



Closing the Rural Finance Gap: How Microfinance and Digital Payments Together Enhance Financial Inclusion for Farmers in Bihar

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Abstract: Persistent structural barriers continue to limit rural financial inclusion in Bihar, where a large share of the farming population remains underserved by formal credit and digital financial services. This study examines how the convergence of microfinance delivery models and emerging digital payment infrastructures can narrow the gap and enhance long-term economic participation among rural households. Drawing on secondary evidence from RBI's financial inclusion indicators, NABARD's All India Rural Financial Inclusion Survey, NPCI's digital transaction data, and evaluations of PMJDY and SHG-bank linkage programs, the study maps current patterns in account usage, credit access, and digital adoption across different socio-economic groups. The review suggests that while initiatives such as Aadhaar-enabled payment systems, UPI-based platforms, and expanding MFI outreach have increased basic access, functional inclusion remains constrained by low digital capabilities, uneven connectivity, gender disparities, and limited formal credit absorption among small and marginal farmers. The analysis highlights that digitally enabled MFIs-supported by mobile-based repayment channels, algorithmic credit scoring, and partnerships with rural fintech innovators can reduce transaction costs, enhance transparency, and provide more flexible financial products tailored to agricultural cycles. The study proposes a composite strategy that emphasises MFI digitisation, targeted digital literacy programs, SHG-centric financial training, and strengthened last-mile digital infrastructure. Ultimately, the findings underscore that a coordinated ecosystem combining microfinance, digital payments, and community-based support systems is essential for advancing inclusive rural finance and empowering Bihar's farming communities to integrate more effectively into the formal economy.

Keywords: Microfinance, Rural Finance, Digital Payments, Financial Inclusion, Bihar Farmers, UPI, Digital Literacy, Fintech, SHGs.

Introduction: Rural financial exclusion remains a major obstacle to economic growth in Bihar, where small and marginal farmers often lack meaningful access to formal credit, secure savings mechanisms, and reliable payment channels. Limited banking infrastructure, low literacy levels, and persistent socio-economic barriers have kept many farming households dependent on informal lenders, restricting their ability to invest in productive activities and manage financial risks. Although national initiatives have expanded basic account ownership, the gap between access and actual usage continues to undermine financial inclusion efforts.

Against this backdrop, the combined rise of microfinance institutions (MFIs) and digital payment systems presents a transformative opportunity. MFIs, through self-help groups and joint liability groups, have advanced collateral-free lending and community-based financial literacy, while digital platforms, particularly mobile payments and UPI-based services, offer low-cost, real-time financial transactions. Together, these systems can reduce transaction barriers, enhance transparency, and build credit histories, enabling farmers to participate more fully in the formal economy. Understanding how these two mechanisms can operate synergistically is essential for closing Bihar's rural finance gap and fostering more inclusive agricultural development.

Achieving broad-based and sustainable economic development in India increasingly depends on extending meaningful financial access to underserved rural populations. Nowhere is this challenge more evident than in Bihar, where small and marginal farmers continue to face significant obstacles in accessing affordable credit, secure savings options, and efficient payment systems. Despite national efforts to universalize banking services, large segments of the rural population remain excluded due to sparse brick-and-mortar banking networks, inadequate digital connectivity, low literacy, and deep-rooted social and economic constraints. These conditions not only limit household financial stability but also restrict the ability of farmers to invest in improved agricultural practices and diversify their livelihood strategies.

Amid these persistent gaps, the simultaneous expansion of microfinance institutions (MFIs) and the rapid adoption of digital payment platforms offer a promising pathway to reshape rural financial ecosystems. MFIs, by leveraging community-based lending structures, have helped reduce dependence on informal moneylenders and enabled rural households to access small, collateral-free loans for productive and consumption needs. Their reliance on collective models such as self-help groups (SHGs) and joint liability groups (JLGs) has been particularly effective in fostering financial discipline and supporting women's economic participation. At the same time, digital payment solutions ranging from mobile wallets to UPI-driven transactions have made it possible for even remote households to engage more seamlessly with the formal financial system. Together, these innovations create an opportunity to bridge Bihar's rural finance gap by combining the outreach strength of microfinance with the efficiency and transparency of digital technologies.

Literature Review:

Microfinance has been widely recognised as a crucial mechanism for extending financial services to communities that have traditionally lacked access to formal banking. Built on the foundational ideas introduced by the Grameen Bank and its founder Muhammad Yunus, India's microfinance landscape has grown through the efforts of Microfinance Institutions (MFIs), which specialise in offering small, unsecured loans to low-income households. These services overwhelmingly focus on women, enabling them to pursue livelihood activities and strengthen household financial security. Swain and Wallentin (2009) note that the benefits of microfinance extend beyond income generation, highlighting its role in enhancing both economic and social empowerment for women in rural areas. In Bihar and similar states, group-based models such as SHGs and JLGs serve as critical vehicles for strengthening financial discipline, improving repayment, and expanding financial literacy.

Parallel to developments in microfinance, the rapid growth of digital payment technologies has reshaped how rural populations access and use financial services. Platforms such as UPI, AePS, and mobile wallets have simplified transactions, reduced reliance on cash-based transactions, and made it easier for citizens to engage with formal financial systems. These tools have brought greater transparency, lowered transactional costs, and improved the efficiency of government subsidy transfers. Initiatives like DBTs and the PMJDY have helped embed digital financial practices into rural daily life, facilitating the shift from traditional in-person banking to more accessible digital channels. Consistent with the Global Findex Report (Demirgüç-Kunt et al., 2018), digital payment systems play a significant role in reducing financial friction and expanding the

reach of formal institutions, although gaps persist in states such as Bihar, where limited digital literacy and infrastructure challenges contribute to high rates of inactive accounts.

A growing body of research highlights that digital finance influences economic performance through multiple pathways. Hongli and Pengcheng (2021) provide evidence that digital financial development is positively associated with total factor productivity among listed firms. Complementary findings by Li Xiuping and Bingtao (2022) show that digital finance, coupled with diverse organizational leadership, promotes innovation. Likewise, Xiaoge, Shihu, and Xiaoxin (2021) argue that digital financial systems help correct inefficiencies in capital allocation, thereby supporting innovative activity and optimizing resource deployment. Another line of work connects digital finance to sustainability outcomes. Studies by Kong et al. (2022) and Shusong, Nina, and Ke (2022) indicate that digital finance reduces information asymmetry and improves access to funds for green innovation, while Li et al. (2023) emphasize its contribution to environmentally aligned, high-quality development. These findings underscore the role of digital financial tools in advancing energy efficiency, facilitating green transitions, and strengthening climate resilience—especially in rural and developing regions. Growing attention is also being given to how digital finance can broaden ESG-focused investments in rural sectors traditionally left out of sustainability-focused funding channels.

In the context of rural development, Xiuhua, Xiaojin, and Jing (2012) provide foundational insights into the nature of financial exclusion in remote regions. Subsequent studies by Ying (2024) and Xiaoyi (2020) show how digital inclusive finance can promote innovation and resilience among SMEs in economically disadvantaged areas by offering scalable and customizable financial solutions. Technologies such as AI and big data analytics are increasingly integrated into rural financial systems, helping institutions improve credit allocation, reduce operational barriers, and extend financial services to underserved entrepreneurs. Research from ASEAN countries supports this perspective, indicating that digital literacy and financial education enable rural MSMEs to manage resources effectively and withstand economic shocks. The importance of digital skills in fostering financial inclusion is further supported by Setiawan et al. (2022) and Suyanto et al. (2023), who demonstrate that digital training and community learning platforms improve the adoption of digital financial tools such as e-wallets and online credit systems.

The COVID-19 pandemic intensified the need for digital engagement while simultaneously highlighting deep inequalities in digital access. Research indicates that many rural and artisanal enterprises adopted digital platforms to survive economic disruption, as seen in the work of Anggadwita et al. (2023), Anggia et al. (2021), Triwardhani et al. (2023), Dirgiatmo et al. (2020), Drummond et al. (2023), and Susanty et al. (2020). These studies point to the significance of digital adaptability, innovation-oriented behavior, and social media engagement in helping SMEs remain resilient during crises. The pandemic also saw increasing reliance on mobile-based lending, crowdfunding, and G2P transfers, transforming financial interactions in many low-income communities. Evidence from Africa and the MENA region reinforces the idea that digital finance enhances livelihoods and strengthens resilience (Frimpong et al., 2022; Akande et al., 2023; Al-Smadi, 2023). Grounded in human capital theory (Becker, 1967) and open innovation frameworks (Raya et al., 2021; Siregar et al., 2020), these findings suggest that a combination of financial capability and digital empowerment contributes to entrepreneurial development and long-term rural innovation. Digitally supported MSMEs are better equipped to innovate, participate in value chains, and access wider markets.

The convergence of microfinance and digital technologies has therefore emerged as a central theme in contemporary scholarship. Reports from IFMR LEAD (2017) and CGAP (2020) note that digitising microfinance processes can lower operational costs and boost transparency. States such as Tamil Nadu and Karnataka have seen success integrating mobile tools into SHG activities, although persistent obstacles—such as inadequate digital skills, poor connectivity, and social resistance—continue to shape outcomes. Complementing this, recent Chinese studies (Guo et al., 2023; Guo and Zhu, 2022; Rong, 2022) show that advanced financial technologies, including machine learning and big data techniques, are transforming risk management practices within the banking sector. These systems enable more refined credit scoring, proactive fraud monitoring, and improved oversight of financial behaviour, thereby strengthening operational performance and promoting financial stability.

Bihar offers an important context for studying digital financial inclusion, given its distinct socioeconomic profile and long-standing developmental constraints. Evidence from NABARD (2019), IndiaSpend (2021), and MicroSave (2020) indicates that the state continues to face obstacles such as inactive bank accounts, limited digital and financial literacy, weak internet access, and entrenched social inequalities—all of which restrict progress toward inclusive finance. At the same time, Bihar has registered meaningful improvements. The growth of digitally supported SHGs and the widening presence of Common Service Centres (CSCs) have created local access points for financial and digital services in remote communities, signalling a slow but steady increase in digital engagement and household financial capability. Microfinance remains instrumental in supporting agricultural livelihoods, enabling timely access to inputs, facilitating investment in seeds and equipment, and reducing dependence on costly informal lending channels (Seibel, 2005; Bhatt & Tang, 2002). Complementarily, digital payment systems are reshaping rural financial behaviour by fostering transparency, reducing intermediary layers, and enabling direct benefit transfers that streamline government support (Ghosh, 2016; RBI, 2020; Sarma & Pais, 2011). Together, these developments create a supportive foundation for greater financial resilience and economic diversification within the state.

A variety of government-led initiatives, including PMJDY, Digital India, NRLM, and PM-KISAN, have further expanded access to financial accounts and strengthened digital infrastructure. Reports by NCAER (2019) and Indicus Analytics (2018) recognize these achievements but highlight the persistence of structural barriers such as inadequate connectivity, low levels of trust in financial institutions, and pronounced gender disparities in digital adoption, all of which remain prominent in Bihar. Addressing these issues requires context-sensitive, participatory policies that involve local stakeholders and respond to community-specific challenges. Enhancing digital public infrastructure and promoting community-based digital literacy programs are key components for bridging these gaps.

Gender remains a critical dimension of financial inclusion in Bihar's rural landscape. Despite women's active involvement in SHGs and similar grassroots financing structures, they continue to confront constraints including limited access to digital devices, high data costs, and restrictive social norms (Mahalekshmi & Gnanadhas, 2010; World Bank, 2021; GSMA, 2022). These barriers contribute to persistent gender gaps in mobile phone ownership and internet usage, reducing women's ability to engage with digital and financial services. Implementing gender-responsive financial education and digital training initiatives is essential for enabling women to act as independent financial decision-makers. Evidence suggests that when women gain digital and financial autonomy, they reinvest in their households and communities, thereby magnifying the developmental benefits of inclusive finance.

Recent innovations in digital microfinance, such as biometric KYC processes and AI-enabled credit assessment, are beginning to gain visibility (Kumar & Shah, 2020). However, despite substantial research on microfinance and digital payments individually, there is limited scholarship exploring how the integration of these two mechanisms affects agricultural communities in states like Bihar. Existing studies generally treat them as separate channels of financial inclusion rather than examining their combined impact. There remains a clear need to investigate how the fusion of microfinance services and digital tools influences rural farmers' financial access, particularly in environments characterised by low income and low literacy. The present study addresses this research gap and seeks to generate evidence-based insights and policy recommendations to support sustainable and inclusive rural finance.

Research Methodology:

This research relies exclusively on secondary data obtained from reputable and authoritative sources to ensure a comprehensive and contextually grounded analysis. Core datasets and reports are drawn from institutions such as the Reserve Bank of India (RBI), the National Bank for Agriculture and Rural Development (NABARD), and the National Payments Corporation of India (NPCI), which collectively provide detailed information on rural credit flows, banking sector performance, financial inclusion indicators, and trends in digital financial adoption across the country. The study also incorporates insights from major national programs, most notably the Pradhan Mantri Jan Dhan Yojana (PMJDY), and employs international reference points such as the World Bank's Global Findex Database to benchmark India's financial inclusion achievements and identify inter-state variations.

To better understand the regional realities shaping financial behaviour and access, the analysis includes state-level data from the Government of Bihar, particularly Economic Surveys, Budget Speeches, and Finance Department publications, given Bihar's agrarian character and its substantial engagement with microfinance

initiatives. Additional information on digital transaction activity, including metrics on UPI usage, AePS-based authentication, and Direct Benefit Transfer (DBT) flows, is sourced from the NPCI statistics portal. Together, these datasets facilitate an in-depth evaluation of the penetration, performance, and impact of digital and microfinance systems in rural Bihar.

Analytical Tools: The study employs a range of analytical methods to examine the role of digital payments and microfinance in promoting financial inclusion among rural populations in Bihar. Descriptive statistics are used to summarise key indicators of financial inclusion, such as bank account ownership, card usage, and access to financial services, and to compare these across different demographic groups. Trend analysis is applied to identify patterns and changes in financial access and utilisation over time, with a particular focus on the period from 2011 to 2021. Comparative analysis further situates Bihar's performance against national and state-level benchmarks, offering contextual insight into the state's progress in financial inclusion. Collectively, these analytical approaches provide a robust, evidence-based assessment of gaps in access and the effectiveness of inclusion efforts.

Data Analysis and Findings:

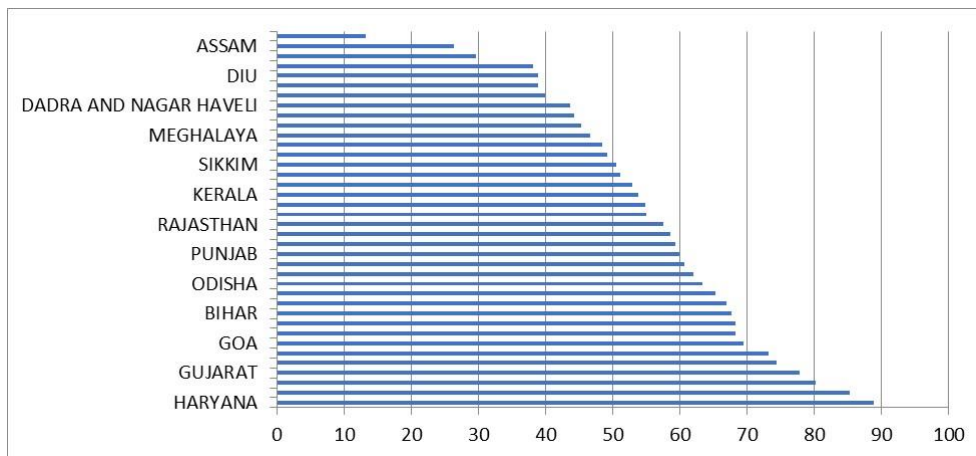
India's financial inclusion landscape witnessed significant advancements between 2011 and 2017, largely driven by initiatives such as the Pradhan Mantri Jan Dhan Yojana (PMJDY), which increased bank account ownership from 35% to 80%, before slightly declining to 78% by 2021. However, increased account access did not consistently translate into active engagement. Indicators such as deposit activity and the proportion of inactive accounts suggest that many accounts remained underutilised. Disparities persist across gender, geography, education, and income: men, urban residents, more educated individuals, and higher-income groups consistently demonstrate greater access to and usage of financial services than women, rural residents, and economically disadvantaged populations. For instance, in 2021, only 20% of women held a debit or credit card compared to 35% of men, while rural card ownership (21%) lagged behind urban levels (36%). Mobile money adoption, though growing from negligible levels in 2011 to 10% in 2021, remains limited.

Within the context of Bihar's rural farming population, these patterns are further exacerbated by low literacy rates, inadequate digital infrastructure, and limited financial literacy. While foundational strides in financial inclusion have been achieved, bridging the gap between mere access and active, productive use of financial services remains crucial for fostering inclusive and sustainable economic growth in the state.

Over the past decade, India has made remarkable strides in financial inclusion, with significant improvements observed across various demographic groups. The most striking development has been the surge in female account ownership, which rose from 26% in 2011 to 78% in 2021, effectively closing the gender gap in access to formal financial services and bringing it on par with men. Similar upward trends are evident among both young adults and older individuals, indicating that financial services are increasingly accessible across age groups.

Targeted government programs, such as the Pradhan Mantri Jan Dhan Yojana (PMJDY) and Aadhaar-linked banking, played a key role in expanding bank account coverage nationwide. Between 2011 and 2021, account ownership among youth aged 15–24 increased from 27% to 67%, while for adults aged 25 and above, it rose from 38% to 81%. Non-working populations, including students, homemakers, and the elderly, also experienced notable gains, with ownership rising from 26% to 73%, compared to an increase from 44% to 81% among the working population. Geographically, rural account ownership grew from 26% to 77%, nearly matching urban levels at 78%. In terms of income, the lowest 40% of households saw their ownership rise from 27% to 78%, slightly exceeding the 77% observed among the wealthiest 60%, signalling the achievement of broad-based, or horizontal, financial inclusion.

While access has improved substantially, deeper engagement with financial services encompassing loans, savings, insurance, and digital payments remains uneven. Younger populations, rural communities, and non-working groups, particularly in states like Bihar, continue to demonstrate lower levels of vertical financial inclusion. Nevertheless, the expansion of account ownership in rural areas and among non-traditional users such as homemakers, students, and the elderly illustrates the success of last-mile outreach efforts. These shifts point toward a more inclusive, diversified, and equitable financial sector in India, where previously underserved groups are increasingly participating in formal financial systems.



States' Performance Ranking Scores of Direct Benefit Transfer (DBT)

Trends in Digital Payment Adoption in India: The use of digital payment systems in India has expanded substantially over recent years, reflecting broader transformations in the country's financial landscape. This growth has been driven by a combination of policy initiatives and technological innovations, including the launch of the Digital India program in 2015, the disruptive effects of demonetization in 2016, and the subsequent proliferation of UPI-enabled platforms, Aadhaar-linked financial services, and smartphone access. These developments have significantly improved convenience, accessibility, and adoption of digital financial services.

One notable development has been the narrowing gender gap in digital payment adoption. In 2014, 14% of women and 30% of men reported using digital payments, marking a 16-percentage-point disparity. By 2021, usage had increased to 28% for women and 41% for men, reducing the gap to 13 percentage points. While this demonstrates meaningful progress toward gender-inclusive financial participation, a digital divide between men and women persists, underscoring the need for targeted interventions to promote equitable engagement.

Age-related differences also highlight how digital financial behaviour is influenced by active economic participation. Adults over the age of 25 reported higher adoption rates (37%) than younger individuals aged 15–24 (30%) in 2021. This suggests that familiarity with digital technology alone is insufficient to drive usage; engagement in formal employment or entrepreneurial activity plays a critical role in promoting digital financial inclusion.

The adoption of digital payments is further shaped by geographic, income, educational, and occupational factors. Individuals with secondary education or higher were more likely to use digital payments (48%) compared to those with primary education or less (29%), reflecting ongoing digital literacy challenges. Similarly, wealthier households showed higher adoption, with the top 60% income group increasing from 29% in 2014 to 41% in 2021, while the bottom 40% rose from 12% to 26%, narrowing the income gap modestly from 17 to 15 percentage points. Rural-urban disparities persist as well, with digital payment usage at 30% in rural areas compared to 40% in urban locations, highlighting the continued need for improved internet infrastructure, user support, and financial literacy initiatives in rural regions. Overall, active engagement in formal economic activities, along with access to technology and education, strongly influences digital payment participation across India.

Digital Payments and Microfinance: Advancing Financial Inclusion for Bihar's Farmers

Expanding Access Through Microfinance and Digital Platforms: In Bihar, the integration of microfinance and digital financial services has significantly enhanced access to formal financial systems, particularly for marginalised groups such as women, small farmers, and low-income households. Between 2011 and 2017, account ownership rose substantially due to government-led initiatives, the work of Self-Help Groups (SHGs), and Microfinance Institutions (MFIs). Despite these improvements, actual utilisation remains limited. A notable proportion of accounts remain dormant, informal borrowing continues, and formal savings behaviour has yet to become widespread. The introduction of digital financial services, including mobile banking and UPI-based platforms, has added a new dimension to inclusion. While mobile money adoption has increased from 2% in 2014 to 10% in 2021 nationally, uptake in rural Bihar continues to face barriers

such as digital illiteracy, cultural resistance, limited internet access, and low trust in online platforms, particularly among women, the elderly, and less-educated populations.

Persistent Demographic Disparities: Financial participation continues to exhibit clear demographic gaps. For instance, while women's account ownership in India increased from 14% to 28% between 2014 and 2021, their borrowing rates remained relatively stagnant at 10%, compared to 15% for men. Similarly, older adults, those with higher education, urban residents, and wealthier individuals consistently demonstrate higher usage of formal financial services. Young people, rural residents, informal sector workers, and lower-educated groups still face systemic barriers, highlighting that financial inclusion remains selective and fragmented, rather than universal and comprehensive.

Integration as a Pathway to Meaningful Inclusion: Achieving meaningful financial inclusion in Bihar requires combining the reach of traditional microfinance and SHG models with the efficiency and scalability of digital technology. While MFIs and SHGs provide high-trust, community-based solutions, their reach is constrained by high transaction costs and operational inefficiencies. Digital tools, such as mobile banking, UPI, Aadhaar-enabled authentication, and fintech platforms, can lower costs, improve transparency, and enable real-time service delivery. In rural Bihar, integrating digital systems with community-based microfinance can enhance loan processing, reduce default rates, and facilitate faster repayments. Additionally, digital literacy initiatives and training for SHG leaders can help bridge the digital divide, enabling communities to adopt and manage digital financial tools effectively. This integration also allows MFIs and SHGs to expand their service offerings, including insurance, savings, pensions, and remittances, while maintaining social cohesion and accountability.

Implications for Farmers and the Road Ahead: Despite these advances, Bihar's small and marginal farmers continue to face economic vulnerability. Limited access to formal credit, irregular cash flows, and dependence on informal moneylenders constrain their financial resilience. Microfinance has mitigated some challenges by providing small loans, yet these are often insufficient for agricultural inputs or risk management. Digital payments have the potential to enhance transparency, facilitate government transfers, and reduce dependence on intermediaries. To fully leverage these tools, Bihar requires stronger digital infrastructure, financial literacy programs, and credit products tailored to agricultural needs. Integrating microfinance with digital services, including crop-specific lending and digital marketplaces, can improve access to essential financial resources and promote economic stability.

Conclusion:

The convergence of microfinance and digital financial platforms offers a transformative pathway for financial inclusion in Bihar. While significant progress has been made in expanding account ownership, true empowerment requires moving beyond basic access toward active, meaningful participation. Barriers such as low literacy, limited internet access, and socio-cultural constraints must be addressed through comprehensive interventions that combine policy, technology, and community engagement. By fostering digital literacy, deploying fintech solutions tailored to rural farmers, and strengthening institutional support, Bihar can move from passive inclusion toward a model in which farmers are active, resilient participants in the formal financial system. Collaborative efforts among policymakers, financial institutions, civil society, and technology providers are essential to realise this vision of inclusive, farmer-centred financial development.

The integration of digital financial tools with microfinance plays a crucial role in supporting Bihar's small and marginal farmers, many of whom remain reliant on informal lenders and are highly vulnerable to income volatility. Digital payment systems can enhance transparency in pricing, enable direct transfers of government subsidies, and reduce dependence on intermediaries. Microfinance complements these benefits by improving access to credit, promoting disciplined savings through collective mechanisms, and fostering social cohesion within rural communities.

Nevertheless, the effectiveness of these interventions is constrained without supportive ecosystems, including local fintech solutions, tailored financial literacy programs, and enabling regulatory frameworks. For Bihar to achieve meaningful financial inclusion, efforts must move beyond basic banking services toward a model that is digital, farmer-centric, and participatory.

A holistic and coordinated approach, combining digital payments and microfinance, can empower the rural poor to engage actively with the formal financial system. Realising this vision requires collaboration among policymakers, financial institutions, civil society organizations, and technology providers. Only through such

integrated and cooperative strategies can farmers in Bihar transition from passive recipients of financial services to empowered, resilient participants in the broader financial ecosystem.

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