

RESEARCH ARTICLE

Implications of Cashless Transactions in Tamil Nadu Agriculture

A.Vidhyavathi¹, S.Padma Rani¹, Balaji Parasuraman² and R.Sangeetha¹

¹Department of Agricultural Economics, Tamil Nadu Agricultural University, Coimbatore 641 003, Tamil Nadu, India

²Department of Agricultural and Rural Management, Tamil Nadu Agricultural University, Coimbatore 641 003, Tamil Nadu, India

ABSTRACT

This study examines the adoption of cashless transactions among agricultural stakeholders in Tamil Nadu. It evaluates its welfare implications in terms of time saving, labour efficiency, risk reduction, and cost benefits. The research focuses on three districts—Coimbatore (highly developed), Madurai (medium developed), and Ariyalur (low developed)—selected based on a Development Index constructed from secondary data on agriculture, health, infrastructure, and telecommunication. Primary data were collected from 570 respondents, including farmers, landless agricultural labourers, input dealers, and traders, using structured interview schedules. A two-stage stratified random sampling method was employed for sample selection. The Logit Model was applied to identify socio-economic factors influencing the adoption of cashless transactions, with variables such as access to technology, digital literacy, social participation, and infrastructure proving significant. An Adoption Index was also constructed to assess the level of digital transaction usage. The findings reveal that knowledge of electronic gadgets, smartphone ownership, and internet access are key drivers of adoption, while social participation and internet expenditure have supportive roles. Welfare analysis indicates that all stakeholders benefit from adopting cashless transactions, though the extent varies, with input dealers and traders gaining the most due to higher transaction volumes. Farmers and labourers experience moderate benefits, constrained by limited access and awareness. The study underscores the need for targeted interventions to enhance digital infrastructure, promote financial literacy, and ensure equitable access, particularly for smaller stakeholders, to achieve inclusive rural development through cashless systems.

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INTRODUCTION

The government has been promoting cashless transactions by enhancing physical and digital infrastructure, financial inclusion, and literacy programmes. However, the structural transformation of the agrarian economy depends on the accessibility

and adequacy of infrastructure, the level of adoption among stakeholders, and the resolution of challenges faced by farmers and agribusiness participants.

Studies highlight that cash remains the dominant mode of transaction in rural India.

*Corresponding author mail: senthilvidhya_cbe@yahoo.co.in



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Singhraul and Garwal (2018) reported that 98% of transactions were in cash, with only 26% internet access and 200 million digital payment users. The World Bank's Global Findex showed low familiarity with digital banking tools among Indians. Pooja and Sharma (2018) identified key barriers such as a lack of infrastructure, awareness, training, and resistance to change. Similarly, Seema (2017) found limited adoption of digital payments in rural Haryana, with non-cash methods like UPI still in early stages.

Podile and Rajesh (2017) reported negative perceptions, such as security concerns, poor connectivity, and high transaction costs, as hurdles. Santkumar *et al.*, (2018) observed that, despite bank account access, functional literacy, and infrastructure remaining insufficient. Nayak *et al.*, (2017) recommended government interventions to improve rural infrastructure and conduct awareness drives. Sheetal and Krishnamurthi (2017) noted that while debit and credit card POS transactions were preferred, they faced challenges such as digital illiteracy and erratic power supply.

Based on these findings, the study identifies key research gaps, including access to and adequacy of infrastructure, adoption levels across agricultural activities, influencing factors

such as institutional support and stakeholders' knowledge, challenges in transitioning to cashless systems, and welfare impacts in terms of time, labour, risk, and cost. Accordingly, the following objectives are formulated for the present study:

1. To identify the challenges faced in adopting cashless transactions.
2. To assess the welfare implications of cashless transactions in terms of time, labour, risk, and cost for different stakeholders.

MATERIALS AND METHODS

The present study employed both secondary and primary data sources to analyse the adoption of cashless transactions among agricultural stakeholders in Tamil Nadu. Secondary data for the years 2019-20, 2020-21, and 2021-22 were collected from government reports and other reliable sources. These data cover indicators such as agriculture, health, infrastructure, and telecommunication, with special emphasis on e-infrastructure. These indicators were used to construct a Development Index for

all 32 districts, which helped classify them into high, medium, and low development categories. For primary data collection, a two-stage stratified random sampling technique was adopted. Three districts—Coimbatore, Madurai, and Ariyalur—were selected from each category, and one block from each district with the most significant agricultural area was chosen. A total of 570 respondents, including farmers, landless agricultural labourers, input dealers, and traders, were surveyed using structured interview schedules.

To identify the factors influencing the adoption of cashless transactions, a Logit Model was applied. This model examined how socio-economic variables such as age, education, social participation, asset ownership, farm size, proportion of farm income, knowledge of electronic gadgets, ownership of smartphones and apps, internet usage, and distance to financial institutions affected the likelihood of adopting cashless transactions. The significance of each factor was tested using probability values, and marginal effects were calculated to understand their influence. Additionally, an Adoption Index was constructed to measure the extent of adoption across stakeholders. Descriptive statistics, correlation analysis, and inferential tools were used to interpret the data. At the same time, welfare implications were assessed in terms of time savings, labour efficiency, risk reduction, and opportunity cost savings.

RESULT AND DISCUSSION

Logit Model: Factors Influencing the Adoption of Cashless Transactions

The adoption of cashless transactions is influenced by socio-economic factors. In the present study factors namely age of the farmers, education status, social participation, value of assets, farm size, proportion of farm income to total income, knowledge on operating electronic gadgets, having android mobile and using mobile apps, expenditure on availing internet connection/Wi Fi/mobile data and distance to bank/ATM are included to find out which variables are influencing significantly the adoption of cashless transaction.

The factors, namely knowledge of operating electronic gadgets, having a mobile phone, and using mobile apps, are highly influential at the one percent level. The variables, namely social participation and

expenditure on availing internet connectivity/Wi Fi / mobile data, are significant at a ten percent level, as shown in Table 1.

Implications of the Adoption of Cashless Transactions on the Stakeholders

The impact of adopting cashless transactions in

agriculture and non-agricultural activities results in time savings, labor savings, and a reduced risk of theft and robbery. The opportunity cost of these transactions was measured as the imputed value of each activity. The results are discussed for each district and for the state in the following tables.

Table 1. The Factors Influencing the Adoption of Cashless Transactions among Farm Households

Variables	Coefficient value	Marginal effects
Constant	2.3596*** (0.005)	
AGE	0.4269 ^{NS} (0.264)	0.2832
EDU	-0.0000 ^{NS} (1.103)	-7.60e ⁻⁰⁶
SOP	1.1086* (0.055)	0.2458
ASS	0.8758 ^{NS} (0.426)	0.0602
FSIZE	0.0258* (0.070)	0.0085
FINCOME	0.2543 ^{NS} (0.501)	0.0823
KOEG	1.6319*** (0.004)	-0.3641
MOBILE	1.3517*** (0.004)	-0.4363
EEXP	0.3302* (0.098)	0.1066
DIST	-6.87e ⁻⁰⁷ ^{NS} (0.239)	-5.40e ⁻⁰⁸
Log likelihood function	78.92	
Prob> chi ²	0.0006	
N	360	

(Figures in the parentheses indicate *P* value)

(*** indicates 1% level of significance and * indicates a 10% level of significance)

Table 2. Implications of cashless transactions in terms of time, labour, risk, and cost on different stakeholders in Coimbatore District

S.no	Stakeholders	Cashless transactions in agriculture			Cashless transactions in other than agricultural activities		
		Time saving (Hrs/Year)	Risk reduction (%)	Opportunity cost (Rs//Year)	Time saving (Hrs/Year)	Risk reduction (%)	Opportunity cost (Rs//Year)
1	Farmers	27-91	11	981-3087	48-121	17	1678-3546
2	Landless Agri Labourers	8-13	2	243-413	29-103	7	782-3256
3	Input Dealers	175-345	36	3342-5643	284-432	47	4478-9086
4	Traders	128-312	21	1922-3908	175-412	34	2549-6314

The results presented in Table 2 highlight the implications of adopting cashless transactions for different stakeholders in Coimbatore District, measured in terms of time saving, risk reduction, and opportunity cost, across both agricultural and non-agricultural activities. Farmers experience considerable benefits, saving between 27–91 hours annually in agricultural transactions, coupled with an 11 per cent reduction in risks and an opportunity cost saving of ₹981–3087. Their gains are even more substantial in non-agricultural activities, where time savings increase to 48–121 hours, risk reduction improves to 17 per cent, and opportunity cost savings rise to ₹1678–3546. This indicates that adopting cashless practices not only improves efficiency in farm-related dealings but also offers more substantial benefits in non-farm domains, where transaction frequency and values tend to be higher.

For landless agricultural labourers, the benefits, though smaller in scale, are still noteworthy. In agricultural transactions, they save 8–13 hours annually with a modest 2 per cent reduction in risks and ₹243–413 in cost savings. In non-agricultural activities, however, their benefits increase significantly, with 29–103 hours saved, a 7 per cent risk reduction, and opportunity cost savings of ₹782–3256. These figures suggest that digital transactions offer labourers more advantages in wage payments, remittances, and household purchases compared to agricultural work, where cash remains the dominant medium.

The impact of cashless adoption is most pronounced among commercial stakeholders such as input dealers and traders. Input dealers record significant benefits, saving 175–345 hours per year

in agricultural transactions, with a 36 per cent risk reduction and cost savings of ₹3342–5643. Their advantages are even greater in non-agricultural activities, with 284–432 hours saved, 47 per cent risk reduction, and opportunity cost savings ranging from ₹4478–9086. Similarly, traders enjoy significant benefits, saving 128–312 hours annually in agricultural activities, along with a 21 per cent risk reduction and savings of ₹1922–3908. In non-agriculture, these figures rise to 175–412 hours, a 34 per cent risk reduction, and savings of ₹2549–6314. These results reflect the heavy reliance of commercial agents on cashless systems for managing bulk and high-value transactions, where efficiency, transparency, and security become critical.

Overall, the findings clearly indicate that while all stakeholders, farmers, labourers, dealers, and traders, gain from adopting cashless transactions, the magnitude of benefits is closely linked to the nature of their activities and scale of operations. Farmers and labourers experience moderate but meaningful improvements, especially in non-agricultural contexts. At the same time, input dealers and traders derive the highest gains due to their frequent, large-scale, and high-risk transactions. This demonstrates that digital adoption acts as a strong enabler of efficiency, cost reduction, and risk management, particularly for stakeholders engaged in commercial and service-oriented activities.

The results in Table 3 highlight the implications of adopting cashless transactions for different stakeholders in Madurai District across agricultural and non-agricultural activities. Farmers recorded moderate benefits, saving 19–65 hours annually

Table 3. Implications of cashless transactions in terms of time, labour, risk, and cost on different stakeholders in Madurai District

S.no	Stakeholders	Cashless transactions in agriculture			Cashless transactions in other than agricultural activities		
		Time saving (Hrs/Year)	Risk reduction (%)	Opportunity cost (Rs//Year)	Time saving (Hrs/Year)	Risk reduction (%)	Opportunity cost (Rs//Year)
1	Farmers	19-65	7	879-2770	34-98	14	1437-3238
2	Landless Agri Labourers	5-9	1	210-382	19-86	4	612-2569
3	Input Dealers	148-317	21	3112-5341	254-419	36	4108-7639
4	Traders	115-273	17	1745-3764	154-373	27	2230-6100

in agricultural transactions, with a 7 per cent risk reduction and opportunity cost savings of ₹879–2770. These benefits increase in non-agricultural activities, where time savings rise to 34–98 hours, risk reduction doubles to 14 per cent, and opportunity cost savings range between ₹1437–3238. Landless agricultural labourers derived the least advantage, reflecting their limited transaction volume; they saved only 5–9 hours with 1 per cent risk reduction and ₹210–382 savings in agriculture, while in non-agriculture the benefits improved to 19–86 hours, 4 per cent risk reduction, and ₹612–2569 in cost savings.

In contrast, commercial stakeholders such as input dealers and traders benefited substantially. Input dealers saved 148–317 hours annually in agricultural activities, with a 21 per cent risk reduction and ₹3112–5341 savings. In non-agricultural contexts, these figures surged to 254–419 hours, a 36 per cent risk reduction, and ₹4108–7639 in cost savings. Traders also recorded significant advantages, saving 115–273 hours in agriculture with a 17 per cent risk reduction and ₹1745–3764 in savings. These savings increased in non-agricultural activities to 154–373 hours saved, a 27 per cent risk reduction, and ₹2230–6100 in opportunity cost savings.

Overall, the findings confirm that the scale of benefits from cashless adoption is directly linked to the nature of stakeholders' engagement. Farmers and labourers benefit moderately, mainly in terms of convenience and time savings. At the same time, input dealers and traders gain substantially due to their higher transaction volumes, frequency, and risk exposure.

Here are three visual comparisons for Madurai District (Table 39). Time Savings from the cashless adoption save more hours in non-agricultural activities for all stakeholders, especially input dealers and traders. Risk Reduction: Risk is reduced more in non-agricultural transactions, with input dealers (36%) and traders (27%) gaining the most. Opportunity Cost Savings: Commercial stakeholders (dealers and traders) record the highest monetary benefits, while farmers and labourers gain moderately.

Table 4 highlights the implications of adopting cashless transactions in terms of time saving, risk reduction, and opportunity cost for different stakeholders in Ariyalur District, across agricultural and non-agricultural activities. For farmers, cashless adoption leads to savings of 15–54 hours annually in agriculture, with a modest 3 per cent risk reduction and opportunity cost savings ranging from ₹764–2676. In non-agricultural activities, the benefits are higher, with 23–74 hours saved, 9 per cent risk reduction, and ₹1151–2960 in cost savings. Landless agricultural labourers gain relatively minor, with only 3–7 hours saved, 1 per cent risk reduction, and ₹178–373 in cost savings in agriculture. However, their benefits increase in non-agricultural contexts, where they save 12–65 hours annually, achieve a 3 per cent risk reduction, and gain ₹512–2238 in opportunity cost savings.

Commercial stakeholders in Ariyalur District demonstrate significantly greater benefits. Input dealers record significant advantages, saving 128–286 hours annually in agriculture, with 17 per cent risk reduction and ₹2920–5067 in opportunity cost savings. In non-agricultural activities, these values

Table 4. Implications of cashless transactions in terms of time, labour, risk, and cost on different stakeholders in Ariyalur District

S.no	Stakeholders	Cashless transactions in agriculture			Cashless transactions in other than agricultural activities		
		Time saving (Hrs/Year)	Risk reduction (%)	Opportunity cost (Rs//Year)	Time saving (Hrs/Year)	Risk reduction (%)	Opportunity cost (Rs//Year)
1	Farmers	15-54	3	764-2676	23-74	9	1151-2960
2	Landless Agrl Labourers	3-7	1	178-373	12-65	3	512-2238
3	Input Dealers	128-286	17	2920-5067	211-278	24	3916-6849
4	Traders	86-254	13	1537-3264	121-341	22	1970-5501

rise further to 211–278 hours saved, 24 per cent risk reduction, and ₹3916–6849 in cost savings. Traders also demonstrate notable benefits, with 86–254 hours saved in agriculture, 13 per cent risk reduction, and ₹1537–3264 in cost savings. In non-agricultural transactions, their gains expand further, with 121–341 hours saved, a 22 per cent risk reduction, and opportunity cost savings ranging from ₹1970 to ₹5501.

Overall, the findings from Ariyalur District suggest that while all stakeholders experience measurable advantages from cashless adoption, the magnitude varies widely. Farmers and agricultural labourers mainly benefit through moderate time and cost savings costs. In contrast, input dealers and traders reap the most significant benefits due to their higher transaction volumes, larger financial exposure, and greater dependence on digital systems.

The comparative analysis of cashless transactions across Coimbatore, Madurai, and Ariyalur districts clearly reveals significant variations in their implications for different stakeholders in terms of time saving, risk reduction, and opportunity cost. Among farmers, Coimbatore district stands out with the highest benefits, where cashless adoption in agriculture results in 27–91 hours of time savings annually, an 11 per cent reduction in risk, and opportunity cost savings ranging from ₹981–3087, while in non-agricultural activities, the gains are even higher at 48–121 hours saved, 17 per cent risk reduction, and ₹1678–3546 in savings. In contrast, Madurai farmers gain moderately with 19–65 hours and 7 per cent risk reduction in agriculture, while Ariyalur farmers experience the least benefit, with only 15 to 54 hours saved and a 3 per cent risk reduction. Landless agricultural labourers also show a similar trend, with Coimbatore providing relatively higher gains. They save 8–13 hours in agriculture with a 2 per cent risk reduction and ₹243–413 savings, compared to the much lower benefits in Madurai and Ariyalur. In non-agricultural activities, labourers in Coimbatore record substantial improvements with 29–103 hours saved, 7 per cent risk reduction, and ₹782–3256 in opportunity cost savings, whereas Madurai and Ariyalur show only moderate improvements.

For commercial stakeholders, the impact is much more pronounced. Input dealers in Coimbatore gain the maximum benefits with 175–345 hours saved,

a 36 per cent risk reduction, and ₹3342–5643 in agriculture. In non-agricultural activities, the advantages rise further to 284–432 hours saved, a 47 per cent risk reduction, and ₹4478–9086 in savings. Madurai ranks second in this regard, followed by Ariyalur with comparatively lower figures. Traders too follow the same pattern, with Coimbatore traders enjoying the highest benefits of 128–312 hours saved, 21 per cent risk reduction, and ₹1922–3908 in agriculture, and as much as 175–412 hours saved, 34 per cent risk reduction, and ₹2549–6314 in non-agriculture. Madurai traders gain moderately, while Ariyalur traders benefit the least. Overall, the analysis shows that Coimbatore district consistently records the highest advantages from cashless adoption for all stakeholders due to larger transaction volumes and higher financial exposure. Madurai occupies a middle position with moderate but notable benefits, while Ariyalur remains at the bottom with the lowest impact. Moreover, commercial stakeholders such as input dealers and traders gain far more from the adoption of cashless systems compared to farmers and labourers, reflecting their greater dependency on frequent, high-value financial transactions.

The comparative analysis of cashless transactions across Coimbatore, Madurai, and Ariyalur districts reveals apparent differences in their implications for farmers, labourers, and commercial stakeholders. Farmers in Coimbatore enjoy the highest advantages, with substantial time savings, moderate risk reduction, and notable opportunity cost savings, particularly in non-agricultural activities. In contrast, those in Madurai benefit moderately, while farmers in Ariyalur gain the least. A similar pattern is observed among landless agricultural labourers, where Coimbatore again shows better outcomes compared to the limited benefits seen in Madurai and Ariyalur. The impact is far more significant for commercial stakeholders, especially input dealers and traders, whose larger transaction volumes and higher exposure to financial risks make them the biggest beneficiaries of cashless adoption. Input dealers in Coimbatore record the highest gains, followed by Madurai and then Ariyalur. Traders reflect a similar trend, with the most pronounced benefits again seen in Coimbatore. Overall, the findings highlight a clear hierarchy: Coimbatore emerges as the district with the most significant positive impact from cashless adoption across all stakeholder groups, Madurai

occupies an intermediate position with moderate benefits, and Ariyalur lags with the least impact.

At the same time, while farmers and labourers derive convenience and modest savings, input dealers and traders experience disproportionately higher advantages, underscoring the strong link between the scale of operations and the effectiveness of digital financial systems. From a policy perspective, this indicates the need to strengthen digital literacy, improve mobile and internet connectivity, and provide affordable access to smartphones and digital infrastructure in districts like Ariyalur, while also tailoring financial awareness programs for small farmers and labourers so that the benefits of cashless transactions can be more equitably distributed across all sections of rural society.

The implications of cashless transactions, as presented in Table 5, clearly reveal differentiated impacts across stakeholder groups, with commercial stakeholders enjoying the most significant benefits. At the same time, farmers and labourers gain comparatively modest advantages. For farmers, the adoption of cashless transactions in agriculture translates into annual time savings of 20–70 hours, a 7 per cent reduction in risk, and opportunity cost savings ranging from ₹875 to ₹2844. These benefits expand considerably in non-agricultural domains such as household expenses, wage receipts, or local business dealings, where farmers save 35–98 hours, achieve a 13 per cent reduction in risk, and realize higher opportunity cost savings between ₹1422 and ₹3248. Landless agricultural labourers,

who are generally low-volume users of financial services, register only marginal gains from agricultural transactions, with savings of just 5–10 hours annually, a negligible 1 per cent risk reduction, and opportunity cost savings of ₹210–389. Their gains are relatively better in non-agricultural contexts, with time savings increasing to 20–85 hours, risk reduction improving to 5 per cent, and opportunity cost savings ranging between ₹635 and ₹2688, suggesting that non-farm engagements provide them with greater scope to benefit from digital payment systems. In contrast, input dealers and traders, as commercial stakeholders, are the greatest beneficiaries of cashless adoption due to the high frequency, large scale, and greater financial risk of their transactions. Input dealers save 150–315 hours annually in agricultural dealings, experience a significant 25 per cent risk reduction, and achieve opportunity cost savings of ₹3125–5350, while in non-agricultural activities, their advantages are amplified, with 250–410 hours saved, 36 per cent risk reduction, and cost savings of ₹4167–7858. Traders follow a similar trend, recording 110–280 hours saved in agriculture with 17 per cent risk reduction and ₹1735–3645 in savings, and even higher benefits in non-agricultural activities where they save 150–375 hours, reduce risks by 28 per cent, and gain ₹2250–5972 in opportunity cost savings. Taken together, the results underscore a clear pattern: while cashless adoption benefits all stakeholders to varying degrees, the intensity of benefits is strongly tied to the volume and scale of financial dealings. Farmers and labourers primarily experience convenience and modest savings, whereas input dealers and traders

Table 5. Implications of cashless transactions in terms of time, labour, risk, and cost on different stakeholders in Tamil Nadu

S.no	Stakeholders	Cashless transactions in agriculture			Cashless transactions in other than agricultural activities		
		Time saving (Hrs/Year)	Risk reduction (%)	Opportunity cost (Rs//Year)	Time saving (Hrs/Year)	Risk reduction (%)	Opportunity cost (Rs//Year)
1	Farmers	20-70	7.00	875 - 2844	35-98	13.00	1422 - 3248
2	Landless Agrl Labourers	5-10	1.00	210 - 389	20-85	5.00	635- 2688
3	Input Dealers	150-315	25.00	3125 - 5350	250-410	36.00	4167- 7858
4	Traders	110-280	17.00	1735 - 3645	150-375	28.00	2250 - 5972

realize disproportionately higher gains, making digital financial systems especially valuable for commercial intermediaries. This suggests that future policy measures should not only focus on strengthening digital infrastructure and literacy among small farmers and labourers to broaden their benefits. They should also ensure that the ecosystem of traders and dealers, who act as critical nodes in the rural economy, remains fully integrated into secure and efficient digital platforms.

The implications of cashless transactions, as shown in Table 5, highlight apparent differences in benefits across stakeholders and districts, underscoring how both the scale of financial dealings and the regional economic context shape adoption outcomes. For farmers, cashless adoption in agriculture yields moderate but meaningful gains, with time savings of 20–70 hours annually, 7 per cent risk reduction, and opportunity cost savings of ₹875–2844. These benefits are amplified in non-agricultural contexts such as wage receipts, input purchases, or household expenditures, where farmers save 35–98 hours, achieve a 13 per cent risk reduction, and realize cost savings of ₹1422–3248. This pattern is consistent with findings in Coimbatore, where relatively higher levels of education and digital literacy enabled farmers to leverage non-agricultural transactions

more effectively, compared to Madurai and Ariyalur, where gains were more modest. Landless agricultural labourers, by contrast, derive limited benefits from agricultural transactions, with only 5–10 hours saved, a minimal 1 per cent risk reduction, and opportunity cost savings of ₹210–389, though their gains increase in non-agricultural activities to 20–85 hours saved, 5 per cent risk reduction, and ₹635–2688 in cost savings. This finding resonates with the results in Madurai and Ariyalur, where labourers' limited access to digital tools constrained their benefits. However, non-farm engagements still offered relatively better opportunities. Commercial stakeholders, however, experience the most substantial advantages across all districts, reflecting their larger transaction volumes and higher exposure to financial risks. Input dealers save 150–315 hours annually in agricultural activities, with a 25 per cent risk reduction, and savings of ₹3125–5350. In non-agricultural activities, these benefits increase significantly to 250–410 hours saved, a 36 per cent risk reduction, and cost savings of ₹4167–7858. Traders follow a similar trajectory, saving 110–280 hours in agricultural dealings, reducing risks by 17 per cent, and achieving cost savings of ₹1735–3645, while in non-agricultural domains, their benefits increase further to 150–375 hours saved, 28 per cent risk reduction, and ₹2250–5972 in opportunity cost

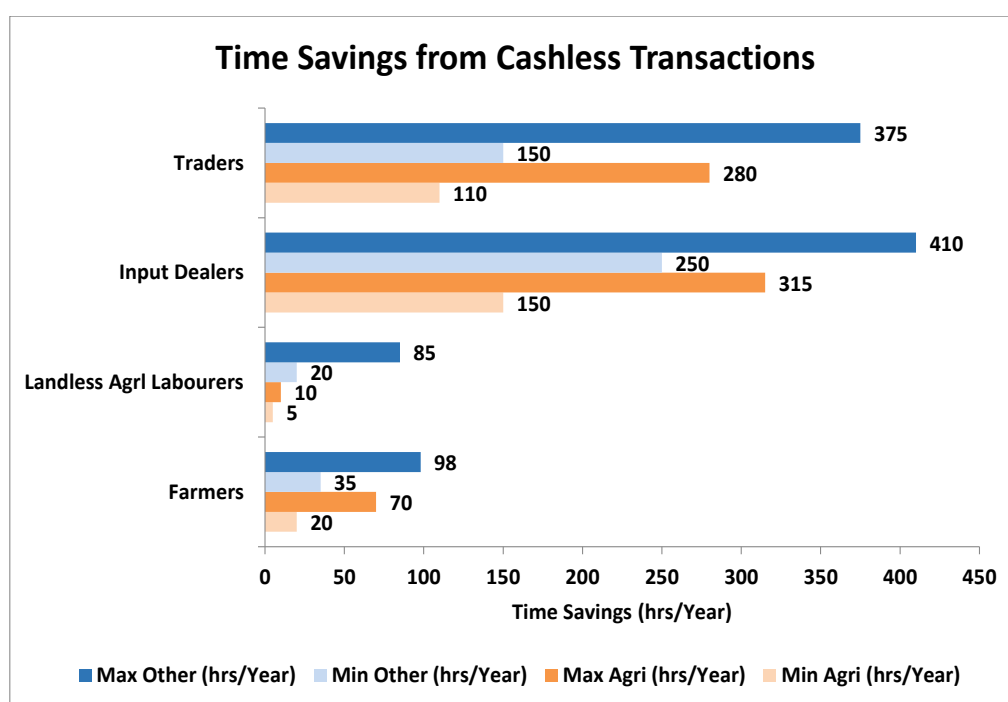


Figure 1. Time Savings from Cashless Transactions by Different Stakeholders in Tamil Nadu.

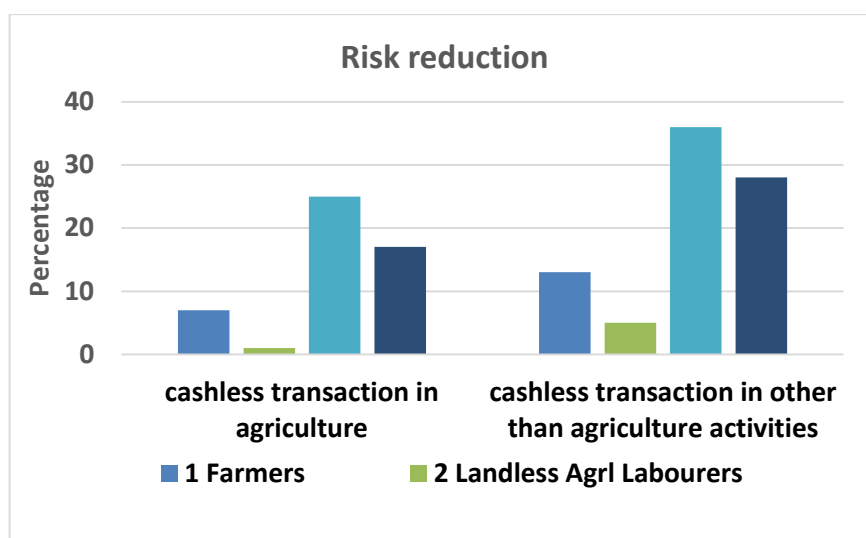


Figure 2. Time Savings from Cashless Transactions by Different Stakeholders in Tamil Nadu.

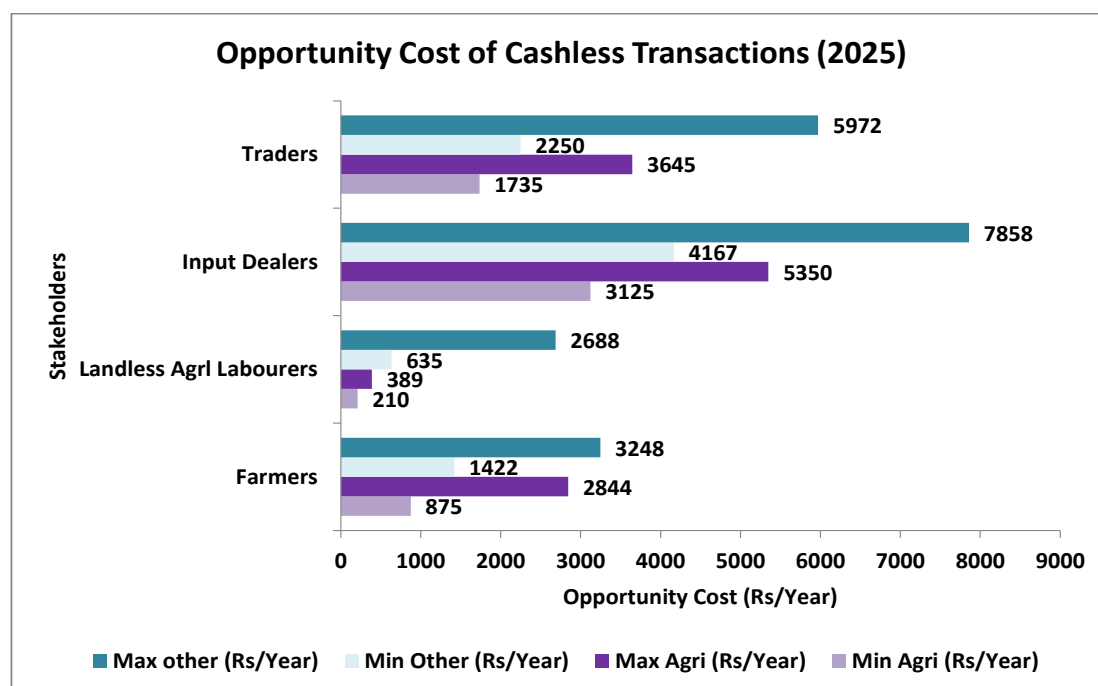


Figure 3. Opportunity Cost of Cashless Transactions by Different Stakeholders in Tamil Nadu

savings. When compared across districts, Coimbatore's traders and input dealers consistently reported higher adoption and greater savings due to stronger digital penetration. Madurai showed moderate levels, while Ariyalur lagged owing to infrastructural and awareness constraints. Overall, the evidence suggests that while farmers and labourers gain primarily in terms of convenience and modest cost savings, input dealers and traders are the greatest beneficiaries across all regions, making them critical drivers of the digital financial ecosystem in Tamil Nadu's agrarian economy. This spatially differentiated impact indicates that

policy interventions must simultaneously enhance digital access and literacy among small farmers and labourers. They must also ensure that traders and dealers, who serve as crucial intermediaries, remain fully integrated and supported within secure, efficient, and regionally tailored cashless transaction systems.

CONCLUSION & POLICY IMPLICATION

The study investigated the adoption of cashless transactions among various agricultural stakeholders

across three districts in Tamil Nadu—Coimbatore, Madurai, and Ariyalur—which represent regions with high, medium, and low levels of development, respectively. By employing a logit model, the research analysed the socio-economic factors that influence the adoption of digital payments. It was found that familiarity with electronic devices, ownership of smartphones with relevant applications, and access to internet connectivity were the most significant determinants driving adoption. Additionally, social participation and expenditures related to internet services also positively impacted usage.

The welfare effects of adopting cashless transactions were assessed in terms of time savings, labour efficiency, risk mitigation, and opportunity cost reductions. The results demonstrated that all stakeholder groups benefit from digital transactions, but the extent of these benefits varies widely. Farmers and landless agricultural labourers recorded moderate improvements in both agricultural and non-agricultural activities. In contrast, input dealers and traders experienced considerably larger benefits due to their higher transaction volumes and greater exposure to financial risks. Among the districts, Coimbatore consistently recorded the highest welfare gains, followed by Madurai and Ariyalur.

The findings highlight that the use of cashless transactions enhances transaction efficiency, reduces financial risks, and lowers associated costs, particularly in non-agricultural transactions. These benefits are most pronounced among commercial stakeholders who frequently handle larger and riskier transactions. The study further reveals that adoption is uneven across regions and stakeholder groups, with socio-economic factors such as technology access, digital literacy, and infrastructure playing crucial roles.

While farmers and labourers gain from increased convenience and cost reductions, they face structural constraints like limited internet availability, low awareness, and restricted access to digital devices. On the other hand, input dealers and traders benefit more significantly, underscoring how transaction scale and frequency amplify the positive effects of cashless systems.

Overall, the research confirms that cashless transactions offer transformative potential for rural financial activities and efficiency improvements. However, equitable access remains a significant challenge due to infrastructural gaps and

educational barriers. The study emphasizes the need for targeted interventions to address these challenges and ensure that smaller stakeholders are not left behind in the transition toward a digital economy.

To ensure inclusive and effective adoption of cashless transactions, it is essential to strengthen rural digital infrastructure, improve internet connectivity, and provide affordable access to smartphones. Digital literacy programs should be expanded to educate farmers and labourers on using electronic payment systems, while security measures and grievance redressal mechanisms must be introduced to build trust. Targeted subsidies and incentives can encourage the use of digital platforms, especially among smaller stakeholders. Collaborative efforts between government agencies, banks, and private organizations are necessary to tailor solutions based on regional needs, ensuring that the benefits of cashless transactions reach all sections of rural society.

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