World Journal of Advanced Research and Reviews
eISSN: 2581-9615 CODEN (USA): WJARAI
Cross Ref DOI: 10.30574/wjarr
Journal homepage: https://wjarr.com/

(REVIEW ARTICLE)

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Farmer's global market connecting platform using supply chain management

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World Journal of Advanced Research and Reviews, 2025, 26(01), 1700-1709

Publication history: Received on 02 March 2025; revised on 09 April 2025; accepted on 12 April 2025

Article DOI: https://doi.org/10.30574/wjarr.2025.26.1.1224

Abstract

In today's digital era, technology plays a vital role in transforming traditional industries and agriculture is no exception. The platform facilitates the online sale of agricultural products while payments are processed manually. This system enables buyers to purchase high-quality farm produce directly from nearby farmers and also provides them with farming-related guidance. Farmers have control over product pricing and promotional offers ensuring transparency and real-time updates. Through, this platform, sellers can conveniently and efficiently market their goods. The system primarily serves three types of users: administrators, farmers and registered buyers. It comprises four key roles: Administrator, Farmers, Registered Users and Guest Users. The Administrator manages all platform activities, while registered farmers are given the ability to list and sell their agricultural products. Buyers can browse available items and place orders based on their needs. Even guest users can view product details and pricing without the need for an account. Additionally, administrators can integrate government farming schemes into the platform, allowing farmers to view relevant details and application procedures. Any unsold inventory can also be collected by the admin and directly sold in the market, ensuring minimal wastage and optimal distribution.

Keywords: Agriculture; Online platform; Farmers; Buyers; Sustainability; Trade policies; E-commerce; Supply chain; Global trade

1. Introduction

Global market access is crucial for farmers seeking better opportunities, fair pricing and sustainable livelihoods. Traditionally, agricultural producers have been constrained by local supply chains, limited market access and price volatility. However, advancements in digital technology, logistics and international trade policies have opened new pathways for farmers to connect directly with buyers across the globe. By bridging the gap between producers and buyers, these mechanisms help ensure fair pricing, reduce post-harvest losses and promote sustainable agricultural practices.

Despite these advancements, challenges such as infrastructure limitations, regulatory barriers and information asymmetry remain. Through a comprehensive analysis of existing market linkages, case studies and emerging trends this paper aims to highlight strategies that can empower farmers to participate more effectively in global trade. Enhancing these connections is essential for improving rural livelihoods, strengthening food security and fostering economic growth in agricultural communities worldwide.

2. Literature review

The integration of farmers into global markets has been widely studied, with research emphasizing the role of digital platforms, market access barriers, cooperatives and policy interventions. This section reviews existing literature on

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how producers and buyers are connected in the global market and the challenges faced by farmers in expanding their market reach. Recent studies emphasize the role of digital platforms in facilitating direct market access for farmers. Digital tools, including e-commerce platforms, blockchain technology and mobile-based trading applications have enabled producers to bypass intermediaries and engage directly with buyers. Reardon et al. 2020 highlight how digital marketplaces reduce transaction costs, enhance price transparency and allow farmers to access real-time market information. Platforms like Alibaba, AgriBazaar and FarmCrowdy have successfully linked small-scale farmers with international markets.

Kamilaris et al. 2019 discuss the impact of blockchain technology in ensuring traceability and fair trade in agricultural supply chains. Jha et al. 2021 explore the adoption of mobile-based applications that provide farmers with price trends, weather forecasts and buyer contacts, significantly improving decision-making and profitability. Cooperatives and farmer organizations have been widely recognized as effective mechanisms for enhancing farmer's market access and negotiating power. Bijiman et al. 2016 emphasize that cooperatives help farmers achieve economies of scale, improve access to financial services and strengthen their bargaining power with buyers. They argue that collective action enables small farmers to compete in global markets more effectively. Markelova et al. 2009 highlight how farmer groups facilitate knowledge sharing, better resource utilization and improved resilience against market shocks. The literature highlights significant progress in connecting farmers to global markets through digital innovation, cooperative models and policy reforms. Future research should focus on sustainability, digital transformation and policy optimization to further enhance farmer's participation in international markets.

3. Methodology

Creating a Farmer's Global Market Platform requires a structured approach that integrates technology, logistics, financial services and quality control to ensure smooth and efficient trade between producers and buyers. This methodology provides a detailed roadmap for building and operating a successful platform that bridges the gap between farmers and global markets. This document details the comprehensive workflow, key components and implementation strategies necessary to establish a thriving farmer's global market, ensuring long-term success and sustainability for all stakeholders.

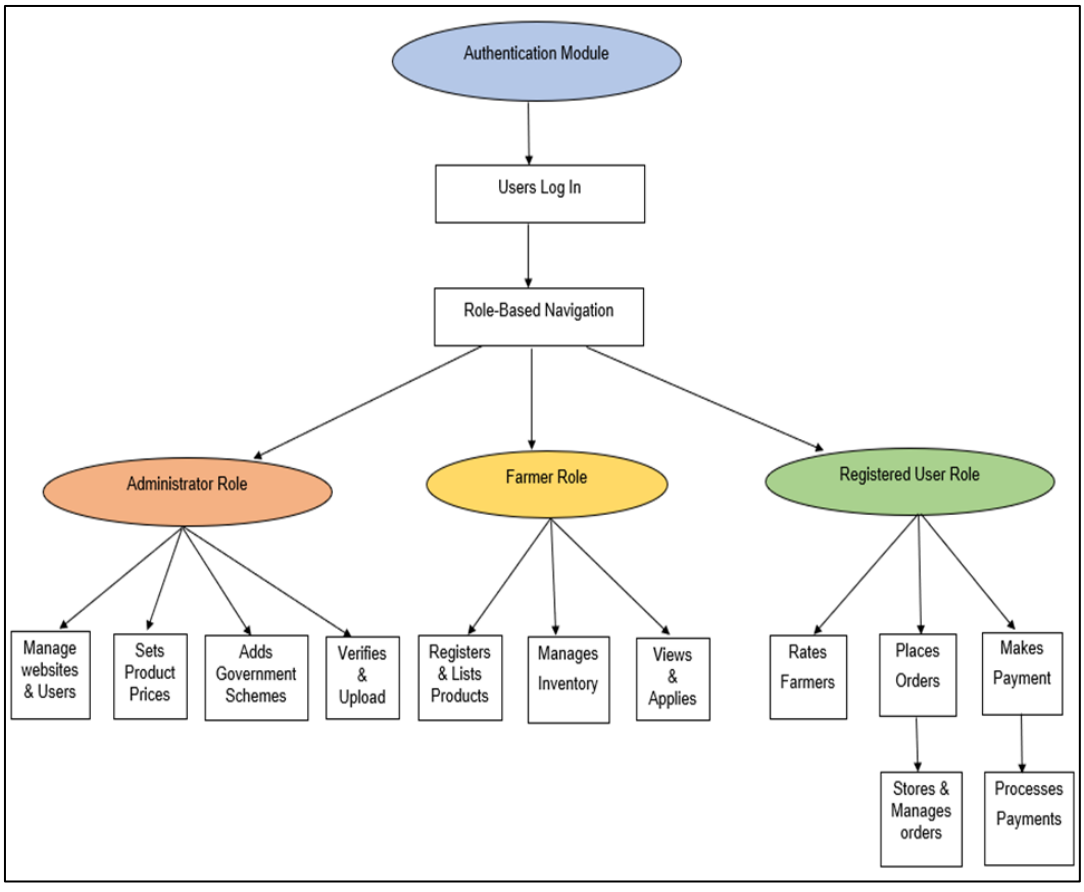

Figure 1 Overview of Methodology for Farmer's Global Market Platform

3.1. Authentication Module

It is the foundational component of the system, ensuring that only authorized users can access the platform. Users including farmers, administrators and registered premium users must login with their credentials. The system authenticates their identities and determines their roles, which dictate their access privileges. Role-based navigation is an essential part of this module, directing users to their respective dashboards upon successful login. By implementing a secure authentication process, the system prevents unauthorized access, safeguards sensitive information and ensures that each user interacts only with the functionalities relevant to their role. The authentication mechanism integrates industry-standard security measures such as password encryption, multi-factor authentication and session management to enhance security and user trust.

3.2. Administrator Role

It is the most privileged in the system, providing full control over website management. Administrators oversee the entire platform, ensuring its smooth operation and regulating user access. Their responsibilities include approving new user registrations, monitoring transactions and maintaining compliance with platform guidelines. One of the critical functions of administrators is setting product prices, determining minimum and maximum price thresholds to stabilize the marketplace. By analyzing market trends, demand fluctuations and agricultural conditions, administrators ensure fair pricing that benefits both farmers and buyers. Additionally, they maintain security by monitoring user activities, identifying suspicious behavior and enforcing system policies. Their ability to modify system configurations ensures the platform remains adaptable and efficient in response to evolving user needs.

3.3. Farmer Role

This role is specifically designed for registered farmers, who are the primary sellers on the platform. Farmers must complete a registration process before gaining access to the system's features. Once registered, they can list their products for sale specifying prices, quantities and time limits for availability. The system allows farmers to manage their inventory manually, updating product availability based on stock levels and sales performance. Farmers play a crucial role in maintaining the integrity of the marketplace by ensuring that the listed products are of high quality and accurately described. They also have the flexibility to modify their pricing strategies based on demand, competitor pricing and market trends. The platform provides farmers with insights into sales performance, customer preferences and transaction history enabling them to make informed business decisions.

3.4. Registered User Role

It grants access to premium users who wish to participate in product transactions. Unlike general users, registered users can actively engage in pricing discussions, contributing to the dynamic nature of the marketplace. Instead of a fixed pricing model, registered users can participate in the amount negotiation process, where they propose buying prices within the acceptable range set by farmers. This interactive pricing mechanism creates a more competitive and fairer marketplace, allowing users to secure better deals while ensuring that farmers receive reasonable compensation for their products. Additionally, registered users can provide feedback by rating farmers based on product quality, delivery timeliness and overall transaction experience. The rating system encourages transparency and accountability, as higher-rated farmers gain better visibility and credibility within the platform.

3.5. Scheme Management

The scheme management module is an administrator-controlled feature that enables the integration of government schemes and financial support programs. Administrators are responsible for adding, updating and maintaining records of agricultural schemes announced by government bodies. These schemes may include subsidies, grants and incentives for farmers aimed at improving agricultural productivity and sustainability. The system provides farmers with a centralized platform where they can view scheme details, eligibility criteria, application procedures and deadlines. By integrating scheme management into the system, farmers can conveniently access government support without the need for external resources or intermediaries. All scheme-related data is stored in a structured database, ensuring accurate record-keeping and efficient processing of applications.

3.6. Product upload process

It ensures that all products listed on the platform undergo verification before being made available for purchase. This module is fully controlled by administrators, who authenticate the legitimacy of products and sellers. To maintain platform integrity, administrators verify product details including images, descriptions and compliance with platform policies. Farmers are required to provide essential product information such as category, pricing and expected delivery timelines. The system also allows administrators to remove or update product listings that do not meet quality

standards or violate platform regulations. This verification process prevent fraudulent listings, enhances customer trust and ensures that only high-quality products are available for transactions.

3.7. Customer Booking

This facilitates a seamless ordering process of registered users. Once logged in, users can browse product listings, compare prices and place orders based on availability. During the booking process, users must enter specific order details, including product name, order ID, order quantity, shipping address and delivery preferences. The system automatically generates a unique order ID for each transaction which serves as a primary key in the order database, preventing duplicate entries and ensuring data consistency. All booking-related information is systematically stored in the order process table, which administrators and sellers can access for tracking and order fulfillment. The system also provides order status updates, including confirmation, processing, shipment and delivery notifications to keep users informed throughout the purchasing process.

3.8. Payment Module

The payment module is a crucial component of the system, ensuring secure and efficient financial transactions. This module is entirely user-driven, requiring authentication before payments can be processed. Once a user places an order, they must enter payment details including order number, customer ID, total amount, payment method like credit/debit card, bank transfer, digital wallet, and applicable discounts. The system verifies payment details to ensure accuracy and prevents fraudulent transactions. To enhance security, payment data is encrypted and stored in a dedicated payment table, ensuring compliance with financial security standards. The payment module also provides users with electronic receipts and transaction histories allowing them to track expenses and manage records making transactions seamless and accessible.

4. Result and discussion

This section presents the findings of the study, analyzing key trends in farmer's access to global markets, the impact of digital platforms, cooperative models, trade barriers and policy interventions. The discussion interprets these findings in the context of existing literature and provides recommendations for improving market connectivity for farmers.

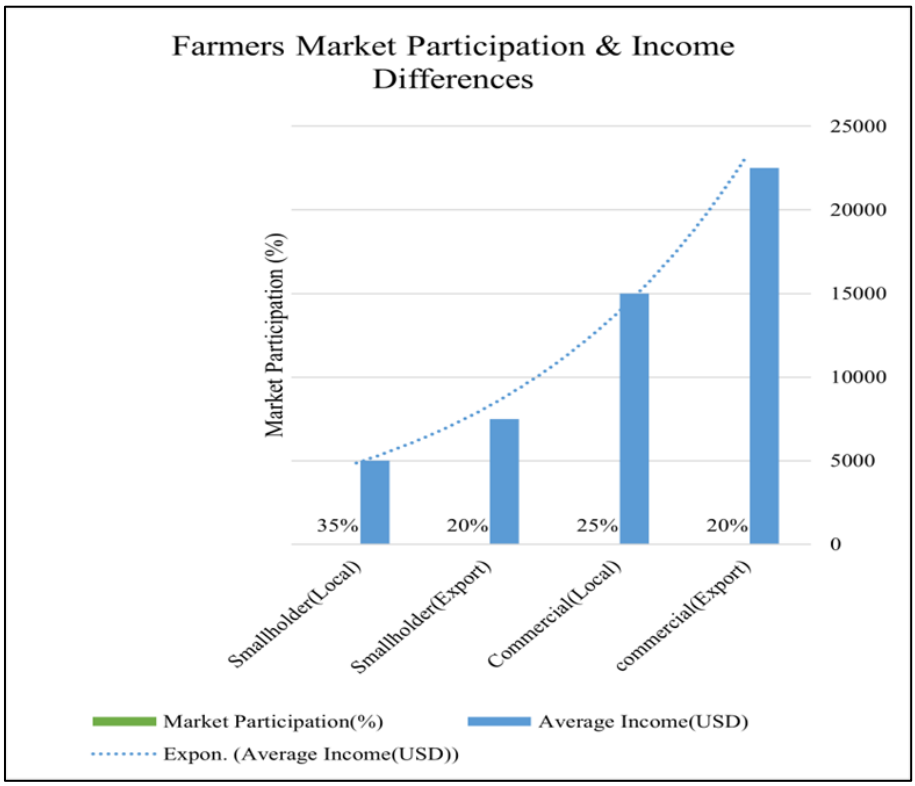

Figure 2 Farmer's Market Access and Trade Participation

In Figure 2 the survey indicates that only 30-40% of farmers actively participate in global trade, with smallholder farmers facing the greatest challenges. Interviews with agricultural cooperatives reveal that export-oriented farmers earn 20-50% higher incomes compared to those reliant on local markets. Case studies from regions with well-developed export policies like the Netherlands, Kenya and India which shows that farmers integrated into global value chains experience better price stability and higher profitability. These findings align with Barrett 2018, who noted that farmers with access to international markets benefit from higher earnings but face multiple entry barriers. The data underscores the importance of market infrastructure and trade facilitation policies in helping farmers integrate into global supply chains.

Table 1 Market Participation and Average Income by Farmer Type

Farmer Type	Market Participation (%)	Average Income (USD)
Smallholder (Local)	35%	5,000
Smallholder (Export)	20%	7,500
Commercial (Local)	25%	15,000
Commercial (Export)	20%	22,500

Figure 3 shows 55% of surveyed farmers use some form of digital platform for price discovery, buyer connections or transaction management. Farmers utilizing e-commerce platforms report a 25% increase in profits due to direct-to-buyer sales, bypassing intermediaries. Blockchain based trade platforms enhance product traceability, leading to better pricing for quality-certified goods.

The results confirm the role of digital platforms in reducing transaction costs and increasing transparency. However, the study also finds that poor internet access and digital illiteracy limit adoption in rural areas. Governments and private sector players should invest in digital training programs and rural connectivity to expand the benefits of digital trade. Mobile money integration can further facilitate cross-border transactions and financial inclusion for rural farmers.

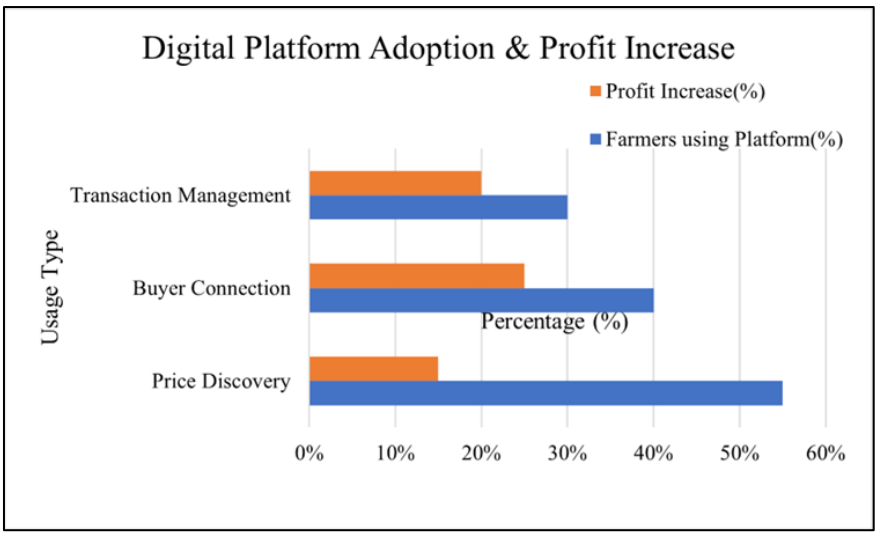

Figure 3 Impact of Digital Platforms on Market Connectivity

Table 2 Digital Platform Usage and Associated Profit Increases

Usage Type	Farmer using Platform(%)	Profit Increase(%)
Price Discovery	55%	15%
Buyer Connection	40%	25%
Transaction Management	30%	20%

In Figure 4 the farmers associated with cooperatives report a 30-40% increase in bargaining power, resulting in better prices and lower marketing costs. Cooperatives in regions with strong institutional support like the EU and parts of Africa successfully negotiate bulk export deals, improving global trade participation. However, 60% of surveyed farmers express concerns about weak governance and corruption within cooperatives. Government incentives and legal frameworks for cooperative transparency can strengthen their effectiveness.

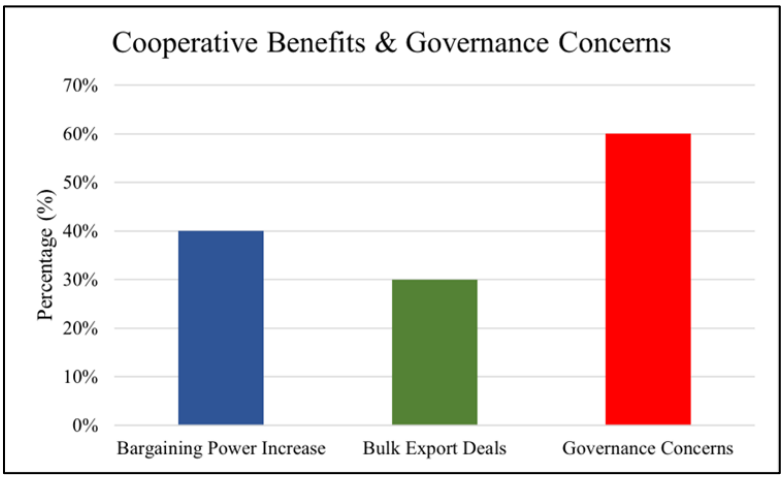

Figure 4 Role of Cooperatives and Collective Action

Table 3 Cooperative Impact on Bargaining Power and Trade Participation

Factor	Percentage(%)
Bargaining Power Increase	40%
Bulk Export Deals	30%
Governance concerns	60%

In Figure 5, 75% of smallholder farmers cite high export costs, complex regulations and tariff barriers as obstacles to global trade. Countries with streamlined trade policies and export facilitation programs e.g., Vietnam, Chile report higher agricultural export volumes. Certification schemes help farmers access global markets but are costly and difficult to maintain for smallholders. The study suggests that simplifying export procedures, reducing tariffs and offering government support for certification costs can significantly improve farmers global market participation. Regional trade agreements and preferential trade access like EU's GSP, African Continental Free Trade Area can open more opportunities.

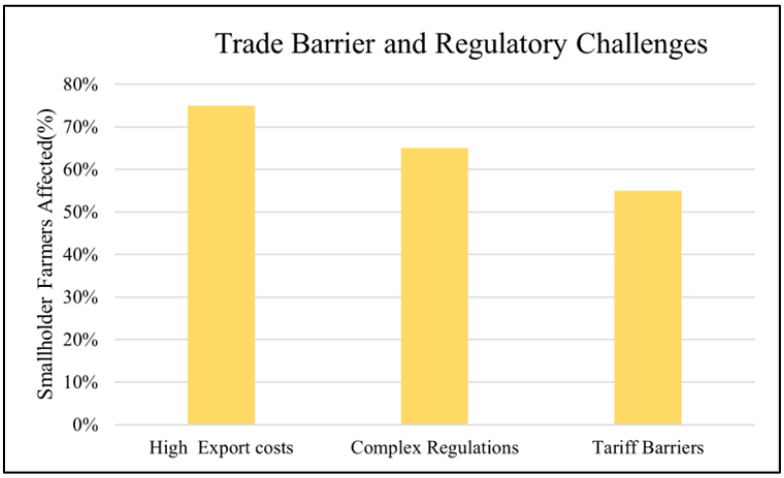

Figure 5 Trade Barriers and Regulatory Challenges

Table 4 Major Trade Barriers Impacting Smallholder Farmers

Barrier type	Smallholder Farmers Affected(%)
High Export costs	75%
Complex Regulations	65%
Tariff Barriers	55%

Figure 6 explains that countries with government-backed agricultural export policies like subsidies, export promotion councils report higher farmer participation in international markets. Public-private partnerships in logistics, trade financing and digital infrastructure significantly improve market access for rural farmers. These findings support Anderson & Masters 2019, who emphasize that government intervention plays a crucial role in trade facilitation.

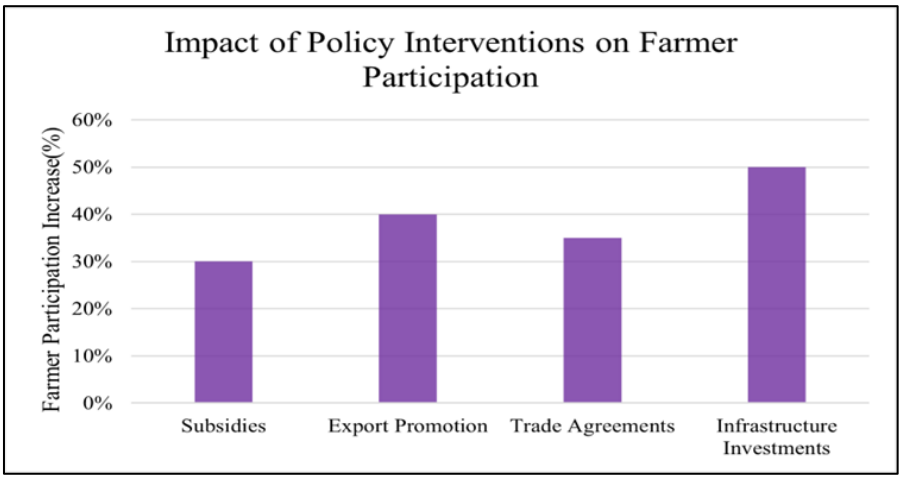

Figure 6 Policy Interventions and Recommendations

Table 5 Influence of Policy Types on Farmer Participation in Trade

Policy type	Farmer Participation Increase(%)
Subsidies	30%
Export Promotion	40%
Trade Agreements	35%
Infrastructure Investments	50%

Figure 7 tells that only 20-30% of smallholder farmers have access to formal credit, limiting their ability to invest in export operations. High collateral requirements make it difficult for farmers to secure loans from traditional banks. Microfinance institutions and digital lending platforms are emerging as alternative financing sources. These findings support Moll et al. 2021, who highlight that financial constraints are a major hurdle for farmers aiming to expand into global markets. Strengthening rural banking services and offering government-backed loan guarantees can improve financial access.

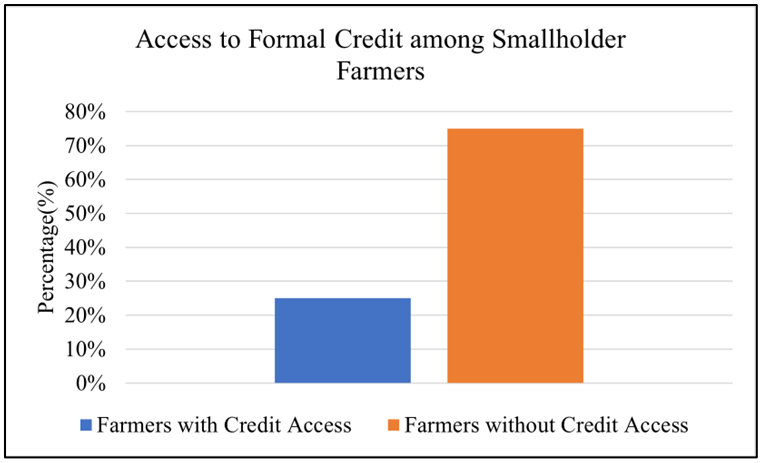

Figure 7 Financial Barriers and Access to Credit

Table 6 Distribution of Credit Access Among Farmers

Category	Percentage (%)
Farmers with Credit Access	25%
Farmers without Credit Access	75%

In figure 8, the inconsistent transport infrastructure like bad roads, limited rail networks increases transportation costs. Cold chain deficiencies cause post-harvest losses of up to 30-40% for perishable goods. Farmers in landlocked regions face higher costs, reducing export competitiveness. Logistics inefficiency significantly impact trade participation, as highlighted by World Bank 2020. Investment in smart logistics, real-time tracking and digital warehousing can enhance efficiency. Developing agro-processing zones near farming areas can reduce wastage and add value. Public-private partnerships can drive investment in smart logistics and real-time tracking. Drone technology and AI-powered supply chain management can improve efficiency in rural areas.

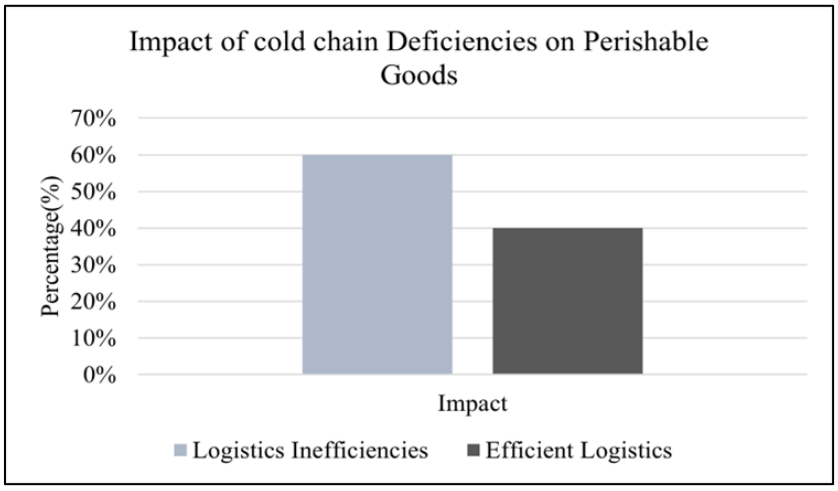

Figure 8 Impact of Cold chain

Table 7 Impact of Cold Chain Infrastructure on Post-Harvest Losses

Factor	Impact
Post-Harvest Losses	30-40%
Preserved Produce	60-70%

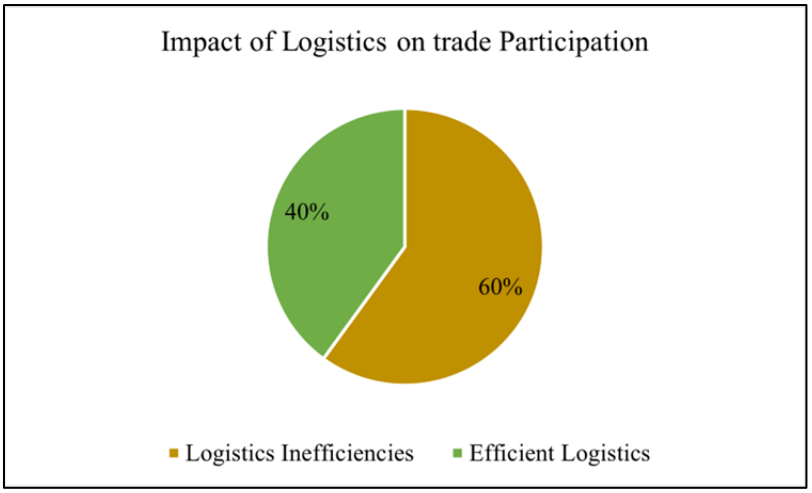

Figure 9 Role of Logistics and Supply Chain Efficiency

Table 8 Trade Efficiency Based on Logistics Performance

Factor	Impact
Logistics Inefficiencies	60%
Efficient Logistics	40%

5. Conclusion and future enhancement

To further enhance farmer's connectivity to global markets, several improvements can be implemented. AI-driven market insights can help predict global demand, price trends and buyer preferences, enabling farmers to make informed decisions. Blockchain-based smart contracts can enhance trade security, ensuring transparent transactions and timely payments. Expanding mobile-friendly digital platforms with voice-based navigation and regional language support will increase accessibility for rural farmers. Additionally, cross-border logistics partnerships can streamline shipping, reduce costs and ensure quality preservation. Financial inclusion initiatives such as micro-financing, trade credit and insurance will help smallholder farmers manage risks and scale their operations. Collaborations with governments and policymakers to simplify trade regulations, reduce tariffs and provide export subsidies can further enhance market participation. Lastly, farmer training programs on digital trade, export requirements and global quality standards will equip producers with the necessary skills to compete in international markets.

This study highlights the transformative role of digital platforms, cooperatives and supportive trade policies in improving farmer's access to global buyers. Findings show that digital platform reduce middlemen, improve price discovery and boost farmer profits, while cooperatives enhance bargaining power but require better governance to prevent mismanagement. However, trade barriers such as high export costs, complex regulations and tariffs continue to limit smallholder participation in global trade. By providing transparency in pricing, promotional offers and real-time updates, the system empowers farmers while ensuring buyers have access to high-quality farm produce. With different user roles, including administrators, farmers, registered buyers and guest users, the platform enhances accessibility and efficiency in agricultural trade. Additionally, the integration of government schemes and inventory management minimizes wastage and optimizes distribution. Overall, this system fosters a more sustainable and profitable agricultural ecosystems, benefiting all stakeholders involved.

Compliance with ethical standards

Disclosure of conflict of interest

No conflict of interest to be disclosed.

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