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Digital Financial Inclusion in Agricultural Marketing: A Study of Crop Producer Organizations in Telangana

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Abstract:
Agricultural marketing in India is moving from cash-based, intermediary-dominated exchange towards digital payments, platform-based trading and direct benefit transfers, yet the institutions that aggregate smallholders, namely crop producer organisations, are unevenly placed to benefit. This paper reviews digital financial inclusion (DFI) in crop producer organisations (CPOs) marketing in Telangana on the basis of a desk-top analytical design and using official statistics, Parliamentary records, NABARD and SFAC data, regulator reports, and published works. The three dimensions of access, use, and quality are used for the marketing functions of producer organisations. The data reveals the huge digital payments growth taking place across the country, as the UPI transaction volume jumped from 10.79 billion transactions in 2019 to 38.74 billion in 2021, and the user count of e-NAM increased to 1.76 crore by July 2022. Persistent gaps are also observed, such as inactive accounts, cash-dominated merchant payments, gender gap in the use of digital, thinned institutional credit to producer companies with only 12 Telangana organisations getting credit-guarantee cover up to 2021-22. The paper proposes a definition of capability building, merchant-side digitisation, designing for women and integrated grievance redress as potential inclusions at the account level and makes a case for such inclusions to have kept pace with inclusion of accounts. Researchers and policymakers are suggested to continue research through primary field-based validation.

Keywords: Digital financial inclusion; farmer producer organisations; agricultural marketing; e-NAM; UPI; Telangana.

1. Introduction

Agricultural marketing continues to be one of the weakest links of the Indian farm economy. The sector is characterised by small and marginal holdings, with farmers regularly selling small parcels into markets with only partial information reaching them, where they are paid in cash or later, and where there is a disparity in bargaining power between them and traders and commission agents (Dev, 2012; Pingali et al., 2019). As such, the debate on how to improve farm incomes has come back to market efficiency and short supply chains, which are essential complements to productivity gains (Chand, 2017).

Collective institutions is one solution. Farmer producer organisations (FPOs) are generally producer companies that bring members together to collect produce, share inputs and transport, and aim to get fair prices due to volume. India's Central Sector Scheme for the Formation and Promotion of 10,000 FPOs, launched in 2020 with an outlay of ₹6,865 crore, gave the model a large public financial commitment (Lok Sabha, 2022). Each organisation can receive management support of up to ₹18 lakh over three years, a matching equity grant of up to ₹2,000 per member subject to a cap of ₹15 lakh, and credit-guarantee cover on project loans of up to ₹2 crore (Lok Sabha, 2022). The expectation is that an aggregated, formally registered body can do what an individual smallholder cannot: negotiate, borrow and transact at scale.

There has been a second shift taking place in tandem. With the introduction of Jan Dhan account drive in 2014, the availability of bank accounts along with Aadhaar ID and mobile connectivity has enabled digital payment channels to become available. The Unified Payments Interface (UPI) has exploded during the pandemic years; the National Agriculture Market (e-NAM) provides an electronic trading layer on top of regulated mandis; and farm income support is now done via Direct Benefit Transfer (DBT). The World Bank's Global Findex 2021 found that the percentage of Indian adults using or receiving digital payments increased from 22 per cent to 35 per cent from 2014 to 2021 (Demirgüç-Kunt et al., 2022). These developments affect the sale of produce, members' remuneration, and working capital funding arrangements in a producer organisation. Digital financial inclusion is thus a marketing component of FPOs' financial infrastructure rather than a side topic of banking.

It is an interesting setting in Telangana. The state pioneered the Rythu Bandhu investment-support scheme, under which cash assistance of ₹5,000 per acre is credited to landholding farmers' bank accounts at the start of each crop season, reaching about 66 lakh farmers and 1.52 crore acres (The Indian Express, 2021). It also hosts a growing cluster of producer companies promoted by NABARD, the Small Farmers' Agribusiness Consortium (SFAC) and the state's Society for Elimination of Rural Poverty (SERP), covering crops such as paddy, maize, cotton, pulses and mango. Farmers in Telangana are thus already embedded in digital transfer systems, yet the extent to which their collective marketing institutions use digital finance for sales, procurement payments, credit and record-keeping is far less documented.

This paper addresses that gap. It seeks responses on the status of digital financial inclusion for crop producer organisations in marketing their crops in Telangana, the evidence base on access, use and quality of digital financial services at the organisation level and what institutional and policy interventions would help to turn digital financial inclusion at the account level into a marketing outcome. The contribution is a coherent and systematic compilation of disparate official and published evidence systematized according to a scheme that distinguishes access from usage and quality. The paper is organized as follows: Section 2 reviews the literature, Section 3 outlines the framework, Section 4 explains the objectives and methods, Sections 5 through 8 summarize the evidence and analysis, Section 9 discusses challenges, and Section 10 provides policy implications. Section 11 outlines limitations, and the paper concludes in Section 12.

2. Review of Literature

2.1 Digital technologies and agricultural markets

Among the early studies that provide the strongest evidence on the potential of information and communication technology to improve farm markets, is Jensen (2007) who demonstrated that mobile phones in Kerala fisheries led to reduced price dispersion, virtually eliminated waste and increased producer profits and consumer welfare. Aker and Mbiti (2010) come to a similar finding for Africa -

mobile telephony reduces search costs, enhances the coordination between buyers and sellers, and makes better-informed marketing decisions. Goyal (2010) reported that access to market information and procurement through the ITC e-Choupal network for the soybean growers of Madhya Pradesh in India was correlated with higher soybean prices and change in the acreage of soybean, whereas Mittal, Gandhi and Tripathi (2010) reported the use of mobile telephone for farmers' access to market and agronomic information and reduction in transaction cost.

All of these studies have a common theme: technology lowers information and transaction costs and makes farmers less dependent on intermediaries. However, Deichmann, Goyal and Mishra (2016) warn that agricultural transformation is possible only if supporting factors are in place, such as connectivity, skills, trusted information, and market institutions. That is the key to the present paper as a platform like e-NAM is useful to the producer organisation only if it is able to register, grade, bid, receive payment, and reconcile accounts digitized.

2.2 Financial inclusion and digital finance

Financial inclusion is generally defined as having multiple dimensions. Beck, Demirgüç-Kunt and Honohan (2009) differentiate between access and use of financial services, and highlight that measure should reflect both. Sarma and Pais (2011) operationalised this by means of a multidimensional inclusion index that encompasses access, availability and use of the banking system and found that human development is related to inclusion; the latter changes with income and infrastructure. The Financial Inclusion Index of RBI also follows a similar reasoning by adding a quality component that is based on the financial literacy and financial service inadequacies and weaknesses of consumers (Reserve Bank of India, 2022).

Inclusion is now different with digital channels. In Kenya, Jack and Suri (2014) demonstrated that mobile money helped households to manage risk better and mitigate income shocks due to the ability of money to transfer rapidly and cheaply via networks. Ozili (2018) summarizes the broader evidence on the role of digital finance in promoting financial stability and extending financial inclusion, with a focus on sound regulation. One of the key strands warns against using technology as a cure-all! Gabor and Brooks (2017) suggest that inclusion by the fintech industry can bring poorer households into commercial financial markets, but that protection and capability are necessary for inclusion to protect vulnerable users, a reminder that access without protection and capability may expose vulnerable users to risk. The quality aspect of inclusion is not a refinement; it's a protection.

2.3 Producer organisations and their financial constraints

In India, the producer companies of farmers have been explored by Trebbin and Hassler (2012) as a novel form of farmer organization that holds potential for improved access to markets as well as professional management and external assistance. Bikkina, Turaga and Bhamoriya (2018) examined producer organisations as farmer collectives and noted that the structural factors were: low member equity, poor business skills of the producer organisations, and reliance on promotion agencies. Recurrent financing problem is one of the problems. In India, Narayanan (2016) demonstrates that agricultural credit has not been equally effective in boosting productivity, and that the manner, timing, and reach of agricultural credit are as important as the quantity. The credit relationship is particularly fragile in the case of producer companies that have limited collateral and have seasonal working-capital requirements.

2.4 Research gap

Based on this literature, three propositions are established: digital technologies can lower marketing costs, financial inclusion is multidimensional (with access, usage and quality dimensions) and producer organisations are at a specific disadvantage in terms of financial constraints. What is less frequently discussed is a holistic perspective of digital financial inclusion at the producer organisation level in a certain context. Current performance studies of the FPOs in the state of Telangana are primarily on the governance, grading and rendering of welfare to members without any emphasis on digital finance. In this paper, an attempt is made to fill this gap through a structured synthesis for Telangana.

3. Conceptual Framework

The analysis adopts a three-dimensional approach based on the access, use, and quality dimensions of financial inclusion literature (Beck et al., 2009; Reserve Bank of India, 2022) and the marketing functions of a producer organisation. Figure 1 summarises the relationships.

The infrastructure that enables access – with access to Aadhaar-linked accounts, UPI and other payments systems, mobile or internet connectivity, and access to market platforms like e-NAM – is important. It also includes the organisation level, where it includes whether the producer company maintains a current account, registers on a trading platform, and has access to institutional credit. Usage is whether these channels are actually being used for marketing transactions: collecting sale proceeds digitally, paying members and suppliers electronically, bidding on platforms, and keeping digital records for borrowing. Quality relates to circumstances of usage: digital and financial literacy, trust, transparency of charges, grievance redress and equal access to services by gender and social groups.

The structure is not a sequential one, but rather a ‘not if’ kind of structure. Enabling infrastructure can be in place without use, as the experience of India demonstrates, or use can be in place without enabling infrastructure in place, such as where quality protections are inadequate. Each link is mediated by institutional support like equity grants, credit guarantees, handholding, or a cluster of support from NABARD, SFAC, and SERP and by capability barriers and policy responses, determining whether digital inclusion can lead to improved price realisation, reduced transaction costs, and increased access to working capital.

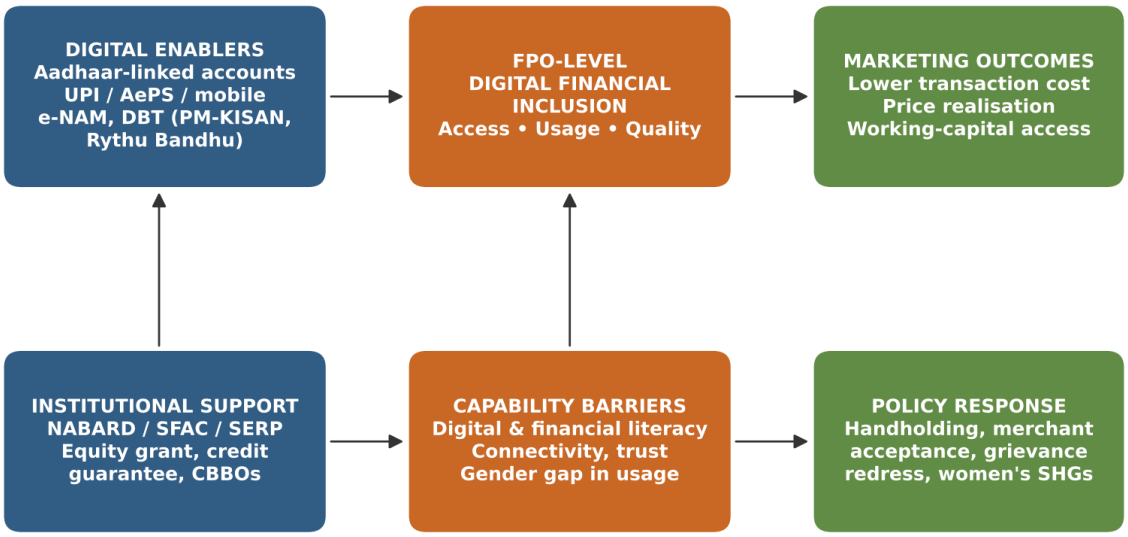


Figure 1. Digital financial inclusion in producer organisation marketing – conceptual framework.
Source: Author's framework, adapted from Beck et al. (2009) and Reserve Bank of India (2022).

4. Objectives and Methodology

The study has four objectives. The first is to create a picture of the institutional realities of the crop producer organisations in Telangana. The second is to document the national and state-level digital financial infrastructure available to them. The third is to assess, using the access, usage, and quality framework, how far producer organisations are positioned to use digital finance in marketing. The fourth is to identify barriers and propose policy measures.

The research design is descriptive and analytical, and it is desk-based. It was sourced from five categories: Parliamentary replies of the Ministry of Agriculture and Farmers Welfare on FPOs and e-NAM, Press Information Bureau releases, regulator and payment-system data from the Reserve Bank of India and the National Payments Corporation of India (NPCI), World Bank's Global Findex 2021 database, and published academic and technical studies like performance evaluation of Telangana FPOs. All figures are presented as published and the reference year is indicated if relevant. Analysis is limited to mid-2022; a few statements from late 2022 are mentioned, when appropriate.

There are definite constraints in a "desk-based" design. It does not provide primary data on individual producer organisations' behaviour, and the national indicators in the digital payments field refer to adults broadly. The paper thus reads the evidence as indicative and makes their conclusions as propositions, not as measured effects to be tested in the field. Quoted percentages are derived from the figures cited by the sources; the author calculated the derived percentages and indicated them in the tables.

5. Crop Producer Organisations in Telangana

There are three main streams in the construction of the producer organisation landscape in Telangana.NABARD has promoted producer companies through its PRODUCE fund and other promotional support, SFAC has promoted farmer producer companies and administers the equity grant

and credit guarantee schemes, and SERP has promoted farmer producer groups anchored in women's self-help groups. NABARD data cited in a performance study of Medak district recorded 273 farmer producer companies in Telangana in 2018-19, of which 72 had been formed under the PRODUCE fund (Amitha et al., n.d.). Since 2020, additional organisations have been registered under the 10,000 FPO scheme through implementing agencies and cluster-based business organisations.

Table 1 summarises the institutional indicators available for Telangana. The 142 organisations registered under the central scheme, as reported to Parliament in December 2022, are drawn from across the state, but the distribution is uneven (Table 2). Siddipet, Karimnagar and Medak together account for 37 of the 142, or about 26 per cent, and the six leading districts account for 61, about 43 per cent. Organisations in these districts are likelier to benefit from cluster effects such as shared agencies, nearby mandis and denser banking networks, while districts with one or two organisations may lack comparable support.

Table 1. Institutional indicators of producer organisations in Telangana

Indicator	Value	Reference period
Farmer producer companies in Telangana (NABARD)	273	2018-19
FPOs registered under the 10,000 FPO scheme in Telangana	142	As reported in December 2022
Of which registered through NABARD as implementing agency	20	As reported December 2022
FPCs with equity grant sanctioned	9 (total ₹45.88 lakh)	2014-15 to 2021-22
FPCs with credit-guarantee cover sanctioned	12 (total ₹273.10 lakh)	2014-15 to 2021-22
Credit-guarantee cover by lender	9 via NABKISAN Finance; 3 via State Bank of India	2014-15 to 2021-22

Source: Amitha et al. (n.d.); Lok Sabha (2022). Totals as published; lakh amounts rounded by the author.

Table 2. District-wise distribution of FPOs registered under the 10,000 FPO scheme in Telangana (leading districts)

District	FPOs registered	Share of 142 (%)
Siddipet	14	9.9
Karimnagar	12	8.5
Medak	11	7.7
Nizamabad	10	7.0
Mahbubnagar	7	4.9

District	FPOs registered	Share of 142 (%)
Vikarabad	7	4.9
All other districts (26 listed)	81	57.0
Total	142	100.0

Source: Lok Sabha (2022), Annexure I; shares calculated by the author.

There are two observations to make about Table 1. The number of producer companies with equity grants and credit-guarantee cover over eight years to 2021-22 are relatively low (nine and 12 respectively) as compared to 273 in 2018-19. While the periods and definitions are not directly comparable, they suggest that only a small number of producer companies have these provisions in place. The sums are also modest: total credit-guarantee cover of ₹273.10 lakh and total equity grants of ₹45.88 lakh imply averages of roughly ₹22.8 lakh and ₹5.1 lakh per recipient organisation. Second, credit-guarantee lending is concentrated in two channels, NABKISAN Finance and the State Bank of India, which suggests that commercial bank branches are not yet routine lenders to producer companies.

Performance evidence points the same way. A 2021 evaluation of four Telangana producer companies graded Kollapur Farmer Producer Company in the highest category, Panugal and Thimmaipally Thanda in the middle category, and Wanaparthy Girijana Fruit Producer Company in a lower one, while finding members' socio-economic status significantly better than that of non-members ("A study on performance of Farmer Producer Organisations (FPOs) in Telangana state", 2021). Performance is thus differentiated, and benefits to members appear real where organisations function well. Mango marketing illustrates the potential. The state government reported in April 2021 that 25 FPOs in 21 districts, each with 800 to 1,200 members, were procuring mangoes, and that 12 of them had already reached a turnover of ₹7 crore against a target of ₹20 crore for 2021-22 (Telangana Today, 2021). Sales of this kind, across city markets and with large numbers of members, depend heavily on reliable, traceable payment systems.

6. Digital Financial Infrastructure Available to Producer Organisations

6.1 National indicators of digital payments

India's digital payment ecosystem has deepened rapidly. The Global Findex 2021 reports that the share of Indian adults who made or received digital payments rose from 22 per cent in 2014 to 35 per cent in 2021, while the corresponding share in developing economies rose from 35 to 57 per cent (Adda247, 2022; Demirgüç-Kunt et al., 2022; Dvara Research, 2022). Figure 2 compares the two. The same survey identifies the weak points that matter for producer organisations. About one-third of Indian account owners had an inactive account in the past year, a share broadly unchanged between 2017 and 2021, and 85 per cent of account owners, some 670 million adults, made merchant payments only in cash. India and Sri Lanka showed no gender gap in account ownership but a gap of 17 and 18 percentage points respectively in the use of digital payments (Demirgüç-Kunt et al., 2022; Strive Community, 2022).

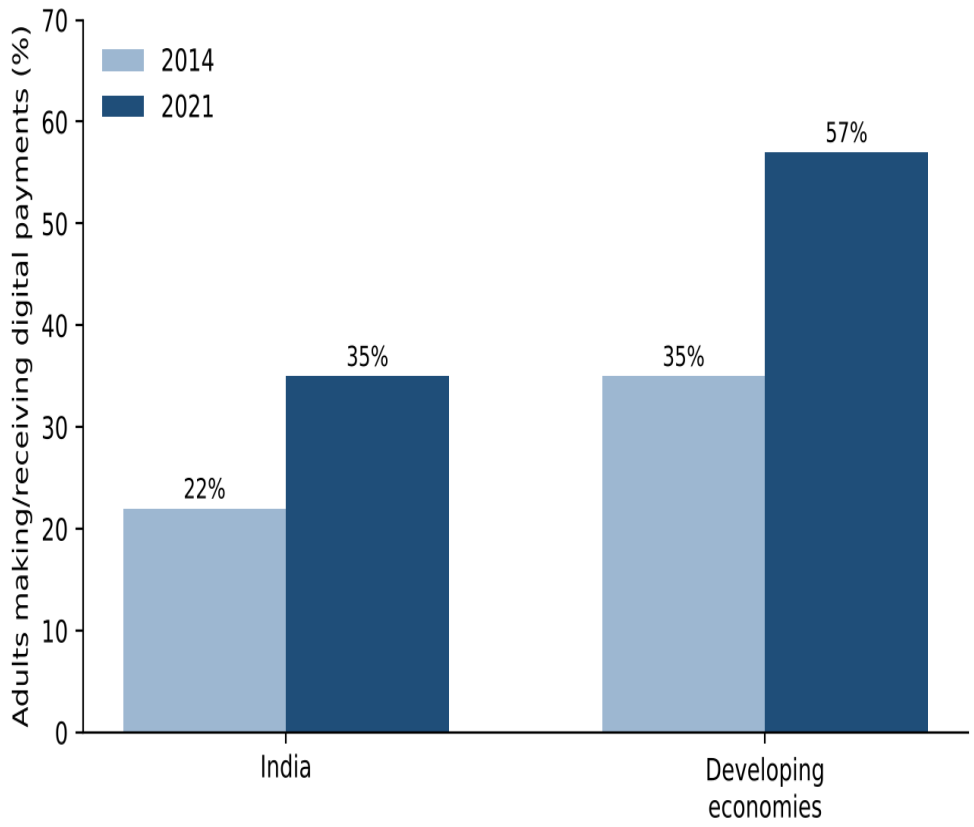


Figure 2. Adults making or receiving digital payments, India and developing economies, 2014 and 2021

Source: Demirgüç-Kunt et al. (2022); Dvara Research (2022); Adda247 (2022).

Table 3. Selected Global Findex 2021 indicators relevant to digital financial inclusion

Indicator	India	Developing economies
Adults making or receiving digital payments, 2014 (%)	22	35
Adults making or receiving digital payments, 2021 (%)	35	57
Account owners with an inactive account, 2021	About one-third	Not reported here
Account owners making only cash merchant payments, 2021	85% (about 670 million)	Two-thirds (excluding China)
Gender gap in digital payment use, 2021 (percentage points)	17	Not reported here

Indicator	India	Developing economies
Indian adults making a first digital merchant payment during the pandemic	More than 80 million	-

Source: Demirgüç-Kunt et al. (2022), as reported by Dvara Research (2022), Strive Community (2022), and Adda247 (2022).

6.2 Payment rails: UPI and the transfer system

UPI has been the principal rail of the digital shift. It recorded 38.74 billion transactions worth ₹71.59 lakh crore in calendar year 2021, about double the 18.88 billion transactions worth ₹33.88 lakh crore of 2020, and well over three times the 10.79 billion transactions and ₹18.37 lakh crore of 2019 (YourStory, 2022). In the financial year 2021-22 it exceeded ₹83 lakh crore in value (India TV News, 2022). Table 4 and Figure 3 present these figures. For producer organisations, the importance of UPI lies less in the headline numbers than in what they permit: instant, low-cost and traceable collection from buyers and payment to members, with a digital record that can later support a credit application.

Table 4. Growth of UPI transactions, calendar years 2019 to 2021

Year	Volume (billion)	Value (₹ lakh crore)	Annual growth in volume (%)
2019	10.79	18.37	-
2020	18.88	33.88	75.0
2021	38.74	71.59	105.2

Source: YourStory (2022); growth in volume for 2020 calculated by the author, 2021 as reported.

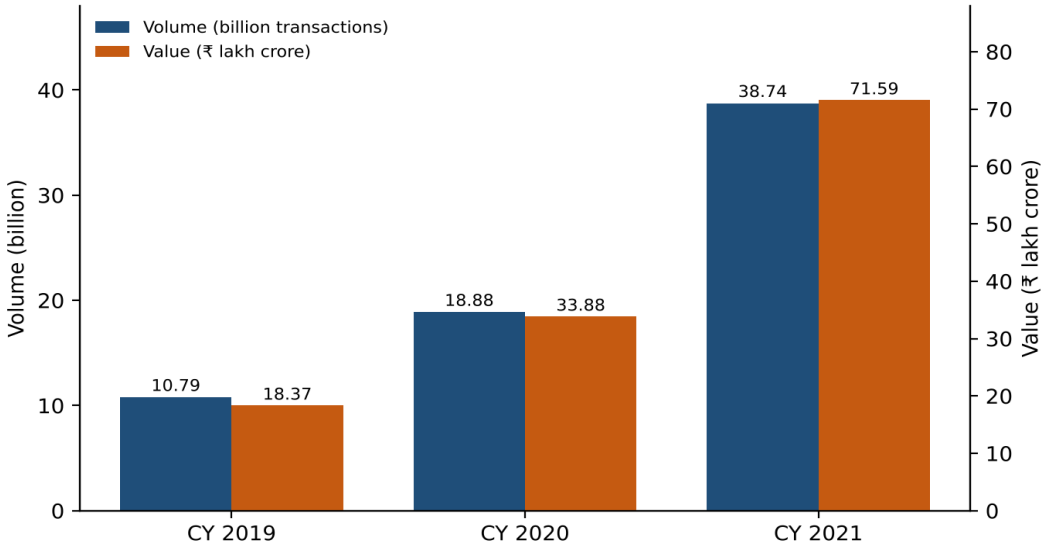


Figure 3. UPI transaction volume and value, 2019 to 2021

Source: YourStory (2022).

The second pillar of DBT is Direct Benefit Transfer, which is based on UPI. In Telangana, Rythu Bandhu has turned the experience of transferring money via bank accounts into a common occurrence for farmers, and the cumulative disbursement by late 2021 was over ₹43,000 crore (The Indian Express, 2021). However, DBT systems have revealed some issues with digital delivery as well. According to a study conducted by LibTech India, published in January 2022, approximately 4.7 lakh farmers from the state of Telangana had not received any benefits from PM-KISAN, due to issues related to bank rejection, payment suspension by the state, and Aadhaar verification failures (Das, 2022). Electronic rails are efficient when an identity, account, and land record are congruent; when they are not, it is a system exclusion.

6.3 Overall inclusion trend

It shows that the Financial Inclusion Index (composite) of the RBI has increased from 43.4 in March 2017 to 53.9 in March 2021 and further to 56.4 in March 2022, with an improvement in all sub-indices (Financial Inclusion Index, 2022). Although the direction is positive, there is still a long way to go as the score is 56.4 which still falls short of 100, which is the maximum score, the index is at national level and not at the level of producer organisations or Telangana.

7. Digital Marketing Platforms and Producer Organisations

e-NAM is a government initiative to create a central public platform for electronic agricultural trading.By May 2020, 1,000 mandis in 18 states and three union territories had been integrated, with 1.66 crore registered farmers and 1,005 registered FPOs (Ministry of Agriculture and Farmers Welfare, 2020). In March 2021, the Lok Sabha was told that more than 1.69 crore farmers had registered and trade worth ₹1.25 lakh crore had been recorded (Lok Sabha, 2021). By 19 July 2022, 1.76 crore farmers and traders were registered, and trade worth ₹1.9 lakh crore had been transacted, with about 5.7 crore metric tonnes traded (Press Information Bureau, 2022). Table 5 and Figure 4 show the trend.

Table 5. e-NAM progress indicators, 2020 to 2022

Date	Registered users (crore)	Cumulative trade value (₹ lakh crore)	Remark
May 2020	1.66 (farmers)	-	1,000 mandis; 1,005 FPOs registered
March 2021	1.69 (farmers)	1.25	Budget 2021-22 announced 1,000 more mandis
19 July 2022	1.76 (farmers and traders)	1.90	About 5.7 crore MT traded

Source: Ministry of Agriculture and Farmers Welfare (2020); Lok Sabha (2021); Press Information Bureau (2022). The July 2022 figure includes traders.



Figure 4. e-NAM registered users and cumulative trade value, 2020 to 2022

Source: Ministry of Agriculture and Farmers Welfare (2020); Lok Sabha (2021); Press Information Bureau (2022). Includes traders.

Two points follow for producer organisations. First, platform trading is attractive for FPOs because aggregation of lots gives them a stronger basis for grading, price discovery and electronic payment directly into the account of the organisation. Early national figures nonetheless show how modest FPO trading was: by May 2020, the 1,005 FPOs registered on the platform had traded 2,900 tonnes of produce worth ₹7.92 crore (Eastern Mirror, 2020). Second, registration is not usage. National registration grew by about 6 per cent from May 2020 to July 2022, while cumulative trade value rose by roughly 52 per cent between March 2021 and July 2022, suggesting that existing users were trading more while the addition of new registered participants had slowed. The platform's benefits for Telangana producer organisations will depend on their ability to move from account and registration to routine digital transactions.

8. Analysis: Access, Usage and Quality

When brought into the framework, an overall pattern emerges from the evidence. Access and usage have increased at a greater rate than quality. The assessment for each dimension is provided in Table 6, along with the relevant evidence, the implications for the Telangana producer organisations, and the level of confidence in the understanding.

Table 6. Assessment of digital financial inclusion for producer organisations by dimension

Dimension	Evidence	Implication for Telangana producer organisations	Strength of evidence
Access	UPI volume rose from 10.79 to 38.74 billion (2019-2021); Rythu Bandhu and PM-KISAN transfers reach bank accounts; e-NAM 1.76 crore users by July 2022	Infrastructure to receive and make digital payments is largely available to organisations and members	Strong (national and state data)
Usage	One-third of accounts inactive; 85% of account owners make cash-only merchant payments; FPO trade on e-NAM small in 2020	Accounts exist but marketing transactions may continue in cash, limiting digital records that support credit	Moderate (national indicators, not FPO-specific)
Quality	17-point gender gap in digital payments; 4.7 lakh Telangana farmers missed PM-KISAN transfers; FI-Index 56.4	Literacy, grievance redress and gender equity remain binding constraints; exclusion can arise from verification failures	Moderate to weak (indirect inference)

Source: Author's analysis of sources cited in Sections 5 to 7.

Access: There is the clearest and most positive evidence on access. This is because farmers in Telangana have already been a part of the account-based transfer system, UPI is ubiquitous across the country, and e-NAM is a trading layer. It is a simple action to open an account and register on a producer organisation's platform. The second question, the more challenging one, is about credit. As of 2021-22, only 12 producer companies had credit-guarantee cover, with lending limited to two companies (Lok Sabha, 2022). Consequently, access to payment services seems to be progressing further than access to institutional credit.

Usage: The Findex evidence that most Indian account owners still pay merchants in cash is the key caution on usage (Demirgüç-Kunt et al., 2022). For a producer organisation, the analogy is buyers, local traders and mandi intermediaries might like cash, the electronic settlement may get delayed, or perhaps informal credit terms might be agreed, leaving electronic channels open but being used little. Where mango and other perishable crops are sold in distant city markets, as in Telangana's FPO mango marketing, digital settlement is more important and more likely, because trust and traceability across distance are harder to maintain in cash (Telangana Today, 2021). Usage also determines the financial record that lenders need:

an organisation that conducts sales and member payments in cash has little verifiable transaction history to present to a bank.

Quality: Quality is the least evidenced and most consequential dimension. The gender gap in digital payments, 17 percentage points in India, matters because women are central to many Telangana producer groups, including those promoted through self-help groups (Demirgüç-Kunt et al., 2022). As per studies on verification and rejection problems in DBT, technology can exclude when records do not match (Das, 2022). The quality assessment is inferential since digital literacy and charges and dispute resolution are not included in the national data at the organisation level. This plays out in the manner of the warning issued by Gabor and Brooks (2017) about the potential for unequal risk exposure if protection is scarce, when fintech inclusion is concerned.

9. Challenges

The evidence indicates a set of recurring challenges, as summarised in Table 7. They are institutional and behavioral rather than technological, so cannot be solved by investment in infrastructure.

Table 7. Principal challenges to digital financial inclusion in producer organisation marketing

Challenge	Supporting evidence	Consequence for marketing
Inactive or little-used accounts	About one-third of account owners had an inactive account (2021)	Digital channels exist, but transactions revert to cash
Cash-dominated merchant payments	85% of account owners paid merchants only in cash	Buyers do not settle digitally; weak transaction records
Gender gap in usage	17-point gap in digital payment use	Women members and women-led groups under-served
Thin institutional credit	12 FPCs with credit guarantee; 9 with equity grants (2014-22)	Limited working capital for procurement and storage
Verification and data mismatches	4.7 lakh Telangana farmers missed PM-KISAN benefits	Members excluded by identity or land-record errors
Low platform trading by FPOs	1,005 FPOs traded ₹7.92 crore on e-NAM by May 2020	Marketing gains from platform access not realised

Source: Author's compilation from Demirgüç-Kunt et al. (2022); Lok Sabha (2022); Das (2022); Eastern Mirror (2020).

The challenges interact. Early sale to the same traders is due to the fact that local traders make cash purchases, limiting the digital record of a producer organisation, limiting their credit eligibility, limiting working capital, and so on. The solution is not just on the FPO side, but also on the transaction side.

10. Policy Recommendations

The results of the analysis lead us to four sets of measures. The first, and most crucial, is that capacity should be developed in tandem with infrastructure. The handholding by cluster-based business organisations for FPOs in UPI collection, account reconciliation, e-NAM bidding, and basic digital bookkeeping should be built into the cluster-based handholding for 5 years, which is already being done, for FPOs to enable them to develop digital and financial skills. The best approach to training is to link it to the organization's own transactions and not provide training as modules. Secondly, the digitisation of the merchant side should be promoted. As the number of farmers joining producer organisations has increased at a higher rate than the number of farmers accepting the producer organisation's offer on the buyer side, digital settlement should be made an imperative when farmers make a procurement decision, and mandi and market authorities should give favorable treatment to digital settlement in terms of reduced fees or priority. Producer companies have this advantage over individual farmers owing to the aggregation of the volume they offer. Thirdly, credit linkage must be based on digital transaction records. The credit guarantee facility can be extended to a larger number of organisations by developing appraisal templates by banks/NBARD for FPOs, based on the verified history of UPI and e-NAM receipts as a basis for working-capital loans. There's a direct motivation to digitise – linking transaction history to credit. Fourth, plan to address inequities and to address grievances. Special attention should be paid to producer groups led by women and those anchored by SHGs, including women as authorised signatories and users of digital accounts of the organisation. Aadhaar, mismatches in bank accounts, and mismatches in land records should be addressed by the district-level helpdesk, which could be managed by SERP or the lead bank, in order to clear the glitches that hinder transfers. Progress on quality indicators like the percentage of members who have active accounts and the percentage of sales that are completed electronically should be reported at the FPO level, where they can be seen by promoters and regulators.

11. Future research directions and limitations

The study's limitations are inherent to the study design. It is based on secondary evidence, of which many items are not specific to producer organisations in Telangana, and figures are published at different dates, limiting direct comparison between the tables. Access, usage, and quality assessment is therefore a reading of indicative evidence, rather than a measurement. Future research should focus on primary data from a sample of Telangana producer organisations on digitisation of their sales and member payments, e-NAM participation, credit history, and experience of women members, and compare across different agencies and districts based on crops. The causal claims that this paper can only suggest would be reinforced by panel evidence on the relationship between digital transaction intensity and price realisation and credit access.

12. Conclusion

Crop producer organisations are integrating digital financial inclusion into their marketing system in Telangana. There has been rapid improvement in the enabling environment: UPI volume has increased more than 3 times from 2019 to 2021, direct benefit transfer accounts for millions of farmers in the state, e-NAM has now recorded 1.76 crore users mid-2022, and the Financial Inclusion Index (FI) of the Reserve Bank has gone up consistently. However, evidence also exists that account-level inclusion has outpaced inclusion in usage and quality. A large number of accounts are not active; still, merchants go for cash

payments, women have less usage of digital payments, and only a few Telangana producer companies got credit guarantee support till 2021-22. The key takeaway is that the next step in policy should be "how to use the channels opened. A practical agenda is the capacity to include capacity building within FPO handholding, to use digital transaction records for credit appraisal, and to adopt an equity-based approach to grievance redress. For producer organisations, the chance to trade access as a regular digital settlement offers them additional benefits beyond the fact that transaction costs are reduced, and it also provides them with the certainty of records that can release working capital, the resource that is most often in short supply. It is an empirical question whether this is actually the case in practice, and the most obvious next step would be the natural next step in the primary studies proposed here.

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