which leads to mounting debt, financial instability, and a diminished quality of life. In more severe instances, these pressures force farmers to leave their land or migrate to cities in search of alternative sources of income. At the same time, consumers face difficulty accessing affordable, high-quality, and locally grown produce. Such inefficiencies underscore the need for a more balanced, transparent, and direct agricultural marketing framework. The increasing availability of digital tools especially smartphones and internet services in rural areas has opened new doors for restructuring how agricultural goods are sold[19]. Modern digital solutions, including mobile applications, websites, and e-commerce platforms, offer a means for farmers to engage directly with consumers. These platforms allow producers to set their own prices, manage orders, and receive payments securely, thereby eliminating the need for intermediaries. Consumers, in turn, benefit by gaining access to fresher products at lower costs while contributing to the sustainability of rural livelihoods. This research aims to investigate the transformative potential of digital platforms in connecting farmers directly with end-users, thus bypassing traditional supply chain bottlenecks. The study delves into the flaws of the existing system, highlights the tangible benefits of adopting digital approaches, and explores real-world implementations of such models. It further outlines the practical and technological challenges involved and offers suggestions for developing an inclusive, scalable, and sustainable digital agriculture ecosystem.

2. LITERATURE SURVEY

Several researchers have explored the role of digital platforms in enhancing farmer-to-consumer linkages and improving agricultural market efficiency. Dr. B. Jalendar (2023) proposed "Farmasite: A Web Application Portal Designed for Farmers", which introduced an online platform that enables farmers to list and sell their produce while integrating secure payment gateways, order tracking, and location-based services. While the system offers convenience, the study highlights major concerns such as security risks, regulatory compliance issues, and scalability limitations, which may affect long-term adoption. Building on this, Nitin M. Shivale (2024) presented "Implementing a

New Framework to Sell Farmer Goods in Modern Era”, where he suggested a vending machine-integrated platform to connect farmers directly with consumers. This innovative approach aims to enhance affordability and profitability for both parties. However, the model faces challenges including high initial investment costs and resistance from traditional intermediaries in the agricultural supply chain. Similarly, Anurag Gangane (2024) explored the development of an “E-Commerce Platform for Farmers”, which empowers farmers to independently set prices, access real-time market information, and track sales. Despite these advantages, the study points out the lack of transaction security and the absence of advanced functionalities such as inventory management and expert advisory support, which limit its effectiveness. In another contribution, Pritam Ramteke (2025) proposed “Development of Web-Based System for Farmers to Consumers”, emphasizing a web solution designed to eliminate middlemen and empower farmers. The system integrates real-time data, e-learning resources, and local language support to enhance accessibility. Nonetheless, issues related to payment security and delivery logistics remain key obstacles to implementation. Finally, Hua Lu (2025) in “The Impact and Mechanism of E-Commerce of Agricultural Products” analyzed the Chinese agricultural market, illustrating how e-commerce platforms can increase profitability, improve market access, and encourage crop diversification among farmers. While the findings demonstrate significant benefits, the study is highly context-specific to China and lacks integration across the entire agricultural supply chain, limiting its global applicability.

3. METHODOLOGY

This research followed a structured approach combining field-based data collection and prototype development[6]. Surveys with farmers in Nashik were conducted to identify challenges such as dependency on intermediaries, lack of price transparency, and limited digital literacy. Consumer feedback was also gathered to understand their expectations for affordability, freshness, and transparency. Insights from both groups guided the design of a conceptual framework modeled through UML diagrams, covering features like product listing, order placement, payment integration, farm visits, equipment rental, and worker hiring, along with predictive tools for price forecasting and demand analysis. Based on this design, a prototype platform FarmConnect was developed using HTML, CSS, JavaScript, Node.js and MongoDB. The system was structured into modular components for farmers, consumers, an admin dashboard and a farm-visit map. Functional and usability testing with a pilot group ensured reliability and ease of use, while feedback refined navigation and security. Both quantitative and qualitative analyses were applied survey data measured adoption readiness, while interviews highlighted user perspectives. Ethical practices were followed throughout, ensuring data security and voluntary participation [20].

3.1 Predata analysis:

Table 1 Comparison of FarmConnect with Traditional and Other AgriTech Solution.

Feature	Farm Connect	Traditional Marketplaces	Other AgriTech Solution
Direct Farmer Consumer Interaction	Yes	No	Limited
Farm Visit	Yes	No	No
Rental	Yes	No	No
Traceability	Yes	No	No
Worker	Yes	No	No

3.2 Problem statement:

Farmers today face several persistent challenges that limit their growth and profitability. A major issue is the lack of direct market access, as most farmers still depend on local mandis or agents, leaving them with little opportunity to sell directly to end consumers such as households, restaurants, or stores. This problem is compounded by the presence of multiple middlemen in the traditional supply chain, which reduces farmers’ earnings and creates dependency. Additionally, farmers often struggle with limited access to modern equipment like tractors, seeders, harvesters, and drip irrigation systems that could otherwise improve efficiency and productivity. The situation is further worsened by labour shortages, particularly during peak agricultural seasons such as planting, weeding, and harvesting, when manpower demand is high. Lastly, many farmers lack awareness about agro-tourism, despite having farms and rural experiences that could attract visitors and generate additional income. Together, these challenges highlight the need for innovative solutions to improve market access, resource availability, and alternative income opportunities for farmers.

3.3 Solution:

We are developing a website designed to support farmers by offering multiple integrated services. The platform enables direct selling, allowing farmers to market and sell their crops, vegetables, fruits, and other produce directly to consumers without relying on intermediaries. It also promotes agro-tourism through a farm visit booking feature, where people can schedule visits to farms and experience rural life. To address seasonal labour shortages, the website includes a worker hiring option that lets farmers post job requests and connect with nearby workers for tasks such as planting, harvesting, or irrigation. Additionally, a farm equipment rental service is provided, giving small farmers affordable access to costly machinery like tractors, tillers,

and harvesters on a daily or hourly basis. Finally, an order tracking system ensures transparency by allowing both farmers and consumers to monitor delivery status in real time. Together, these features aim to empower farmers, reduce dependency on middlemen, and create new opportunities for growth and sustainability in agriculture.

3.4 Block Diagram:-

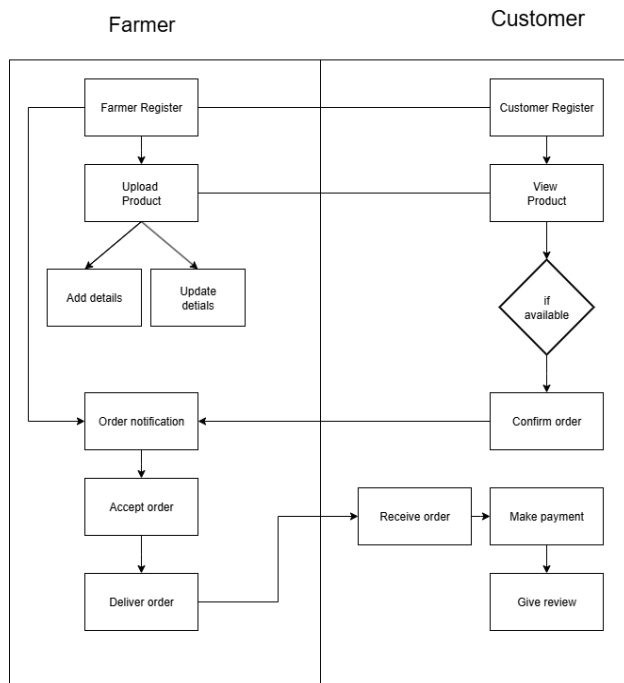


Figure 3.4 Block diagram

4.RESULT AND DISCUSSION

The implementation of the FarmConnect prototype and its evaluation through pilot testing revealed significant potential for transforming farmer–consumer interactions. The results show that the proposed system successfully integrates multiple features like direct sales, order tracking, equipment rental, worker hiring, and farm visit scheduling into a unified digital platform. This combination of services differentiates FarmConnect from earlier AgriTech models, which largely focused only on online marketplaces or basic e-commerce functionalities. The results demonstrate that FarmConnect not only empowers farmers by improving income opportunities and reducing dependency on middlemen but also enriches consumer access to fresh, affordable produce. The discussion highlights that the platform’s true innovation lies in combining market access with operational support, agro-tourism, and labor solutions creating a comprehensive ecosystem for sustainable agriculture. While challenges in logistics, scalability, and inclusivity remain, the system provides a strong foundation for future expansion and policy integration.

5. CONCLUSIONS

This research underscores the transformative potential of digital platforms in reshaping the relationship between farmers and consumers. By removing unnecessary intermediaries, farmers are able to secure more equitable returns for their produce, while consumers benefit from direct access to fresh, reasonably priced, and locally sourced food. Such platforms not only expand market opportunities but also foster transparency, accountability, and trust within the food supply chain. Furthermore, the integration of digital tools provides farmers with the ability to display their products, manage orders efficiently, and reach wider audiences beyond their immediate localities. Services such as online marketplaces, doorstep delivery systems, and secure digital payments create additional economic prospects and strengthen farmers’ participation in the digital economy. Ultimately, adopting digital solutions for farmer–consumer linkages represents more than just a technological shift it signals progress toward sustainable agriculture, improved economic resilience, and inclusive growth. By bridging the gap between producers and end-users, such platforms ensure that farming continues to thrive and adapt in an increasingly dynamic market environment.

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