

# Digital Payment Platforms and Financial Inclusion Among Small-Scale Tea Farmers in the Western Tea-Growing Counties of Kenya

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## ABSTRACT

In recent years, the financial technology (FinTech) sector has transformed the way financial services are delivered around the world, and digital payment platforms are one of the most promising ways to improve access to formal financial services. Yet, there is not a lot of evidence available on the effectiveness of these platforms in enhancing financial inclusion in rural agriculture. The study focused on the impact of digital payment platforms on the financial inclusion of small-scale tea farmers in five of the Western tea growing counties of Kenya: Kericho, Bomet, Nandi, Kisii and Nyamira. The study used a correlational research design based on the Financial inclusion Theory, Technology Acceptance Model, and Diffusion of Innovations Theory. Stratified random sampling was used to obtain a sample of 384 small-scale tea farmers from a population of 420,000 small-scale farmers, according to Krecjie and Morgan formula. Data were gathered through a structured questionnaire which was pre-tested for content validity and reliability (Cronbach  $\alpha \geq 0.70$ ). Data was analysed using descriptive statistics, Pearson correlation and multiple linear regression with SPSS package program version 29. The results showed that digital payment platforms had a statistically significant positive impact on financial inclusion ( $\beta = 0.811$ ,  $p < 0.001$ ). The control variables (smartphone ownership, years of farming experience and cooperative membership) all yielded  $p$  values  $> 0.005$  indicating their non-significant effect on financial inclusion. The regression model explained 66.7% of the variance for financial inclusion ( $R^2 = 0.667$ ,  $p < 0.001$ ). The study found that digital payment platforms have a significant effect on the financial inclusion of small scale tea growers by making payment easier, facilitating financial book-keeping and linking the farmers to formal financial systems. The study recommends need to enhance the digital payment infrastructure in rural areas, support the implementation of digital literacy programs and create digital payment platforms that meet the needs of farmers. These findings inform policy formulation, enhance responsible FinTech innovation and inclusive finance development in the underserved African agricultural communities in Kenya.

**Keywords:** Digital Payment Platforms, Financial inclusion, FinTech(financial technology), small-scale farmers, Western Kenya

## INTRODUCTION

Financial Technology (FinTech) is revolutionizing the world of finance, reshaping the way people and entities access, manage, and transfer financial assets around the globe. In many poor and developing economies, some of the most powerful forces in the financial sector that have been able to overcome traditional financial service access barriers include mobile money, peer to peer lending, blockchain and electronic wallets. For Del Sarto and Ozili (2025), the centrality of FinTech in financial inclusion is apparent as its scalable designs overcoming financial exclusion and supporting inclusive economic growth. Through their bibliometric analysis, key research trends in FinTech are identified and charted regarding mobile payments, digital lending, and financial

literacy interventions globally. The developed world, including the USA, the UK, and China, is leading the way in FinTech innovation and policy, but the emerging markets are also closing the access gap in finance, particularly for the vulnerable, by using FinTech. However, Del Sarto and Ozili warn that knowledge gaps in how FinTech can deliver financial equity and long-term stability, a reference to the need for context-specific solutions and ethical research.

Regionally, in the African context, FinTech adoption has gathered pace as a practical response to traditionally low levels of financial inclusion and infrastructural limitations. Ashenafi and Dong (2022) find that FinTech services, underpinned appropriately by institutional stability, anti-corruption, and good governance, can improve financial inclusion substantially. However, research across 39 African nations also discovers a paradox: even as FinTech enhances access to formal finance, it can simultaneously contribute to growing income inequality if services are not aligned with poor people's needs. Agriculture-oriented FinTech services, improved digital literacy, and availability of loans are also brought to light as crucial means of guaranteeing the best pro-poor potential of FinTech. Furthermore, MFIs in Sub-Saharan Africa have gravitated increasingly towards FinTech-based financial inclusion products to diversify their services and reduce risk-taking efforts (Banna et al., 2021). Their findings confirm that MFIs' adoption of FinTech improves outreach to small-scale borrowers, improves operating efficiency, and decreases information asymmetry, particularly when institutions employ digital scoring, e-wallets, and mobile saving platforms.

In a national capacity, Kenya has become the world leader in developing-world FinTech following its success with cell phone money systems such as M-Pesa, Airtel Money, and FinTech applications offering electronic credit and savings services. Aicha (2023) evidence supports that FinTech has also increased Kenya's financial inclusion on a broader scale, with significant trends in mobile savings, transaction services, and access to digital credit. Not all FinTech services, however, have had the same positive effects towards broadening the scales of financial inclusion. While transaction and savings platforms are associated with sustained growth in access to finance since 2011, FinTech credit services have been negatively or weakly correlated with inclusive finance, driving over-indebtedness and risk exposure issues. This is also supported by Kim's (2022) doctoral research, which claims that digital credit lenders in Kenya, particularly those from low-income and rural groups, are subjected to coercive borrowing, high interest rates, quick loan cycles, and data privacy abuse. The proliferation of unlicensed credit apps has led to sky-high default rates and anxiety over the consumer protection regime for Kenya's digital financial sector.

FinTech, or financial technology, revolutionized the world's financial scenario by introducing digital alternatives to traditional banking facilities. Arising in the aftermath of the 2007–2008 financial crisis, FinTech introduced technology-driven platforms that are convenient, affordable, and inclusive, especially to the underprivileged group of society (Chouhan et al., 2021; Li et al., 2021). In Kenya, FinTech innovation is most influential in mobile banking, electronic payment, other credit scoring systems, and online credit lending platforms. These are widely regarded as revolutionary tools for enhancing financial inclusion, including access to and use of formal financial services by all segments of society, even people with low incomes and the rural communities (Asif et al., 2023). While their potential is vast, their ability to tap into the marginalized sections, particularly small tea farmers in rural areas, is unrealized and undiscovered (Aleemi, Javaid & Hafeez, 2023).

Kenya's tea-producing western counties of Kericho, Bomet, Nandi, Kisii, and Nyamira form a crucial subgroup that lacks FinTech research analysis. The small tea farmers face geographic and infrastructural constraints, low levels of financial literacy, and limited access to formal credit facilities. These are also the same obstacles that make them extremely reliant on cash economies and traditional lending mechanisms. Digital payment platforms can, however, enable seamless passing on of payments like tea payouts, input procurement, and remittances.

Despite the increased reach of digital finance tools, recent evidence shows mixed effects. While FinTech services have enhanced the accessibility of financial services, over-indebtedness, abnormally high default rates, and exclusion in digital credit systems prevail (Aleemi, Javaid & Hafeez, 2023). Aicha (2023) demonstrated the positive relationship between FinTech and financial inclusion, particularly concerning savings and credit services, but suggested reporting biases of the data and the sub-optimal effectiveness of

credit-led FinTech services. Javaid and Hafeez (2023) highlighted the optimistic but non-monotonic role of FinTech on bank competition and financial inclusion and urged further evidence to be established on impact mechanisms. Similarly, Aron (2018) and Wieser et al. (2019) pointed toward FinTech adding to improved savings behavior and risk-sharing. However, they cautioned against productivity bursts because technology had not entirely replaced informal finance operations.

Digital payment platforms such as peer-to-peer (P2P) payments and mobile wallets are revolutionizing the way smallholder farmers manage money. In Rwanda (Kahonde et al., 2023) and Uganda (Turyatamba et al., 2024), they have experienced a dramatic shift from cash to digital payments, thereby increasing the security and transparency of payments (Hamed et al., 2023). It also helps the farmers to build credit history, improving their access to formal loans (Christopher & Turyasingura, 2024). But digital illiteracy and infrastructure gaps, especially in rural areas, constrain more widespread adoption (Ajambo et al., 2022). While such platforms can potentially significantly level the financial services playing field, technology trust, affordability, and infrastructure solutions will have to be established to unlock their full potential in Kenya's tea sector.

The exponential growth of FinTech innovations has occurred worldwide thus ensuring that improved financial inclusion everywhere. However, it is uncertain if this growth is making the financial inclusion of rural societies more efficient. In theory, the technologies offer low-cost, simple-to-use, and convenient financial services regardless of geography, income, or education level. Despite this, smallholder tea producers in Kenya's western tea production counties of Kericho, Bomet, Nandi, Kisii, and Nyamira continue to face severe barriers such as geographical remoteness, illiteracy in digital matters, inadequate transport facilities, and denial of access to reliable financial information. These barriers annihilate their capability to reap the maximum advantage of digital financial services. Past studies on the impact of FinTech in Kenya have focused on urban areas or averaged national-level statistics and offered minimal details on how agricultural societies in rural areas adopt and apply such technologies. Secondly, there has been a lack of empirical data on how different FinTech products influence financial inclusion among smallholder tea farmers. This represents a fundamental knowledge gap, especially in the context of increasing worries that particular FinTech products, like mobile credit, can augment over-indebtedness and financial vulnerability rather than creating inclusion. This research thus aimed to examine how FinTech innovations result in financial inclusion among small-scale tea farmers in Western tea-growing counties of Kenya and create localized evidence for policy-making and inclusive, responsible financial innovation.

## LITERATURE REVIEW AND THEORETICAL FRAMEWORK

### Digital Payment Platforms and Financial inclusion

Silva & Rasanjalee (2025) carried out a systematic review focusing on how digital banking can help improve financial access for farmers in developing countries. They identified barriers such as low level of digital literacy, poor infrastructure and regulatory issues using the PRISMA methodology. The study highlighted solutions like USSD-based banking for non-smartphone users and blockchain technologies. Emphasis was put on community-based solutions like digital banking cooperatives for empowering farmers in the rural areas. Citing M-Pesa in Kenya as a successful model, the authors demonstrated how digital payment platforms uplift rural economies and improve agricultural productivity, providing valuable insights for understanding digital financial inclusion among small-scale tea farmers in Western Kenya.

Mapanje, et al. (2023) conducted a study on FinTech's role in financing sustainable agriculture in 17 countries in Sub-Saharan Africa. Their scoping review classified digital financial products into four categories, credit, savings, insurance, and payment platforms, showcasing the ways each solve production or risk management issues. The authors highlighted that the improvement in efficiency and the expansion of sustainable practice adoption through FinTech, needs to be complemented by farmer-training on how to use digital platforms and policy actions to tackle urban-rural infrastructure barriers for scalability to take place. This review adds to the theoretical connections between digital payment platforms and financial inclusion, by conceptualizing FinTech as a support system that can foster economic sustainability and inclusive growth amongst the smallholder tea farmers in Western Kenya.

Opiyo et al. (2024) investigated FinTech's impact on financial inclusion among small-scale fish farmers in Homa Bay County, Kenya. They used multiple regression analysis in their correlational study based on Innovation Diffusion Theory and Technology Acceptance Model. The results indicated that agency banking ( $\beta=.231$ ), mobile money ( $\beta=.196$ ) and online banking ( $\beta=.410$ ) significantly improved financial inclusion, while government regulations reduced the impact of online banking. These results are transferable because the region's geographic location and population characteristics are comparable to those of western Kenya's tea farmers, who are also subject to similar limitations in access to infrastructural and literacy resources, and operate in rural areas.

Owuor (2021) compiled the empirical evidence regarding financial inclusion of the smallholder farmers in Africa, noting the mobile money systems in Kenya such as M-PESA and M-SHWARI. The study showed that propensity score matching was associated with an increase in household commercialization (37%), an increase in per-capita income (~US\$224), and an increase in input use (US\$42). However, challenges included, high fungibility of targeted funding, weak access to mobile phones among the poorest farmers, and infrastructure gaps between rural and urban areas. The findings put into perspective the experiences of smallholder tea growers in Western Kenya regarding financial inclusion, and highlight potential mediation of the effectiveness of digital payment systems in promoting financial inclusion in such contexts.

Turyatamba et al. (2024) presented insights regarding the factors propelling the uptake of digital payments among the smallholder tea farmers in Kanungu District of Uganda. They stated that to a considerable extent, the agricultural sector would still make crop payments mainly through direct, over-the-counter cash payments and that smallholders were not yet ready to adopt a cashless electronic financial system. They argued that less than or about 21% of Uganda's rural smallholder farmers were banked or registered with mobile money; therefore, the most vigorous justification was put forward for establishing whatever infrastructure and framework would keep cost and uncertainty at bay. According to the authors, the small-scale tea farmers of Kanungu District strongly preferred cash to be paid into their hands rather than into accounts of banks or any electronic payment for the past 57 years. They elaborated that from 1966 to 2017, all payments to smallholder crops were direct cash. However, by December 2021, some smallholder tea farmers had adopted digital payment, and direct cash payments had significantly declined from Ugx. 4,481,074,546bn to Ugx. 3,895,759/= while Ugx. 5,388,278,040bn was paid digitally. They reported that Ugx. 2,887,452,150bn was paid through commercial banks and Ugx. 2,500,825,890bn through mobile money. The authors clarified that electronic payments enhance efficiency, transparency, and accountability, provide a record trail for your financial credit evaluation, and lower business costs on all value chains. They employed a cross-sectional descriptive research design with a quantitative orientation. Descriptive and inferential statistics were employed to analyze data for research problems using SPSS version 26. The correlation coefficient (-0.768) indicated a strong and highly significant negative correlation between digital payments and gross domestic product since the corresponding probability value of 0.004 was less than 0.05. Before the digital payment ecosystem emerged, 86% of all payments were said to be cash payments; now, bank payments and the digital ecosystem encompass over 98%.

Ajambo et al. (2022) undertook to assess digitally enabled available innovative cross-value chain services in terms of how they handle inefficiencies, giving way for greater efficiency and inclusiveness, and thus forming future innovations for scaling. Research covered innovations in logistics and finance for value chains such as digital payments, credit, insurance, supply chain management, transport, traceability, e-platforms, and storage. Qualitative research techniques applied included collecting data through an inception workshop, key informant interviews of 39 enablers and service providers, 12 focus group discussions, individual interviews, and a validation workshop. The study revealed that an ag innovation can solve a good number of challenges and render benefits by connecting value chain actors to enabler services (such as, insurance firms, banks, government), enhanced market access and extension and advisory services, quality Agri-inputs, credit, Agri-insurance, and HVAC and warehousing services. Notwithstanding, there are barriers to inclusive adoption and scaling characterized by narrow awareness, low digital literacy, social norms, power relations, and limitations of technology design. In Uganda, ICT facilities are also unevenly distributed with huge rural-urban gaps, while limited access to power strengthens urban-rural disparities in internet and cellphone use. Despite these challenges, the exploration identified promising innovations for scaling, emphasizing the need to address low awareness and provide information to support farmers in investing in digital services.

Kahonde, Rickard, Seburikoko, and Kumar (2023) explore the integration of the United Nations Principles for Responsible Digital Payments into Rwanda's tea sector to improve efficiency and enhance farmers' living incomes. The research highlights the vital importance of tea sector in Rwanda's economic development, especially in the implementation of a number of Sustainable Development Goals (SDGs) such as poverty reduction (SDG 1), gender equality (SDG 5) and economic growth (SDG 8). Tea exports have seen a significant improvement in the revenue, rising from \$52 million in 2014 to \$90 million in 2020/21, of which around \$45 million is paid to farmers directly. The study also reveals that women form the majority of the workforce in Rwanda's agricultural sectors, including tea farming, but are underrepresented in the higher level managerial positions. This disproportion, which is exacerbated by the absence of gender disaggregated employment data, can make tracking gender equality efforts hard, especially in the context of digital financial inclusion. The research highlights the importance of responsible digital payments to address these challenges and facilitating the equitable distribution of financial inclusion benefits to enhance efficiency and farmers' income. There are however, a few shortcomings in the study. The study is centred around the opportunities of digital payments. It does not, however, go into much detail about the practical challenges faced by the implementation of digital payment systems, especially for women farmers who may have specific challenges, like limited access to mobile phones or digital literacy.

Hamed et al.'s (2023) study aimed to revamp the picture of digital payments among smallholder tea farmers in Kanungu District, Uganda. The particular objectives of the study were to investigate the impact of digital payments on financial penetration, assess the effect of inflation rates on Uganda's economic literacy, determine the influence of per capita income on Uganda's economic literacy, and evaluate the effect of foreign direct investment on Uganda's economic literacy. With a descriptive research design using a quantitative approach, the exploration proceeded. The average cash payment was 3,862,241,831 before digital payments like mobile money and banks, and later declined significantly to 3,895,754 after digital methods were implemented for cash payments. According to Hamed et al. (2023), the payment of smallholder farmers increased immensely from 2,379,988,876 to 2,500,825,890, which signified that a vast improvement and increase had been made in the profitability rate of the factory after the introduction of digital systems. There was a strong, negative relationship between digital payments and gross domestic product (-0.768) (Hamed et al., 2023). Understanding the factors influencing the acceptance of digital payment gives a reference base in identifying barriers preventing some societies from using digital financial services. Thus, specific measures were developed by policymakers and financial institutions to promote financial inclusion. Flexibility of the created models to suit agricultural stakeholders' needs and react to their limitations was crucial for the success of innovative instruments in rural areas.

## Theoretical Review

The theoretical review focuses on the financial inclusion theory and the technology acceptance model

### Financial inclusion Theory

Demirguc-Kunt and Klapper's (2012) theory of financial inclusion views the access to and utilization of formal financial services as essential for individuals and societies to be actively involved in economic life and increase their general welfare. This is based on the necessity to overcome barriers such as geographical location, high transaction costs, and low financial literacy to make financial services and products accessible to everyone in society (Demirguc-Kunt & Klapper, 2012). FinTech platforms can promote financial inclusion by reducing the expense of financial products to underserved segments and increasing their accessibility (Huang & Haque, 2020).

Financial inclusion Theory is based on empowering all, irrespective of their socioeconomic status, particularly ease of access and availability of formal financial services. Financial inclusion theory demands the elimination of geographical exclusions, the high price of transactions, and low financial literacy. FinTech products like digital payment platforms have been proven to be drivers of financial inclusion. Theoretical justification is provided by the theory explaining how FinTech innovations can address some of the needs of underprivileged populations in Western tea-growing counties of Kenya and promote comprehensive financial empowerment and economic development goals.

The applicability of Financial inclusion Theory in this research is that it demands the elimination of structural and systemic barriers to access to finance. Smallholder tea farmers in rural Kericho, Bomet, and Nandi might lack bank accounts, credit history records, and money management skills required in handling advanced financial systems. Although Financial inclusion Theory emphasises the necessity of access to equal financial services, it has been criticised for overemphasising access and account ownership, but paying inadequate attention to the problem of quality, affordability, and sustainability of services (Ashenafi & Dong, 2022). The theory presupposes that, once individuals receive accounts or access, they are presumed already to be financially included, ignoring the usage aspect, which, in many cases, is limited by unknown costs, bad digital literacy, and distrust in financial institutions. The other weakness is that it is more macro-level in orientation and thus generalises inclusion without considering the contextual differences like cultural practices, gender inequalities, and rural needs of the tea farmers, among others. As a result, the theory can be applied to conceptualise the idea of inclusion at the policy level. However, it cannot inform micro-level interventions that can be relevant to the lives of underserved communities.

### Technology Acceptance Model

The Technology Acceptance Model (TAM) of Davis (1989) hypothesizes that perceived usefulness and ease of use predict individuals' use of new technology. Perceived usefulness is the belief that a technology will simplify finance management and access to services, while perceived ease of use is the degree to which people find the technology easy to use (Davis, 1989). A study of the determinants will enlighten us concerning FinTech innovations' adoption behaviors by customers in Western tea-producing counties of Kenya (Alalwan et al., 2017).

The Technology Acceptance Model (TAM), developed by Davis (1989), will be employed within this research to capture psychological and behavioral determinants of consumers adopting and utilizing new financial technology. TAM believes that two fundamental beliefs, such as, perceived ease of use and usefulness, would lead an individual to adopt or reject a technology. This model is specifically revealed to work best in a rural environment where technology acceptance cannot be guaranteed even when access exists. To tea smallholder farmers in Western tea-growing counties in Kenya, understanding their awareness of the convenience, reliability, and ease of use of FinTech technologies is essential in determining the likelihood of their actual use. TAM allows the fulfillment of the study purpose to examine barriers to adoption and how to improve the use of FinTech platforms. However, TAM is not without its limitations, primarily its inattention to such outside factors as cost, regulatory environment, or infrastructure affecting adoption so much in low-income rural communities. Secondly, TAM will often assume a rational decision process, which may or may not accurately measure the extent to which trust, peer pressure, or cultural norms sway farmers' adoption patterns.

Technology Acceptance Model (TAM) is relevant in this research because it identifies the user behavior and cognitive beliefs as primary drivers of technology adoption. In rural areas where adequate learning and exposure to the virtual world might be nil, it is thus necessary to understand how users perceive the utility and convenience of financial technologies.

### Diffusion of Innovations Theory

The Diffusion of Innovations Theory, introduced by Everett Rogers in 1962, describes the diffusion of ideas, technology, and practice innovations in a social system over time. It assumes that the innovation's rate of adoption and success are a function of some determinants, such as perceived attributes of the innovation by potential adopters, communication media, time, and social system attributes (Yu, 2022). Platforms such as mobile banking applications, digital payment platforms, alternative credit scoring platforms, and online lending platforms are not so much innovations in terms of technology but rather in terms of concepts. FinTech technologies move entirely from the traditional cash-based or cooperative-based financial systems to Kenya's small-scale tea farmers in rural areas. Hence, the DOI theory is suitable for explaining their adoption behavior.

The DOI theory categorizes adopters into five groups based on their adoptive willingness: innovators, early adopters, early majority, late majority, and laggards (Yu, 2022). All of them possess varying behavioral characteristics. Innovators are early adopters and risk-takers; opinion leaders who are respected because they

diffuse the innovation are early adopters; the early and late majority are more cautious and slower-moving, respectively; whereas laggards are resistant through traditionalism or inaccessibility. Among rural tea farmers, these differences would most likely differ according to age, education, experience with mobile technology, and familiarity with the financial system. Establishing this allocation allows for concentrating efforts in promoting FinTech adoption by adopter type categories.

However, another important aspect of DOI is the perceived attributes of innovations, which become extremely important in describing levels of adoption (Wolf, 2022). They are: relative advantage (is the FinTech better than the conventional banking?), compatibility (are the farmer's values and tradition reconcilable with it?), complexity (is it easy to use?), trialability (can one test it at a small scale before applying it extensively?), and observability (are the effects observable to others?). For instance, digital payment platforms could enjoy a clear relative benefit of saving time and transport costs. However, its complexity could deter take-up if it is not locally supported or requires a high degree of digital competence. If the farmer observes that a neighbor is purchasing inputs using mobile credit and realizes a good harvest, the farmer will also be motivated to take up the service. So, knowledge of these perceived characteristics explains how FinTech products must be designed and framed to maximize financial inclusion.

Another significant component of the theory is channels of communication. DOI differentiates between interpersonal communication and mass media and observes that awareness generation does happen through mass media. However, interpersonal communication (peer-to-peer talk, community leader talk, farmer coops) can better persuade people to adopt an innovation (Wolf, 2022). Peer leaders or first adopters in the farming society are likely influencers for tea farmers. Once such individuals experience favorable uses of digital payment platforms, their peers will follow suit. This is why peer-led digital literacy initiatives and demonstration projects must be used to demystify FinTech services and promote adoption among ultra-conservative or digitally resistant farmer societies.

Applied in this research, Diffusion of Innovations Theory provides a strategy model whereby FinTech innovations are accepted and integrated into everyday life by small-scale tea farmers in Western tea-growing counties of Kenya. The theory complements Financial inclusion Theory and Technology Acceptance Model (TAM), providing both usability and accessibility and a macro-level explanation of innovation diffusion. DOI directs research objectives by helping to identify which FinTech innovations are trendy, among which farmer groups, and why. It facilitates questionnaire design by pointing to usability, benefits clarification, and peer influence. It facilitates interpretation by giving a framework for categorizing adoption patterns and identifying barriers such as incredulity, know-how, or culture fit.

However, as strong as it is, diffusion of innovation theory is not flawless. One limitation is that it describes a linear and uniform adoption process that may fail to capture the nonlinear, untidy rural existence. Adoption within such settings could be provoked by income cycles from seasons, religious ceremonies, or unforeseen external events like drought or price shocks, none of which are explained in the DOI. Moreover, the theory is skewed towards individual agency over cost, infrastructure, and regulatory obstacles. DOI also assumes that all innovation is good. However, in the real world, some FinTech products like digital credit can lead to over-indebtedness or exploitation if regulated poorly. Thus, while DOI helps interpret behavioral and social processes, there has to be some economic, policy, and infrastructure analysis to know the net impact, the very thing this paper attempts to do by integrating it with other theories.

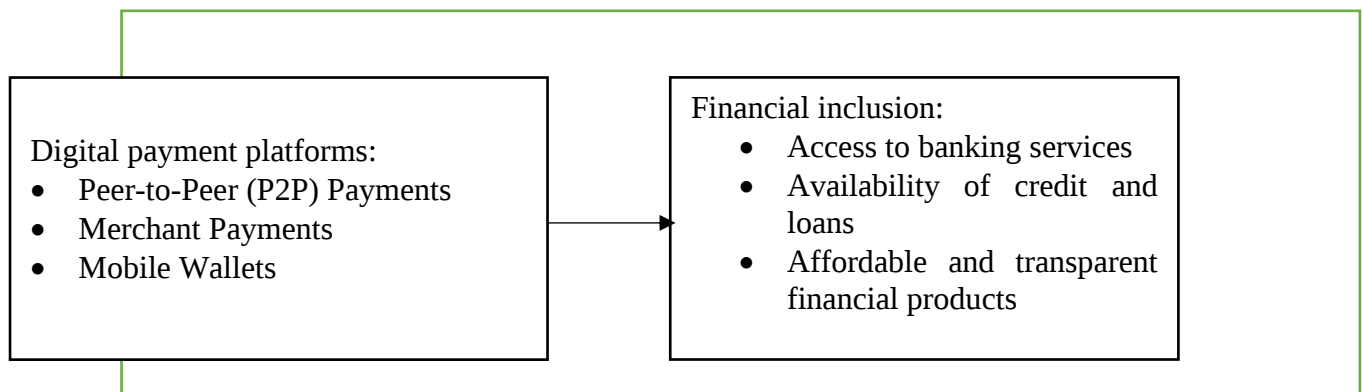
## Conceptual Framework

The conceptual framework illustrates the interconnectedness of various elements in fostering financial inclusion through technological advancements in banking and lending services. The research conceptual framework contains one dependent variable, financial inclusion, and one independent variables for significant FinTech innovations: digital payments platforms. Financial inclusion is quantified through indicators like access to a bank account, access to credit, transparent and low-cost financial services. Digital payment platform are ranked based on peer-to-peer (P2P) payments, merchant payments, and mobile wallet use.

**Figure 1** Conceptual Framework

Independent Variable

Dependent Variable



Source: Author's Conceptual Framework

## Research Gap

Most existing studies of interactions between FinTech innovation and financial inclusion have aimed primarily at the urban poor, formal sector labor markets, or country averages without regard to rural and farming communities' financial realities. In particular, very little is known about how digital payment platforms are performing in rural farming communities. The tea-growing counties of Western Kenya, namely Bomet, Kericho, Nandi, Kisii, and Nyamira, form a significant but under-researched population, even though they produce a significant percentage of smallholder farm production and informal economic activity.

This study seeks to fill the gaps determined by conducting a context-specific, theory-informed, and methodologically rigorous analysis of the contribution of FinTech innovations towards enhanced financial inclusion among small-scale tea producers in Kenya's western tea-growing counties highlands. The study contributes additional evidence to inform rural development policy, digital financial service design, and targeted FinTech interventions in an agricultural society.

## METHODOLOGY

This study utilized a correlational design to investigate the statistical correlation between FinTech innovations and financial inclusion among Kenyan small tea farmers in the Western tea-growing counties. The design helped moderately generalize findings across rural agricultural settings, thus making this design both statistically and semantically sound. According to the Kenya Institute for Public Policy Research and Analysis (KIPPRA), Kenya has over 560,000 small-scale tea farmers supplying their produce to 68 factories managed by the Kenya Tea Development Agency (KTDA) (KIPPRA, 2021). The tea-growing highlands are spread across 19 counties, including Kericho, Bomet, Nandi, Nyamira, Kisii, Nakuru, and Trans-Nzoia (Kenya National Bureau of Statistics [KNBS], 2024). The western tea-growing counties of Kenya, comprising Kericho, Bomet, Nandi, Kisii, and Nyamira counties, host a significant 75% of the country's small-scale tea farmers due to the favorable climatic and geographic conditions.

The target population for this study were small-scale tea farmers from various counties in the western region, including Kericho, Bomet, Nandi, Kisii, and Nyamira. Tea farmers were selected as the population to be targeted, considering that they represent a significant, financially underserved segment of Kenya's rural economy and usually suffer from sporadic access to formal financial services. This sample gave a representative and fairly broad spectrum of tea farmers from one of the significant counties where tea farming is practiced in Kenya.

To offer a proportional and equal representation of the respondents and reduce sampling error for the western tea-growing counties of Kenya, the study employed stratified random sampling obtaining a sample of 384

participants. The respondents within each stratum were selected randomly from lists of farmers obtained from the local tea cooperatives and the respective county agriculture offices. This offered equal representation and reduced sampling error in the five counties. Stratified sampling was also the most suitable for the current study as it enhanced statistical efficiency and allowed for sufficient representation of significant sub-groups in the sample (Nguyen et al., 2021).

Quantitative data was collected through structured survey questionnaires administered to small-scale tea farmers. The survey assessed respondents' usage and perceptions of FinTech innovations on digital payment platforms. According to Bryman (2019), structured questionnaires increase the reliability since they guarantee coherence in the interpretation of the questions and the reaction choices, given that this is important when analyzing a set of variables, such as perceived usefulness and ease of use, based on the Technology Acceptance Model. Since the target population had different levels of literacy, the questionnaire was made using plain and simple wording and was pilot tested to reduce measurement error and guarantee an accurate and a good quality of data collected.

Collected data was analyzed by blending descriptive statistics and multiple linear regression analysis as per descriptive correlational design of the study. Ethical principles, including informed consent, confidentiality, and respect for participants' autonomy, guided all data collection and analysis stages (Hasan et al., 2021). Participants were provided with clear information about the purpose of the study, voluntary participation, and confidentiality measures. The study sought approval for data collection from the University of Kabianga. In addition, the exploration further obtained research authorization from the National Commission for Science, Technology and Innovation (NACOSTI) before embarking on data collection.

## RESULTS

### Response Rate

The study focused on 384 small-scale tea growers of five tea growing counties in the West of Kenya (Kericho, Bomet, Nandi, Kisii and Nyamira). A hundred per cent of the questionnaires were received and were considered valid for analysis (384 returned questionnaires). This is an outstanding response rate as the researcher had personal contact with tea cooperative societies and administered questionnaires in tea cooperative meetings.

The respondents were evenly distributed between the five counties with Kericho having the highest percentage (29.9%, n=115); followed by Bomet (25%, n=96), Nandi (20%, n=77), Kisii (15.1.0%, n=58) and Nyamira (10%, n=38). As for institutional affiliation, 51.3% (n=197) of the respondents were involved with tea farmers' cooperative societies, and 48.7% (n=187) were working on their own. A significant number of farmers had the technical equipment to access smartphone ownership, with 63.8% (n=245) owning a smartphone. The average tea farming experience of the respondents was 21.46 years (SD=11.497) while the range was 1-40 years, indicating an experienced group of farmers with rich knowledge on agricultural financial practices.

### Correlation Analysis

Pearson Product Moment Correlation Analysis was used to establish a possible relationship between the digital payment platform and financial inclusion. Table 2 shows the results.

**Table 1** Pearson Correlation Table

| Variables                 | Financial inclusion | Digital Payment Platforms |
|---------------------------|---------------------|---------------------------|
| Financial inclusion       | 1.000               | 0.816**                   |
| Digital Payment Platforms | 0.816**             | 1.000                     |

\*\*p < 0.001 (1-tailed)

The analysis showed a strong positive correlation between the use of digital payment platforms and the financial inclusion of the small-scale tea farmers ( $r = 0.816$ ,  $p < 0.001$ ). The correlation was statistically significant, suggesting that there was a link between the increase in the adoption of digital payment platforms and improvements in financial inclusion. The strength of the correlation indicates that companies with more robust digital payment systems have greater chances of achieving sustainable financial integration compared to those with less robust digital payment systems.

## Regression Analysis

Multiple linear regression analysis was carried out to find out whether or not digital payment platforms had a significant impact on the financial inclusion of small farmers of tea with control variables including Cooperative Membership, Smartphone Ownership and Years of Farming.

## Model Summary

A summary of the model is given in Table 3. The regression model resulted in an  $R^2$  of 0.667, which means that 66.7% of the financial inclusion variability could be explained by the digital payment platforms. This illustrates the importance of digital payment platforms as one of the key indicators of financial inclusion of small-scale tea farmers. The adjusted  $R^2$  value of 0.663 is also a confirmation of the robustness of the model after taking into account the number of predictors. The standard error of the estimate was 0.42458 which is a fairly accurate prediction. The Durbin-Watson statistic is 1.898, which is within the ideal range of 1.5 – 2.5, suggesting that there is no significant autocorrelation in the residuals.

**Table 2** Model Summary

| R     | $R^2$ | Adjusted $R^2$ | Std. Error of Estimate | Durbin-Watson |
|-------|-------|----------------|------------------------|---------------|
| 0.816 | 0.667 | 0.663          | 0.42458                | 1.898         |

## Analysis of Variance (ANOVA)

The Analysis of Variance (ANOVA) results are shown in the Table 4. The overall results of the ANOVA showed that the regression model was statistically significant with  $F(4, 379) = 189.484$ ,  $p < 0.001$ . This finding shows that variations in the financial inclusion of small-scale tea farmers can be explained by digital payment platforms, and that the fitted regression model is satisfactory for explaining the observed data.

**Table 3** ANOVA Results

| Source     | Sum of Squares | df  | Mean Square | F       | Sig.  |
|------------|----------------|-----|-------------|---------|-------|
| Regression | 137.210        | 4   | 34.303      | 751.260 | 0.000 |
| Residual   | 68.611         | 379 | 0.181       |         |       |
| Total      | 205.821        | 383 |             |         |       |

## Regression Coefficients

The regression coefficients are given in Table 5. To strengthen inference and address potential omitted variable bias, the study focused on DPP as a primary predictor while cooperative membership, smartphone ownership, and years of farming experience were included as control variables. The regression coefficient shows that digital payment platforms have a positive and statistically significant impact on financial inclusion ( $\beta = 0.811$ ,  $p < 0.001$ ). The unstandardized coefficient ( $B = 0.846$ ) indicates that if tea farmers' adoption of digital payment platforms is increased by 1 unit, the financial inclusion of small-scale tea farmers is estimated to increase by 0.846 units. The control variables did not demonstrate statistically significant relationships with financial inclusion with  $p > 0.005$  for all as indicated in the table.

**Table 4** Regression Coefficients

| Variable                  | B     | Std. Error | Beta  | t      | Sig.  |
|---------------------------|-------|------------|-------|--------|-------|
| Constant                  | 0.475 | 0.145      |       | 3.277  | 0.000 |
| Digital Payment Platforms | 0.846 | 0.031      | 0.811 | 27.203 | 0.000 |
| Cooperative Membership    | -.021 | .044       | -.014 | -.483  | .630  |
| Smartphone Ownership      | .072  | .045       | .047  | 1.595  | .112  |
| Years of Farming          | -.002 | .002       | -.039 | -1.298 | .195  |

Using the results, the regression equation is:

$$\text{Financial inclusion} = 0.475 + 0.846(\text{Digital Payment Platforms}) - 0.021(\text{Cooperative}) + 0.072 (\text{Smartphone}) - 0.002 (\text{Years Farming})$$

This finding is consistent with the results showing that digital payment platforms have a strong impact on improving financial inclusion for small farmers producing tea in Western tea-growing counties in Kenya. The positive relationship is strong, with farmers becoming increasingly digitalized by using and implementing digital payment systems as they receive tea payments, manage their family and farming expenses, and are increasingly involved in the formal financial sector. The non-significance of smartphone ownership, in particular, implies that device access alone does not guarantee inclusion, instead structured use of payment ecosystem does.

### Summary of Findings

The analysis consistently shows that digital payment platforms play a crucial role in achieving a higher level of financial inclusion of small-scale tea growers. The findings of descriptive statistics revealed that the digital payment platforms are moderately adopted and showed that there is a need to improve the adoption of the digital payment platforms. The inferential analysis showed a strong positive correlation between the digital payment platforms and financial inclusion ( $r = 0.816$ ,  $p < 0.001$ ). The regression results showed that digital payment platforms accounted for a significant share (66.7%) of the variance in financial inclusion outcomes and had a significant effect on improving financial integration ( $\beta = 0.811$ ,  $p < 0.001$ ). In conclusion, the results suggest that digital payment systems are a key lever for improving financial inclusion in rural agriculture markets, especially for smallholder tea growers in Western Kenya.

## DISCUSSION

This study aimed to find out the impact of digital payment platforms on financial inclusion of smallholder tea farmers in western tea growing counties, Kenya. The results show that digital payment platforms offer more than just a payment option for cash; they are a financial infrastructure that can play an important role in formalizing the economic activity of rural agricultural producers. According to the descriptive and inferential analysis, smallholder farmers who actively engage in using digital payment systems have higher financial accessibility, a more transparent transaction and access to formal financial networks.

The descriptive results revealed that the overall mean score for digital payment platform adoption was 3.06, indicating moderate level of adoption of digital payment platform among the respondents. The mean score of perceived benefits of digital payments for managing household and farming expenses was highest in perceived usefulness of digital payments for managing household and farming expenses, implying that farmers' perception of the usefulness of digital payments in streamlining their household and farming expenses has increased. The moderate adoption rate indicates that it is a transition period in the study area, where cash disbursement through cooperative is replacing traditional cash disbursement. The dominance of tea-cooperative societies as the main distribution channels for digital payment seems to create a unique pattern of adoption: Digital financial systems get introduced into farmers' world through institutional trust structures, which do not come with self-exposure in the markets

The correlation analysis revealed that there was a positive and highly significant correlation between the digital payment platforms and financial inclusion ( $r = 0.816$ ,  $p < 0.001$ ). The results indicate that the effectiveness and usage of the digital payment systems are positively associated with financial inclusion, as they were perceived effective. Implementing digital payment reduces the risks associated with handling cash, enhances financial tracking and provides a reliable and easy-to-reproduce history of payments that may be utilized for future credit assessment and loan applications. Farmers, in turn, with deliberate utilization of digital payments in their finances, will be more inclined to access financial products at affordable costs, face reduced transaction charges and have a greater opportunity to participate in the formal economy.

These results are also supported by a regression analysis. The coefficient of determination ( $R^2 = 0.667$ ) shows that digital payment platforms account for about 66.7% of the variance in financial inclusion of small-scale tea growers. This shows that digital payments play a significant role in financial integration in the context of this study. Moreover, the regression coefficient ( $\beta = 0.811$ ,  $p < 0.001$ ) indicates that increases in the use of digital payment systems have a high corresponding increase in financial inclusion. The control variables smartphone ownership ( $B = 0.072$ ,  $p = 0.112$ ), cooperative membership ( $B = -0.021$ ,  $p = .630$ ), and years of farming experience ( $B = -0.002$ ,  $p = 0.195$ ) yielded statistically non-significant results indicating that their individual contributions to financial inclusion are negligible once digital payment platform utilization is accounted for. While about one-third of the financial inclusion variation can be explained by other organizational, infrastructural and technological factors, the findings clearly indicate that the digital payment platforms have been a key enabler of higher levels of financial inclusion for the rural tea farmers.

The findings support the empirical evidence for the Financial inclusion Theory which suggests that overcoming geographical, cost, and structural barriers is essential for the inclusion of marginalised groups in formal financial systems. Digital payment platforms directly reduce transaction costs, the need for physical journeys to banking institutions and provide transparent financial footprints by digitizing and automating the cooperative payouts, purchasing of inputs and household remittances. These results introduce greater financial resilience and enhance the ability of smallholder farmers to plan, save, and borrow credit using transaction behavior evidence. The study also fits into the Technology Acceptance Model and the Diffusion of Innovations Theory, where the adoption of digital payments through trusted cooperative networks lowers perceived complexity, increases compatibility with the seasonal agricultural income cycle and speeds up the adoption of digital payments via interpersonal communication channels instead of one-by-one decision-making.

The findings align with the previous empirical studies cited in this research, which found that the adoption of digital payment, transparency in finances and economic empowerment of a rural area were found to be positively correlated. The results align with those of Turyatamba et al., (2024) which demonstrated how important the transition has been for tea producers in Uganda from cash to digital payments and the benefits in terms of transparency and financial documentation. The current study adds to such literature by quantifying the direct effect of digital payments on financial inclusion specifically in the Kenyan agricultural context where digital payments mostly take the form of cooperative payments, with unique institutional adoption patterns. This is in line with Ajambo et al (2022) who note that low digital literacy, limited penetration of smartphone technology and infrastructure challenges continue to be a hurdle for the full deployment of digital payment systems in rural areas of East Africa. The results suggest that the effective use of digital payment solutions to achieve higher levels of financial inclusion of western Kenyan tea farmers requires a direct link between the platforms and targeted financial literacy training, user-friendly platforms, and robust network infrastructure in rural areas. The results overall indicate that digital payment platforms should not be considered as a mere transactional tool but must be viewed as a strategic element of the rural financial ecosystem.

## CONCLUSION AND RECOMMENDATION

### Summary & Conclusion

The research found that digital payment platforms have a positive and statistically significant effect on financial inclusion of targeted small scale tea farmers ( $\beta = 0.811$ ,  $p < 0.001$ ). The positive sign indicates a

direct link between the penetration of digital payment systems in the formal financial system and the growing adoption, as well as perceived effectiveness. Digital payment platforms is associated with higher levels financial inclusion by changing the way small-scale tea growers receive and manage agricultural income and track it, which helps them to mitigate risks of cash handling, and to connect them with traceable financial systems. The research concluded that the use of a digital platform for payouts, input purchases and household remittances has a significant and positive effect, as it leads to higher levels of transparency, record keeping, and farmers' eligibility for formal credit based on verifiable transactions. This is complemented by the descriptive data revealing a high level of consensus regarding the positive impacts of digital payments on the management of expenses, demonstrating their relevance in rural agrarian contexts, which are particularly attuned to farmers' practices and methods of managing expenses. Modest overall uptake ratings however indicate that infrastructure issues including differential coverage of mobile networks and other factors such as digital literacy are a blocker to smooth uptake. For this reason, digital payment systems should be embedded within a wider financial system, and complemented with investments in network reliability, agent network expansion and collaborative financial education efforts to secure access and continued adoption among all farmer sub-groups.

## **Recommendations**

Given the strong positive correlation between digital payment platforms and financial inclusion and the high descriptive mean for better expense management, policy makers and financial institutions must encourage smooth integration of digital payment platforms in the agricultural value chains, mainly regarding payout disbursement of tea and purchase of inputs. Network infrastructure investments need to be made in remote farming regions where farmers are not working near main markets to reduce transaction failures and provide farmers with the guarantee of access to the network. Tea cooperatives should be able to provide a trusted onboarding and technical support hub, while network infrastructure investments should be targeted to remote farming regions to limit transaction failures and guarantee farmers can access the network outside of the major markets.

## **Contribution to Knowledge**

This study contributes to the literature and to interventions in financial inclusion in a number of substantive ways. Firstly, it fills a significant gap in existing literature which has largely focused on urban populations or on national-level data, by offering strong empirical evidence on the correlation between the introduction of FinTech innovations and financial inclusion of small-scale tea farmers in Western Kenya. Second, the findings reinforce and extend the applicability of the Technology Acceptance Model and the Diffusion of Innovations Theory; both of these theories are still very relevant when applied in the context of rural agricultural communities' infrastructural, institutional, and behavioral realities. Third, the research provides empirical answers to the question of priority in terms of how well different FinTech constructs predict, which will have implications for choosing technological interventions, and specifically points to the importance of online lending platforms in terms of strategic direction for policy design and program implementation. Finally, the methodological rigour used in this study, such as stratified random sampling, validated measurement instruments, and extensive diagnostic testing, provide a replicable framework for analysis, which further increases the reliability and replicability of the results, and sets a methodological standard for future empirical studies in agricultural finance and rural digital economics.

## **Ethical Approval**

The study received ethical approval from the University of Kabianga Institutional Research Ethics Committee and the National Commission for Science, Technology and Innovation (NACOSTI) (Ref: NACOSTI/P/26/4190275). All procedures were conducted in compliance with institutional and national ethical guidelines, the Helsinki Declaration and Kenyan research regulations and informed consent was obtained from all participants, who were asked to participate voluntarily and to ensure confidentiality and the right to withdraw without any penalties.

## Conflict of Interest

The authors have no known competing financial or non-financial interests. No financial, material, technical or organizational interest or commercial relations from outside the authors have been involved in the design, development, writing, publication or dissemination of this research.

## Data Availability Statement

The datasets collected and analyzed in the course of this research are not publicly available as they are the property of the participants (individual small-scale tea farmers and small-scale tea cooperative societies) who did not give full permission for public availability. Anonymized data that support the findings of this study are available on reasonable request to the corresponding author upon ethical approval by the University of Kabianga and documentation of research purpose.

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