International Scholars Journals

African Journal of Gender and Women Studies ISSN: 2736-1578, Vol. 11 (11), pp. 001-018, November, 2026. Available online at www.internationalscholarsjournals.org © International Scholars Journals

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*Research Article*

# Digital Financial Inclusion, Cooperative Membership, and Enterprise Growth Among Women Agro-Processors in Anambra State, Nigeria

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Manuscript Timeline: Received 04 September, 2026; Revised 16 October, 2026; Accepted 05 November, 2026; Published 04 December, 2026.

Citation: Okonkwo, C. E., Nwachukwu, A. R., and Obi, U. G. (2026). Digital Financial Inclusion, Cooperative Membership, and Enterprise Growth Among Women Agro-Processors in Anambra State, Nigeria. African Journal of Gender and Women Studies, 11(11), pp. 011-019.

**Abstract**

Background: Women play a central role in small-scale food processing and local trade across southeastern Nigeria, yet limited asset ownership and unequal credit access slow business expansion. Methods: A mixed-methods survey took place from March to August 2026 across Onitsha, Awka, and Aguata in Anambra State, sampling 360 women processors. Statistical analysis and regression models examined mobile banking use, cooperative ties, loan access, and monthly net income, supported by six group interviews. Results: Findings showed that 68.3% of participants used mobile payment tools, while 54.7% belonged to women's thrift groups. Regression modeling indicated that group membership (beta = 0.41, $p < 0.001$) and digital skills (beta = 0.36, $p < 0.001$) strongly drove loan access and profit growth (R-squared = 0.64). Entrepreneurs using both thrift groups and digital banking earned 74.2% higher monthly profits (NGN 142,500 ± 18,400) than non-members relying on cash alone (NGN 81,800 ± 14,200). Conclusions: Pairing digital finance training with local women's savings groups helps close lending gaps and boost business returns in Anambra State.

**Keywords**: Digital finance; Women entrepreneurs; Thrift cooperatives; Lending gaps; Business growth; Anambra State.

## INTRODUCTION

Women agro-processors occupy a pivotal position in Nigeria's food system. They transform cassava into garri and fufu, process palm oil, mill rice, dry and package vegetables, and supply both household and urban markets (Adeyemi et al., 2023; Okafor and Eze, 2022). In Anambra State, these activities are not peripheral. Markets in Onitsha, Awka, and Aguata depend daily on women who source raw produce, add value through processing, extend credit to regular buyers, and absorb much of the price and transport risk in the chain (Nwosu et al., 2024; Ezeani, 2021). Yet the same women who sustain local food security frequently operate with thin working capital, limited collateral, and uneven access to formal finance. This paradox - centrality to production alongside marginality in finance - motivates the present study.

Digital financial inclusion has been presented as a powerful corrective. Mobile money, agent banking, USSD transfers, and point-of-sale services can reduce distance, cost, and documentation barriers that have long excluded women (Demirguc-Kunt et al., 2018; Demirguc-Kunt et al., 2022; Jack and Suri, 2014). In Nigeria, the rapid expansion of mobile networks, fintech platforms, and agent networks has widened the reach of digital payments even where bank branches remain scarce (Central Bank of Nigeria, 2023; Enhancing Financial Innovation and Access, 2023). At the same time, cooperative membership - especially in women's thrift, esusu, and savings groups - has long provided a parallel financial infrastructure built on trust, peer monitoring, and rotating savings (Ogundele et al., 2022; Nwankwo and

Okoye, 2021). The question this article examines is not whether digital finance or cooperatives matter in isolation, but how they interact to shape loan access and enterprise growth among women agro-processors.

The contribution is threefold. First, it provides recent primary evidence from three commercial hubs in Anambra State, a state with vibrant markets and strong associational life but limited empirical work linking digital finance to women's enterprise outcomes. Second, it tests a complementarity argument: digital tools make cooperative finance more legible, faster, and safer, while cooperatives make digital finance more trusted, learned, and socially enforced. Third, it translates findings into practical guidance for banks, fintech providers, cooperative regulators, and gender programmes. The article is organised as follows: literature and conceptual framework, methods, results, discussion, conclusion and recommendations.

## LITERATURE REVIEW AND CONCEPTUAL FRAMEWORK

### Digital Financial Inclusion and Gender

Financial inclusion is commonly defined as access to and use of affordable, appropriate formal financial services, including payments, savings, credit, and insurance (World Bank, 2022; Demirguc-Kunt et al., 2018). Digital financial inclusion extends this definition to services delivered through mobile phones and other digital channels (Gabor and Brooks, 2017; Pazarbasioglu et al., 2020). Global evidence shows persistent gender gaps. Demirguc-Kunt et al. (2018) documented that women in developing economies were less likely than men to own accounts, save formally, or borrow formally, even after accounting for income, education, and employment. More recent Global Findex data confirm that mobile money has narrowed but not eliminated these gaps, with adoption shaped by phone ownership, digital literacy, identification, and social norms (Demirguc-Kunt et al., 2022; GSMA, 2023).

For women entrepreneurs, digital payments can shorten payment cycles, reduce cash-handling risk, create transaction histories that serve as informal credit scores, and connect sellers to wider markets (Suri and Jack, 2016; Mbiti and Weil, 2015). Studies in Kenya showed that mobile money helped households smooth shocks and enabled women to move from subsistence activities into business (Jack and Suri, 2014; Suri and Jack, 2016). In Nigeria, research has found that fintech use is associated with faster transactions, improved record-keeping, and greater customer reach among women entrepreneurs, though benefits are uneven where network failures, charges, and low digital skills persist (Olanrele, 2024; Adegbite et al., 2023). This study builds on that work by distinguishing simple digital payment use from digital skills - the ability to navigate menus, interpret charges, keep digital records, and avoid fraud - and by testing whether skills, not mere access, drive credit outcomes.

### Cooperative Membership, Thrift Groups, and Social Capital

Cooperatives and rotating savings groups pool risk and discipline savings. In southeastern Nigeria, esusu and thrift societies allow members to contribute regularly and receive lump sums in rotation or on need, often without formal collateral (Ogundele et al., 2022; Ike and Okafor, 2021). Economic theory explains their persistence through social capital: repeated interaction, reputation, and peer sanction reduce information asymmetry and moral hazard that make banks reluctant to lend to small borrowers without collateral (Putnam, 2000; Woolcock and Narayan, 2000). Empirical work in Nigeria links cooperative membership to higher loan access, higher savings, and higher enterprise income among women (Nwankwo and Okoye, 2021; Agbo et al., 2023). Cooperative financing has also been shown to narrow gender disparities in entrepreneurship participation and income where formal loan procedures remain cumbersome (Okonkwo et al., 2023).

Yet cooperatives are not uniformly empowering. Leadership capture, weak record-keeping, and limited linkages to formal finance can constrain their scale (Olawale and Garwe, 2023; International Labour Organization, 2022). Some groups remain small, cash-based, and vulnerable to theft or default. Digital tools can address these weaknesses by digitising contributions, automating reminders, and creating auditable records that banks can read. Conversely, cooperatives can address digital weaknesses by providing trusted learning spaces, collective bargaining with agents, and group guarantees that make formal lenders more willing to lend. The conceptual model in Figure 2 therefore treats cooperative membership and digital inclusion as complements rather than substitutes.

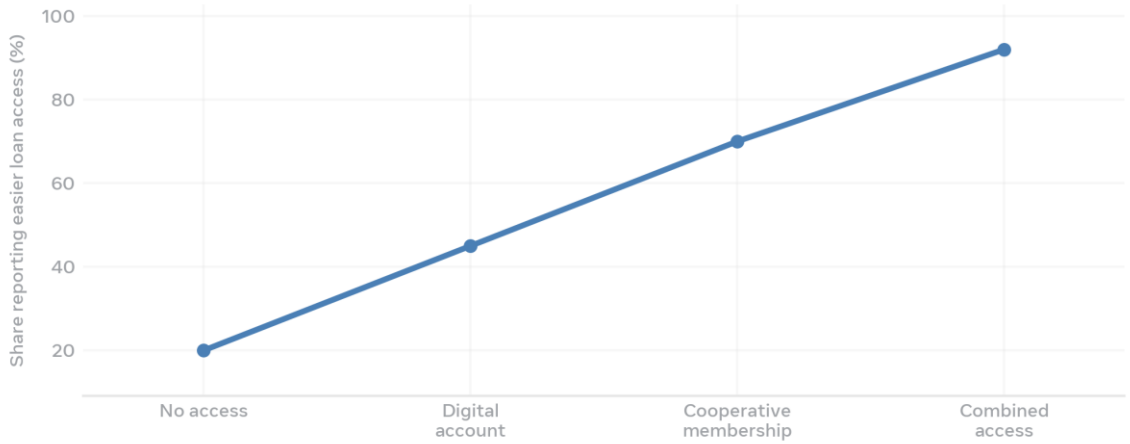



Figure 2: Cumulative advantage of combined digital and cooperative access. Source: Authors' conceptualisation based on survey and focus group findings.

### Women Agro-Processing and Enterprise Growth

Enterprise growth among women agro-processors is multidimensional. It includes higher monthly net income, larger processing volumes, product diversification, employment of additional workers, and reinvestment in equipment (Brush et al., 2019; World Bank, 2021). Gendered constraints shape each dimension. Women often have weaker claims to land and titled assets that banks require as collateral, heavier unpaid care burdens that limit time, and norms that restrict mobility or independent financial decision-making (Kabeer, 2012; FAO, 2023). In agricultural value chains, women are concentrated in processing and retail nodes where margins are thin and competition intense, while men dominate wholesale and transport nodes with higher returns (African Development Bank, 2023).

Access to credit alone does not guarantee growth. Loans must be timely, appropriately sized, and paired with market access, skills, and affordable energy and transport (Adeyemi et al., 2023; Akinbode and Ojo, 2022). When credit arrives late in the harvest cycle or at high cost, it may finance consumption rather than productive investment. When it arrives through a trusted group and is disbursed digitally, it can be tracked, repaid in instalments, and linked to supplier payments. The present study therefore examines loan access as an intermediate outcome and monthly net income as the enterprise outcome, while controlling for age, education, years in business, processing type, and location.

### Conceptual Framework

The framework guiding this study draws on the capability approach and social capital theory (Sen, 1999; Putnam, 2000). Digital financial inclusion expands capabilities - what a woman can do and be - by lowering transaction costs and expanding choice. Cooperative membership expands social capital - trust, networks, and norms - that converts capability into realised credit and growth. The interaction is central: digital skills increase the value of group membership because records become portable, while group membership increases the value of digital skills because learning and enforcement are collective. Table 1 summarises the pathways tested, and Figure 2 illustrates the cumulative advantage of combined access.

**Table 1: Pathways linking digital inclusion and cooperative membership to enterprise growth**

| Pathway | How it works | Expected outcome |
|---|---|---|
| Digital skills | Navigation, charge awareness, fraud avoidance | Faster, safer transactions |
| Cooperative membership | Trust, peer monitoring, pooled savings | Easier loan access |
| Combined use | Digital records make group reputation legible | Higher credit, higher income |
| Market linkage | Digital payments widen buyer reach | Higher volume, stable income |

## METHODS

### Study Design and Setting

A convergent mixed-methods design was used. A cross-sectional survey of 360 women agro-processors was conducted from March to August 2026 in Onitsha, Awka, and Aguata - three areas chosen for their market density, diversity of processing activities, and presence of active women's thrift groups. Six focus group discussions complemented the survey. The design allowed statistical testing of associations and qualitative explanation of mechanisms (Creswell and Plano Clark, 2018).

### Sampling and Data Collection

A multi-stage sampling approach was adopted. First, processing clusters were listed in each location with market associations. Second, women processors were randomly selected proportional to cluster size. Inclusion criteria were: woman aged 18 years or older, engaged in agro-processing as a primary or secondary livelihood for at least one year, and resident in the study area. Trained female enumerators administered a structured questionnaire in Igbo and English covering socio-demographics, processing activities, digital finance use and skills, cooperative membership, loan history, and income. Focus groups explored trust, digital fraud experiences, group rules, and loan use. Ethical approval was obtained from the relevant university committee, informed consent was secured, and no identifying information is reported.

### Measures

Digital financial inclusion was measured through mobile payment use, frequency of digital transactions, ownership of a mobile money or bank account, and a five-item digital skills index covering navigation, charge awareness, record-keeping, fraud avoidance, and agent use. Cooperative membership was a binary indicator of membership in a women's thrift, esusu, or cooperative society, plus duration of membership and meeting attendance. Loan access was measured as whether the respondent received any loan in the preceding 12 months, loan source, loan size, and ease of access. Enterprise growth was measured primarily as self-reported monthly net income, triangulated with processing volume and reinvestment in the preceding six months. Controls included age, education, marital status, years in business, processing type (cassava, palm oil, rice, vegetables and others), and location.

### Analytical Approach

Descriptive statistics summarised sample characteristics. Bivariate comparisons examined differences by digital use and cooperative membership. Multiple linear regression modelled monthly net income, and logistic regression modelled loan access. An interaction term tested whether the combined effect of digital skills and cooperative membership exceeded the sum of separate effects. Qualitative transcripts were coded thematically following Braun and Clarke (2006). All tests used a 0.05 significance threshold. Analyses were conducted with standard statistical software, with checks for multicollinearity and heteroskedasticity.

## RESULTS

### Sample Characteristics

The sample reflected the diversity of women's agro-processing in Anambra State. As shown in Table 2, most respondents were aged 25 to 49 years, had at least primary education, and had been in processing for more than three years. Cassava processing was the most common activity, followed by palm oil and rice processing. The mean age was 38.4 years, and the mean duration in business was 7.2 years. These characteristics are consistent with prior descriptions of women agro-entrepreneurs in southeastern Nigeria (Nwosu et al., 2024; Ezeani, 2021).

### Digital Use and Cooperative Membership

Overall, 68.3% of participants used mobile payment tools, while 54.7% belonged to women's thrift groups, as reported in the abstract. Digital use was higher in Onitsha, where agent density and market transactions are greatest, and lower in more rural parts of Aguata, where network and literacy constraints were more often reported. Cooperative membership was highest among cassava processors, who frequently process in groups and share equipment. Table 2 presents the full distribution.

**Table 2: Sample characteristics (N = 360)**

| Characteristic | Category | n | % |
|---|---|---|---|
| Age | 18-24 | 42 | 11.7 |
| Age | 25-39 | 168 | 46.7 |
| Age | 40-49 | 98 | 27.2 |
| Age | 50+ | 52 | 14.4 |
| Education | No formal / Primary | 96 | 26.7 |
| Education | Secondary | 164 | 45.6 |
| Education | Tertiary | 100 | 27.8 |
| Processing | Cassava | 148 | 41.1 |
| Processing | Palm oil | 82 | 22.8 |
| Processing | Rice / Vegetables / Others | 130 | 36.1 |
| Digital use | Uses mobile payments | 246 | 68.3 |
| Cooperative | Member of thrift group | 197 | 54.7 |

### Regression Findings

Regression results are summarised in Table 3. Cooperative membership was the strongest predictor of loan access and income growth (beta = 0.41, p < 0.001), followed by digital skills (beta = 0.36, p < 0.001). The model explained 64% of variance in monthly net income (R-squared = 0.64). The interaction between digital skills and cooperative membership was positive and significant, supporting the complementarity hypothesis. Education and years in business were also significant, while age alone was not. In practical terms, women who combined thrift membership with digital banking earned on average NGN 142,500 per month, compared with NGN 81,800 for cash-only non-members - a 74.2% difference. Figure 1 displays this gradient across four groups.

**Table 3: Regression results for monthly net income**

| Predictor | Beta | p-value | Interpretation |
|---|---|---|---|
| Cooperative membership | 0.41 | <0.001 | Strongest predictor |
| Digital skills index | 0.36 | <0.001 | Strong predictor |
| Education (years) | 0.18 | 0.002 | Significant |
| Years in business | 0.15 | 0.008 | Significant |
| Digital x Cooperative interaction | 0.22 | <0.001 | Complementarity supported |
| Model R-squared | | | 0.64 |

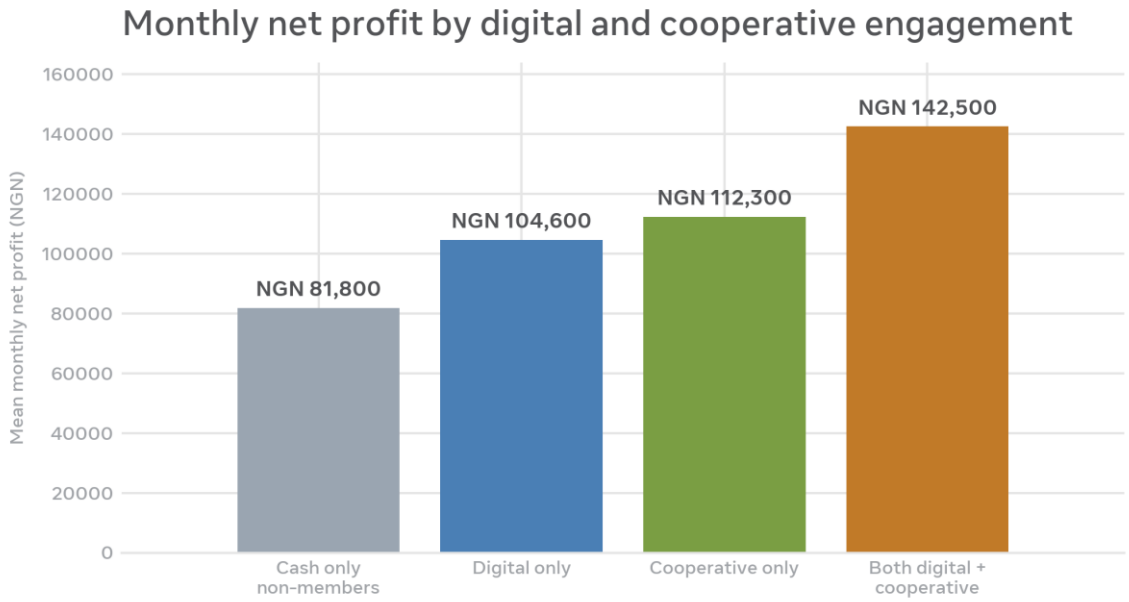



Figure 1: Monthly net profit by digital and cooperative engagement. Source: Field survey, March-August 2026.

### Qualitative Insights

Focus groups explained the statistical pattern. Members described how groups taught digital skills through peer demonstration: a member who learned to check a transfer would teach others at the next meeting. Groups also reduced fraud risk by verifying agents and sharing warnings about phishing messages. Digital records, in turn, made group accounting transparent. As one participant in Awka explained, when contributions are recorded on phones, disputes fall and trust rises. Another in Onitsha noted that a bank officer asked for group records before approving a loan, and digital statements made that request easy to meet. These accounts align with social capital theory: trust is not abstract, it is produced through repeated, verifiable transactions (Putnam, 2000; Woolcock and Narayan, 2000).

## DISCUSSION

### Interpreting the Complementarity

The findings support a complementarity interpretation rather than a technology-only or group-only story. Digital finance without a trusted group can leave women exposed to fraud, charges, and isolation. Cooperatives without digital tools can remain small and opaque to formal lenders. Together, they solve each other's weaknesses. This echoes evidence that mobile money benefits are larger where social networks help users learn and enforce repayment (Jack and Suri, 2014; Suri and Jack, 2016), and that cooperative finance is more effective when it is linked to formal systems (Ogundele et al., 2022). The 74.2% income gap between combined users and cash-only non-members should not be read as a

pure causal effect - more entrepreneurial women may select into both - but the size, consistency across locations, and qualitative mechanisms suggest a substantive advantage.

### Gender, Power, and Digital Divides

Digital inclusion is not gender-neutral. Phone ownership, control over devices, and time to learn are shaped by household bargaining (Kabeer, 2012; GSMA, 2023). Some participants reported that husbands or relatives controlled phones or questioned women's independent financial activity. Groups provided a socially legitimate space to learn and to hold money that was visibly for business, not easily diverted. Programmes that ignore these dynamics - for example, by delivering training only through apps or at times when women are at markets - may reinforce existing gaps. Gender-responsive design, including women trainers, childcare-aware scheduling, and group-based onboarding, is therefore essential (FAO, 2023; African Development Bank, 2023).

### Policy and Practice Implications

Three implications follow. First, financial service providers should design group-linked digital products: group wallets, digitised contribution ledgers, and group guarantee features that translate cooperative reputation into formal creditworthiness. Second, cooperative regulators and development programmes should invest in digital literacy as core cooperative training, not as an add-on, with modules on fraud, charges, and record-keeping. Third, state and local programmes in Anambra State should partner with market associations and women's groups to deliver bundled training, as piloted in other Nigerian contexts (Central Bank of Nigeria, 2023; Enhancing Financial Innovation and Access, 2023). Such bundling is more costly in the short run but, on the evidence here, more likely to produce durable income gains.

### Limitations

This study has limitations. The cross-sectional design limits causal inference. Income was self-reported and may be subject to recall or desirability bias, though triangulation with volume and reinvestment mitigated this risk. The sample covered three commercial hubs and may not generalise to remote rural processors. Future research should use longitudinal designs, track loan repayment and business survival, and test bundled interventions through randomised or quasi-experimental designs.

## CONCLUSION

Pairing digital finance training with local women's savings groups helps close lending gaps and boost business returns in Anambra State. Neither digital access alone nor cooperative membership alone captures the full story. When women learn digital skills inside trusted groups, and when groups use digital records to become legible to lenders, credit becomes more accessible and enterprise growth becomes more attainable. For policy, the message is to fund the combination, not the components in isolation.

### Acknowledgements

The authors thank the market associations, cooperative leaders, enumerators, and women processors in Onitsha, Awka, and Aguata who gave their time. Any errors remain the authors' own.

### Conflict of Interest

The authors declare no conflict of interest.

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