Islamic Social Finance for Inclusive Green Finance: Pathways for Underbanked Farmers in Nigeria

Imran Titilope Ibrahim[1*], Mohd Faizuddin Muhammad Zuki[2]

[1]Faculty of Muamalat, Management and Technology, Universiti Islam Antarabangsa Tuanku Syed Sirajuddin, Malaysia.

[2]Islamic Business School, College of Business, Universiti Utara Malaysia, Malaysia.

[*]Corresponding Author

DOI: https://doi.org/10.47772/IJRISS.2026.101000770

Received: 26 October 2026; Accepted: 31 October 2026; Published: 17 November 2026

ABSTRACT

Climate vulnerability and financial exclusion reinforce one another in Nigeria, where underbanked smallholder farmers face increasing exposure to droughts, floods, and other climate-related risks while experiencing limited access to affordable climate finance. Conventional green-finance mechanisms often require collateral, formal credit histories, and business documentation, creating significant barriers for vulnerable agricultural communities. This study examines how Islamic social finance can advance inclusive green finance for underbanked smallholder farmers in Nigeria. Using a qualitative deductive content analysis of academic literature, policy documents, and relevant case evidence, the study analyses the roles of Islamic microfinance, *zakat*, *waqf*, *infaq*, and *qard hasan* in supporting climate adaptation and sustainable agricultural development. The findings indicate that these instruments can provide Shariah-compliant, lower-cost, and more accessible financing for climate-smart agriculture, renewable-energy adoption, efficient irrigation, drought-resistant inputs, and small-scale green enterprise. *Zakat* can provide targeted assistance and interest-free financial support to eligible vulnerable farmers, while *waqf* can mobilise long-term capital for productive agricultural assets and shared green infrastructure. *Infaq* can support emergency relief and non-repayable resilience-building activities, while *qard hasan* provides interest-free financing for sustainable agricultural investments. Furthermore, the study proposes an integrated Public–Private–Philanthropic Partnership (PPPP) framework that connects government institutions, private financial institutions, and philanthropic organisations to mobilise resources for inclusive green agricultural development. An illustrative Green Climate Fund–Development Bank of Nigeria pathway demonstrates how existing conventional climate funds could be channelled through Shariah-compliant financing arrangements. However, effective implementation remains constrained by regulatory ambiguity, fragmented institutional governance, limited technical capacity, and weak public awareness. The study recommends strengthening institutional coordination, professionalising Islamic social finance governance, and integrating these instruments into national climate and financial-inclusion strategies. These measures can help expand access to climate finance and promote a more inclusive, resilient, and socially just green transition in Nigeria.

Keywords: Islamic social finance, financial inclusion, green finance, underbanked farmers, Nigeria.

INTRODUCTION

Poor households have historically faced barriers to formal financial services due to limited collateral, irregular income streams, and perceived credit risks (Umeaduma, 2023). This exclusion is particularly pronounced in developing economies, where conventional banking models often fail to accommodate the financial circumstances of low-income populations. The global microfinance movement, popularised by the Grameen Bank experiment in the early 1980s, demonstrated the potential of targeted financial services to support productive economic activities and improve the livelihoods of underserved communities (Morduch, 1999;

Sengupta & Aubuchon, 2008). Nevertheless, access to affordable finance remains a significant challenge, particularly for rural communities whose livelihoods depend on climate-sensitive economic activities such as agriculture.

In Nigeria, financial exclusion remains a persistent challenge, although progress has been made in expanding access to financial services. Data from the EFInA Access to Financial Services 2026 survey indicate that 21% of the adult population remains financially excluded, representing a decline from 26% in 2023 and 53% in 2008 (EFInA, 2026). Financial exclusion is increasingly concentrated in the North West and North East, where approximately three-quarters of excluded adults reside (EFInA, 2026). The barriers are largely structural, including irregular income, limited perceived need for formal financial services, institutional exclusion, geographical accessibility, and the cost of banking. These challenges are compounded by increasing exposure to climate-related risks, including desertification, drought, flooding, and coastal erosion, which threaten agricultural productivity, livelihoods, and household welfare. Niang et al. (2014) highlight the wider economic implications of climate change across West Africa, including projected declines in fisheries and increasing exposure of coastal communities to flooding. Such pressures are particularly significant for smallholder farmers, whose limited financial resources constrain their ability to respond to environmental changes and protect their livelihoods.

Conventional green finance mechanisms, including climate funds, green bonds, and sustainable banking products, play an important role in mobilising resources for climate mitigation and adaptation. However, their benefits have not always reached vulnerable households and small-scale agricultural producers. These financing arrangements often require collateral, formal credit histories, and structured business documentation, creating barriers for farmers and micro, small, and medium-sized enterprises (MSMEs) operating within informal or low-income economic settings (Volz et al., 2015). Consequently, communities that are most exposed to climate-related risks may have the least access to the financial resources needed to strengthen their resilience. This highlights the need to reconsider how climate finance is structured and delivered, particularly in contexts where conventional financing requirements do not reflect the economic realities of vulnerable populations.

Islamic finance offers an alternative approach based on Shariah principles, which emphasise social justice, equitable wealth distribution, risk-sharing, and the prohibition of interest (riba). Within this broader system, Islamic social finance serves an important social and developmental function by mobilising resources for poverty alleviation and community welfare. Alaro and Alalubosa (2019) highlight the potential of Islamic financing arrangements, including *musharakah*, *mudarabah*, *zakat*, and *waqf*, to extend financial services to underserved populations while promoting productive investment and social solidarity. Unlike conventional financing approaches that primarily rely on commercial lending, Islamic social finance incorporates redistributive and charitable mechanisms that can complement market-based financing. Its integration with Islamic microfinance institutions may therefore provide an institutional basis for extending financial services to communities that remain underserved by the formal financial sector.

Despite the growing discussion of Islamic finance and financial inclusion, the connection between Islamic social finance and green finance remains an area requiring further investigation, particularly in the context of Nigerian agriculture. Existing studies have considered the contribution of Islamic microfinance and individual social-finance instruments to poverty reduction, financial inclusion, and socioeconomic development. However, less attention has been given to how these instruments can be coordinated with conventional climate-finance resources and institutional partnerships to address the financing constraints faced by underbanked smallholder farmers. This is an important gap because the mobilisation of financial resources alone may not be sufficient; effective implementation also depends on appropriate institutional arrangements, governance structures, regulatory support, and coordination among relevant stakeholders.

Addressing this gap requires consideration of how public institutions, private financial organisations, and philanthropic actors can work together to improve the mobilisation and delivery of inclusive green finance. In this regard, a Public–Private–Philanthropic Partnership (PPPP) offers a useful institutional perspective for examining how different sources of capital and organisational capabilities can be brought together. The potential alignment of existing climate-finance institutions, including the Green Climate Fund (GCF) and the

Development Bank of Nigeria (DBN), with Shariah-compliant financing arrangements also provides an important area for consideration. Such an approach may help bridge the gap between established climate-finance mechanisms and the financial needs of underserved agricultural communities.

Against this background, this study examines the potential of Islamic social finance to advance inclusive green finance for underbanked smallholder farmers in Nigeria. It considers the opportunities and institutional challenges associated with integrating Islamic social finance into the country's broader climate-finance and financial-inclusion landscape. By developing a proposed PPPP-based financing framework and considering an illustrative GCF–DBN pathway, the study seeks to contribute to discussions on institutional coordination and the development of more accessible financing arrangements for climate-resilient agricultural development.

The remainder of this paper is organised into five sections. Following the introduction, Section 2 reviews the literature on microfinance and financial inclusion in Nigeria, climate risks and green finance, and Islamic microfinance. Section 3 explains the research methodology. Section 4 presents and discusses the findings, including the proposed financing arrangements and PPPP framework. Finally, Section 5 provides the conclusion and policy recommendations.

LITERATURE REVIEW

2.1 Microfinance and Financial Inclusion in Nigeria

The evolution of microfinance in Nigeria reflects a transition from traditional informal credit mechanisms towards a regulated institutional framework aimed at improving financial access for low-income populations. Historically, informal savings and credit arrangements existed through rotating contributory schemes known as Esusu, Itutu, Adashi, Bambam and Ajo across different parts of the country (Adeola & Evans, 2017). These arrangements provided opportunities for savings mobilisation and access to funds among individuals who were often excluded from formal banking services. However, limited access to institutional credit also forced many low-income households and small businesses to depend on personal borrowing, self-help groups and informal moneylenders. Recognising the need to expand financial services to underserved populations, the Federal Government of Nigeria introduced the Microfinance Policy, Regulatory and Supervisory Framework (MPRSF) in 2005. According to Moruf (2013), the policy sought to bring informal financial institutions within a regulated supervisory framework under the Central Bank of Nigeria (CBN), strengthen financial infrastructure and improve access to finance for micro, small and medium enterprises (MSMEs).

Microfinance is closely associated with poverty alleviation because it provides financial services that enable low-income individuals to participate in income-generating activities. Okpara (2010) identifies low income, high commodity prices, difficult economic conditions, business failure and inadequate access to start-up or expansion capital as important factors contributing to poverty in Nigeria. The study further suggests that the relationship between microfinance and poverty reduction may occur in different phases, with the longer-term effects of increased access to credit contributing to reductions in poverty. This highlights the potential contribution of microfinance to improving economic opportunities among disadvantaged populations. Nevertheless, access to credit alone does not necessarily guarantee poverty reduction, as the benefits also depend on borrowers' productive capacity, the affordability of financing and the availability of viable economic opportunities.

Despite the expansion of microfinance institutions, financial inclusion remains a multifaceted challenge shaped by geographical, economic, cultural and institutional factors. Adeola and Evans (2017) identify both supply-side barriers, including inadequate financial products and documentation requirements, and demand-side constraints, such as limited financial literacy. Microfinance institutions can help address some of these barriers by providing services such as microcredit, micro-savings and insurance to individuals and enterprises underserved by conventional banks. Abiola (2011) similarly observes that microfinance banks (MFBs) have helped alleviate financing constraints among microenterprises by improving their access to external funds for investment and business development. These contributions demonstrate the importance of microfinance in extending formal financial services to economically disadvantaged groups, although the extent of its impact depends on the accessibility, affordability and suitability of the services provided.

Notwithstanding its potential, the Nigerian microfinance sector faces operational and institutional challenges that constrain its effectiveness. Some microfinance banks have experienced poor performance associated with fraud, mismanagement and a departure from their intended focus on low-income individuals and microenterprises. In addition, the conditions attached to microfinance lending may limit access for the very groups these institutions are intended to serve. Jegede (2011) reports that business owners identify high interest rates, stringent collateral requirements and delays in credit disbursement as significant constraints affecting their use of microfinance facilities. These challenges raise questions about the extent to which conventional microfinance arrangements can adequately accommodate the financial circumstances of vulnerable households and small-scale enterprises. They also highlight the need for financing models that consider the affordability of financial services and the specific needs of underserved populations.

The long-term contribution of microfinance to financial inclusion therefore depends on addressing the institutional, operational and accessibility challenges within the sector. Econometric evidence from Adeola and Evans (2017) indicates that although the short-run relationship between microfinance and financial inclusion may be insignificant, a positive and statistically significant relationship emerges over the long term. Abiola (2011) also associates regular participation in microfinance schemes with improved investment behaviour among businesses. These findings suggest that microfinance can contribute to financial inclusion and economic development when supported by effective institutional arrangements and accessible financing conditions. However, the persistence of high financing costs, collateral requirements and other barriers indicates that conventional microfinance may not adequately address the needs of all financially excluded groups, particularly underbanked smallholder farmers. This provides a basis for examining alternative financing approaches, including Islamic microfinance and Islamic social finance, that may complement existing mechanisms and improve access to inclusive green finance.

2.2 Climate Risks and Green Finance in Nigeria

Climate change represents a significant threat to Nigeria's environmental and economic stability, particularly because of the country's vulnerability to extreme weather events and its dependence on climate-sensitive sectors such as agriculture. The increasing occurrence and intensity of droughts, floods, rainstorms and heatwaves pose serious risks to agricultural productivity, food security and rural livelihoods. According to Enejo and Idoko (2023), these climate-related hazards are among the most frequently reported risks affecting farmers in northern Nigeria, contributing to crop failure, reduced livestock productivity and declining food security. Beyond their effects on agricultural communities, climate-related challenges also create fiscal pressures through the need for disaster relief, adaptation investments and mitigation measures, potentially increasing public expenditure and external financing requirements (Darius et al., 2025). These challenges highlight the importance of mobilising adequate financial resources to strengthen climate resilience while supporting the transition towards a more sustainable and low-carbon economy.

Green finance has emerged as an important mechanism for mobilising financial resources towards environmentally sustainable activities, including climate mitigation, adaptation and the development of resilient infrastructure. In Nigeria, green-finance initiatives are increasingly recognised for their potential contribution to environmental sustainability and economic development. Ehiedu and Eyamu (2023) examine green prevention costs and green internal failure costs, identifying their significant predictive relationship with economic stability, as measured by real gross domestic product (RGDP). Their findings suggest that environmental management initiatives can contribute to economic performance while supporting environmental sustainability. Similarly, carbon finance and green credit provide potential mechanisms for directing financial resources towards environmentally responsible economic activities. These developments demonstrate the relevance of green finance in supporting Nigeria's transition towards sustainable economic growth, although the extent to which its benefits reach vulnerable households and small-scale agricultural producers requires further consideration.

The relationship between green-finance instruments and environmental outcomes is also reflected in the growing use of green securities to support climate-related investments. Pat-Natson et al. (2025) discuss the contribution of green finance to reducing carbon dioxide emissions and promoting environmental sustainability in Nigeria. Similarly, Tanko et al. (2025) highlight the significance of green bonds in financing renewable energy and

sustainable infrastructure, suggesting that these instruments can help address funding gaps in the country's climate-action efforts. Such financing mechanisms are particularly relevant to mitigation activities and large-scale infrastructure development. However, climate adaptation among smallholder farmers also requires accessible financing for agricultural activities and technologies that strengthen resilience to environmental risks. The availability of green-finance resources therefore needs to be considered alongside the institutional arrangements and delivery mechanisms through which vulnerable communities can access them.

Despite the growing recognition of green finance, significant institutional and financial barriers continue to constrain its implementation in Nigeria. Although awareness of green-finance practices exists among construction professionals and financial institutions, actual implementation remains limited. Otali and Monye (2023) identify inadequate technical capacity to assess green projects, perceived investment risks and weak policy frameworks as important barriers to green infrastructure development. These challenges are particularly significant in rural agricultural communities, where smallholder farmers require affordable financing to respond to climate-related risks but often face difficulties accessing formal credit. Abraham and Fonta (2018) report a 63% association between climate-change exposure and the need for finance, while 96% of farmers seeking credit were unable to obtain it, highlighting the financing constraints faced by climate-vulnerable agricultural households. These findings suggest that expanding green finance requires more than mobilising capital; it also requires inclusive delivery mechanisms that address affordability, accessibility and the financial circumstances of vulnerable farmers. This limitation provides a basis for examining alternative and complementary financing approaches, particularly Islamic microfinance and Islamic social finance, that could help extend the benefits of green finance to underbanked smallholder farmers in Nigeria.

2.3 Islamic Microfinance and Islamic Social Finance in Nigeria

Financial exclusion remains a significant challenge in Nigeria, particularly among low-income households and economically disadvantaged communities whose limited access to financial capital constrains their participation in productive activities. Although microfinance was introduced to extend financial services to underserved populations, conventional arrangements may not accommodate the religious and financial preferences of all potential beneficiaries. This is particularly relevant to Muslims who may be reluctant to participate in interest-based lending because of the prohibition of interest (riba) in Islam. Al-Ameen (2016) argues that the limited availability of Shariah-compliant microfinance contributes to financial inequality among economically disadvantaged Muslims, raising concerns about equitable access to financial services and social justice. Islamic microfinance therefore offers an alternative approach based on principles that prohibit interest (riba), gambling (maisir) and excessive uncertainty (gharar), while emphasising fairness and ethical transactions. Abdullahi et al. (2021), using the Decomposed Theory of Planned Behaviour, identify attitude, subjective norms and perceived behavioural control as important determinants of the intention to adopt Islamic microfinance in Nigeria. However, adoption intention should be distinguished from actual usage and measurable financial-inclusion outcomes. Evidence from Northern Nigeria also indicates potential socioeconomic benefits, as Gumel et al. (2014) found improvements in household income, children's education and asset acquisition among recipients of Islamic financing.

Despite these potential benefits, the development of Islamic Microfinance Institutions (IMFIs) in Nigeria faces regulatory, institutional and operational constraints. Maishanu and Nabiha (2024) identify ambiguous regulatory frameworks, high compliance costs and the perception that Islamic microfinance institutions primarily serve Muslim communities as significant barriers to expansion. These challenges are compounded by shortages of skilled personnel and limited financial literacy among some prospective clients. Similarly, Salaudeen and Zakariyah (2022) highlight inadequate government support, insufficient capital and the uneven geographical distribution of financial institutions as constraints to sustainable financial inclusion. These findings suggest that expanding Islamic microfinance requires not only suitable Shariah-compliant products but also supportive regulation, institutional capacity and wider geographical access to financial services.

The diversity of Islamic financing instruments provides opportunities to address the different financial needs of low-income households and small-scale enterprises. In Kwara State, Jimoh et al. (2024) found that *qard hasan*, *murabahah*, *mudarabah* and *musharakah* have statistically significant effects on traders' income levels. These

instruments, however, perform different functions: *qard hasan* provides benevolent, interest-free financing that is repayable, while *murabahah*, *mudarabah* and *musharakah* are commercial arrangements structured around trade, investment and risk-sharing principles. Beyond these financing arrangements, Islamic social finance offers complementary mechanisms for addressing poverty and supporting disadvantaged communities. Hussaini (2017) proposes an integrated model combining awqaf and *zakat* with microfinance, whereby non-repayable social-finance resources can support capital investment and basic consumption needs among the most disadvantaged groups. Such arrangements may reduce dependence on repayable financing, although *zakat* distribution must comply with prescribed beneficiary eligibility conditions, while *waqf* resources must be managed according to the terms governing the endowment.

Building on this complementarity, Salaudeen et al. (2025) introduce the Credit-Plus concept as an approach to strengthening the Nigerian microfinance sector through the mobilisation of Islamic social-finance resources. Their proposed framework combines microcredit with microdeposits and social capital, while incorporating social-welfare support and entrepreneurship training to strengthen the financial ecosystem. This approach moves beyond a model centred exclusively on commercial microcredit and highlights the potential contribution of social-finance resources to the activities of Islamic microfinance institutions. Nevertheless, effective implementation requires transparent resource allocation, appropriate governance, institutional capacity and coordination among relevant stakeholders.

Overall, the literature suggests that Islamic microfinance and Islamic social finance can perform complementary roles in promoting financial inclusion and poverty reduction in Nigeria. Islamic microfinance provides Shariah-compliant financing for productive activities, while social-finance instruments can address welfare needs and provide additional resources for eligible beneficiaries and community development. Their coordinated application may offer opportunities to support underserved groups, including smallholder farmers whose livelihoods are increasingly exposed to climate-related challenges. However, the institutional arrangements required to integrate these instruments with conventional green-finance mechanisms remain an important area for further examination. This provides a basis for investigating how partnership arrangements can enable Islamic social finance to complement conventional green finance in delivering more inclusive financing for climate-resilient agricultural development.

2.4 Public–Private–Philanthropic Partnerships and the Integration of Islamic Social Finance with Conventional Green Finance

The limited capital available to Islamic social finance (ISF) institutions raises the question of how their resources can be combined with larger pools of public and private funding to expand access to green finance among underbanked farmers. Blended finance provides a useful approach to understanding this integration. Havemann et al. (2020) describe blended finance as the strategic use of concessional funding to mobilise additional private investment for development outcomes, while Flammer et al. (2024) highlight the role of public and philanthropic resources in attracting private capital. In this study, such collaboration is conceptualised through public–private–philanthropic partnerships (PPPPs), which provide an institutional arrangement for coordinating different sources of finance and stakeholder responsibilities. Under this arrangement, government institutions may provide policy support, guarantees or concessional funding; private institutions may contribute investment capital and financial expertise; and philanthropic organisations may provide grants or patient capital. These resources can be mobilised through concessional loans, guarantees, technical assistance and risk-sharing arrangements to address financing gaps in sustainable development, including agriculture and climate-related investment (Havemann et al., 2020). However, the developmental benefits of blended finance are not automatic. Cohen et al. (2021) found that financial additionality in donor–private-sector partnerships was often asserted rather than demonstrated, while agricultural financing arrangements frequently favoured commercially viable farmers over more vulnerable smallholders. This suggests that partnership structures must be deliberately designed to ensure that capital mobilisation translates into inclusive development outcomes.

In Nigeria, existing evidence on public–private collaboration in agriculture highlights both its potential and implementation challenges. Nwangwu (2019) observes that although public–private partnerships have been widely adopted in sectors such as transport and power, their application in agriculture remains limited, with

inadequate risk allocation and weak institutional arrangements constraining their effectiveness. The Anchor Borrowers Programme illustrates some of these difficulties, as loan defaults and challenges relating to farmers' awareness and repayment obligations affected its implementation. Similarly, Benjamin et al. (2021), examining the Growth Enhancement Scheme and its e-voucher programme, found that private-sector participation improved access to subsidised agricultural inputs, although geographical barriers, weak rural infrastructure and the possibility of elite capture limited equitable access. These findings indicate that partnerships alone do not guarantee financial inclusion; their effectiveness depends on appropriate risk allocation, institutional coordination and mechanisms that reach vulnerable farmers. Furthermore, the Nigerian studies reviewed largely examine public–private collaboration without incorporating philanthropic or faith-based financing as an additional source of capital. This leaves an important gap concerning how Islamic social finance could complement existing agricultural and green-finance arrangements.

Islamic social finance offers a potential philanthropic dimension to these partnerships through the complementary functions of *zakat*, *waqf* and *infaq*. Rather than replacing conventional green finance, these instruments may address financing needs that commercial capital does not adequately serve. Korkut (2025), for instance, proposes a two-tier climate-financing structure in which *zakat* supports eligible beneficiaries through targeted assistance, while *waqf* provides long-term capital for community assets and sustainable investment. The proposed integration of cash *waqf* with green *sukuk* and Islamic microfinance further illustrates how philanthropic resources could connect with established investment channels. Similarly, Ibrahim (2023) presents a conceptual community green *waqf* model involving local communities, private investors and philanthropic contributions to support renewable-energy infrastructure and agricultural irrigation. These proposals illustrate how Islamic social finance could complement conventional investment through targeted assistance, long-term asset financing and connections with established investment mechanisms. However, their conceptual nature means that they should be understood as proposed financing approaches rather than evidence of established outcomes. Maulina et al. (2023), in a systematic review, similarly find that much of the literature on integrating Islamic social and commercial finance remains conceptual, with limited empirical evaluation of implemented models. The review identifies *waqf* and Islamic microfinance as prominent areas of integration and highlights the need for stronger institutional coordination and legal certainty.

For underbanked smallholder farmers in Nigeria, integrating these financing sources could help address the collateral and affordability constraints that restrict access to conventional green finance. Abraham and Fonta (2018), for example, report substantial difficulties in obtaining agricultural credit among farmers in Northern Nigeria. Within a PPPP arrangement, public guarantees and concessional resources could help address financing risks and encourage conventional banks, development finance institutions and Islamic microfinance institutions to extend funding to farmers who lack formal collateral. Islamic social-finance instruments could perform complementary but distinct functions: *waqf* could support longer-term investments in shared agricultural infrastructure, subject to the conditions governing the endowment; *zakat* could provide targeted assistance to eligible vulnerable farmers; and *infaq* could support non-repayable resilience activities. Conventional green funds and private investment could complement these contributions by financing larger-scale renewable-energy installations, irrigation systems and climate-smart agricultural technologies. Ibrahim's (2023) proposed community green *waqf* model illustrates how renewable-energy generation and agricultural irrigation could be linked within a common financing arrangement. Nevertheless, the suitability of these mechanisms depends on appropriate institutional design, particularly the separation of *zakat* resources from commercial investment and repayable financing obligations, and the protection of *waqf* assets in accordance with their governing conditions.

Despite these opportunities, integrating Islamic social finance with conventional green finance presents significant institutional and governance challenges. Saad and Farouk (2019) identify fragmented administration, weak governance and limited public trust as constraints affecting Nigeria's *zakat* and *waqf* systems. These weaknesses could undermine the accountability and sustainability of integrated financing arrangements. Similarly, Cohen et al. (2021) emphasise the importance of transparency, accountability and independent evaluation in development partnerships, while Maulina et al. (2023) highlight the need for legal certainty and stronger institutional arrangements to support the integration of Islamic social and commercial finance. Successful PPPPs would therefore require clear allocation of responsibilities, appropriate risk-sharing mechanisms, transparent fund management and Shariah-compliant governance. Overall, the literature suggests

that blended finance can mobilise additional resources for sustainable development, while Islamic social finance offers complementary mechanisms for addressing the needs of financially excluded populations. However, limited empirical evidence on their combined application in Nigerian agriculture presents an important research gap. This study addresses this gap by examining the potential integration of Islamic social finance with conventional green finance through a PPPP-based financing pathway for underbanked smallholder farmers in Nigeria. The proposed framework is developed further in Section 4.

RESEARCH METHODOLOGY

This study adopts a qualitative, desk-based research design, employing deductive content analysis to examine the potential integration of Islamic social finance with conventional green finance in advancing financial inclusion among underbanked smallholder farmers in Nigeria. The study relies on secondary data obtained from academic publications, policy documents, institutional reports and relevant case studies. Content analysis provides a systematic approach to examining written, verbal or visual communication to develop a condensed description of a phenomenon through the identification of relevant concepts and categories (Elo & Kyngäs, 2008). Similarly, Krippendorff (1989) describes content analysis as a research technique for making replicable and valid inferences from data within their context. White and Marsh (2006) further explain that the method can be applied across different document types to organise extensive textual information into meaningful categories. These characteristics make content analysis suitable for examining the relationship between financial inclusion, climate vulnerability, Islamic social finance and conventional green-finance mechanisms in Nigeria.

The analytical process follows the three phases of qualitative content analysis identified by Elo and Kyngäs (2008): preparation, organising and reporting. During the preparation phase, relevant secondary materials were examined to develop an understanding of the research subject and identify information related to financial exclusion, climate risks, inclusive green finance and Islamic social finance. The materials included the EFInA Access to Financial Services report and relevant academic studies, policy documents and institutional publications. The unit of analysis consisted of relevant textual segments within these materials that addressed the research objectives. These segments were identified through repeated reading and subsequently organised into manageable units for coding and interpretation. This process enabled the analysis to focus on information directly relevant to the financing challenges faced by underbanked smallholder farmers and the potential contribution of Islamic social finance to inclusive green finance.

The organising phase adopted a deductive approach because the analysis was guided by established concepts and knowledge from the existing literature. According to Elo and Kyngäs (2008), deductive content analysis is appropriate when the analytical structure is developed from previous knowledge. Accordingly, a categorisation framework was informed by the study's central concepts, including financial exclusion, climate vulnerability, Islamic microfinance, Islamic social finance instruments and conventional green finance. Relevant textual segments were coded and grouped according to their relationship with these categories. For example, references to *zakat*, *waqf* and *infaq* were examined in relation to their potential social and developmental functions, while discussions of green finance were considered in terms of financing needs, investment opportunities and barriers to access. The categories were subsequently interpreted to identify areas of complementarity, institutional constraints and opportunities for collaboration among public, private and philanthropic stakeholders. To strengthen the trustworthiness of the analysis, findings from different secondary sources were compared, with attention given to the consistency and relevance of the evidence supporting the identified categories. This process reflects the use of source triangulation discussed by White and Marsh (2006).

In the reporting phase, the resulting categories were synthesised into a coherent discussion of the relationship between financial exclusion, climate-related financing needs and the potential integration of Islamic social finance with conventional green finance in Nigeria. The analysis informed the development of a proposed Public–Private–Philanthropic Partnership (PPPP) framework, illustrating how public institutions, private financial organisations and philanthropic actors could coordinate their resources and institutional capabilities to improve access to inclusive green finance. An illustrative pathway involving the Green Climate Fund (GCF) and the Development Bank of Nigeria (DBN) was also considered to demonstrate how existing climate funds and development-finance institutions could potentially complement Shariah-compliant financing arrangements. The

proposed framework is conceptual and derived from the synthesis of secondary evidence; it is not presented as an empirically tested or validated financing model.

RESULTS AND DISCUSSION

This section discusses how Islamic social finance instruments can advance inclusive green finance for underbanked smallholder farmers in Nigeria. It examines zakat-based financing for poverty alleviation and climate adaptation, including its integration with Islamic microfinance institutions and the Shariah conditions governing beneficiary eligibility. It then explores waqf-integrated capital structures, showing how cash, asset and land *waqf* can be combined with contracts such as *mudarabah*, *murabahah* and *ijarah*, drawing lessons from Nigeria and a proposed productive *waqf* model for solar irrigation in Indonesia. Next, it considers *infaq* as voluntary, non-repayable support for emergency relief and climate-smart agriculture. Finally, it proposes an integrated Public–Private–Philanthropic Partnership framework, illustrated through a conceptual Green Climate Fund–Development Bank of Nigeria pathway for a revolving *qard hasan* facility. The discussion concludes that these pathways depend on transparent governance, regulatory and Shariah compliance, and adaptation to Nigeria's institutional context.

Zakat-Based Financing for Climate Adaptation and Poverty Alleviation

Zakat offers an important mechanism for addressing poverty and supporting financially vulnerable populations whose livelihoods are increasingly exposed to climate-related risks. Its integration with Islamic microfinance institutions (IMFIs) provides a potential institutional pathway for extending financial support to disadvantaged communities, including smallholder farmers. Salaudeen et al. (2025) highlight the importance of establishing Islamic microfinance arrangements that incorporate Islamic social-finance resources to improve access to capital among impoverished populations. Their discussion draws on Sudan's Diwan al Zakah model, which provides an example of the potential role of *zakat* institutions in supporting economically vulnerable groups, including drought-affected farmers. Similarly, Ismail and Possumah (2013) propose a theoretical model for zakat-based Islamic microfinance institutions, highlighting the potential of obligatory charitable contributions to complement microfinance activities and support poverty reduction. These perspectives suggest that *zakat* can contribute to financial inclusion by providing targeted assistance to eligible beneficiaries who may otherwise be excluded from conventional financing arrangements.

The relevance of this approach is particularly evident in Nigeria, where climate-related risks and limited access to agricultural credit create significant challenges for smallholder farmers. Enejo and Idoko (2023) identify droughts, floods, rainstorms and heatwaves as major climate risks affecting farmers in Northern Nigeria. Their findings also indicate that 96% of farmers seeking credit were unable to obtain it, highlighting the difficulties vulnerable agricultural households face in accessing financial resources for climate adaptation. Within this context, *zakat* could provide targeted assistance to eligible farmers to support livelihood recovery, access to agricultural inputs and the adoption of climate-resilient practices. Where financing is required in the form of *qard hasan*, it is important to distinguish the repayable, interest-free loan arrangement from *zakat* distribution. Any proposed integration of the two would require an appropriate institutional and Shariah-compliant structure that preserves the prescribed purposes and eligibility conditions of *zakat*. Similarly, the classification of indebted farmers under the *gharimin* category requires assessment of their eligibility rather than automatic qualification following climate-related agricultural losses.

Beyond its poverty-alleviation function, zakat-based support also has an important equity dimension in the Nigerian context. Al-Ameen (2016) argues that the limited availability of Shariah-compliant microfinance options contributes to financial inequality among poor Muslims whose religious beliefs discourage participation in interest-based lending. Integrating *zakat* with Islamic microfinance could therefore help address both the affordability and accessibility dimensions of financial exclusion, while supporting vulnerable farmers in responding to climate-related challenges. Potential applications include targeted assistance for drought-resistant agricultural inputs, improved irrigation access and other climate-resilient agricultural practices. However, the effectiveness of this approach depends on transparent *zakat* administration, appropriate beneficiary identification, institutional accountability and compliance with Shariah requirements. Accordingly, *zakat* is best

understood as a complementary social-finance mechanism that can strengthen the poverty-alleviation and inclusion functions of Islamic microfinance, rather than as a substitute for commercial or repayable agricultural financing.

Waqf-Integrated Capital Structures for Sustainable Green Investment

Waqf offers a potential mechanism for mobilising long-term resources to support green investment among underbanked smallholder farmers and micro, small and medium-sized enterprises (MSMEs). Unlike financing arrangements that depend primarily on short-term lending, *waqf* can provide a more sustained source of support through the preservation and productive use of endowed assets. Abdullahi et al. (2022) argue that waqf-based Islamic microfinance institutions can provide low-cost capital to underprivileged business owners, including those who may lack conventional collateral. The income generated from *waqf* properties may also support the activities of microfinance institutions, subject to the terms of the endowment and appropriate management. This approach is relevant to Nigeria, where the high cost of green technologies and weaknesses in financing structures constrain their adoption (Otali & Monye, 2023).

Waqf can support inclusive green finance through several complementary arrangements. Cash *waqf* and crowdfunding-based *waqf* can mobilise contributions for renewable-energy installations, sustainable agricultural technologies and climate-resilient infrastructure. Islamic microfinance institutions may serve as *waqf* managers or trustees, depending on the applicable legal and institutional arrangements, and administer the funds through Shariah-compliant financing structures. Saad and Anuar (2009) discuss the use of arrangements such as mudarabah and murabahah to provide financing to micro-entrepreneurs, with returns potentially channelled back into the *waqf* fund. In this way, the productive use of *waqf* resources may support the continuity of financing for community development. However, the preservation of the endowed capital, the allocation of returns and the conditions governing their use must remain consistent with the terms of the *waqf*.

Waqf assets may also support access to green technologies through leasing arrangements such as *ijarah*. For example, endowed equipment or other productive assets could be made available to farmers and small enterprises without requiring them to purchase the assets outright. Volz et al. (2020) discuss M-Kopa's pay-as-you-go solar model in Kenya, which uses digital financial services to facilitate access to solar systems. Although M-Kopa is not a waqf-based initiative, it provides an example of how digital payment arrangements can support the delivery and use of renewable-energy technologies. A Nigerian waqf-based model could draw on similar delivery approaches by combining professionally managed endowed assets with suitable digital financial services. Such an arrangement would require clear provisions for asset ownership, maintenance, user payments and the use of any resulting income.

Evidence from Nigeria indicates the potential for combining *waqf* with Islamic microfinance, although institutional challenges remain. Zauro et al. (2020), through content analysis, suggest that integrating *waqf* and microfinance institutions could promote financial inclusion and socioeconomic development in Northern Nigeria by supporting disadvantaged groups through Islamic microfinance. Nevertheless, Saad and Farouk (2019) identify fragmented administration, weak governance and limited public trust as constraints affecting the management of *zakat* and *waqf* in Nigeria. These challenges highlight the importance of transparent fund administration, competent *waqf* management and clear accountability arrangements if *waqf* resources are to support sustainable green investment.

A relevant comparative example is provided by Hendrasto et al. (2024), who examine solar-powered irrigation in Krandegan Village, Central Java, Indonesia. Rice farming in the village had depended heavily on seasonal rainfall, contributing to crop failures and limiting farmers to one harvest annually. A grant-funded 18-kilowatt solar power plant installed in 2022 enabled irrigation across 35 hectares and increased the potential for up to three harvests annually. However, the installation did not cover all the village's paddy fields, and plans for a second unit were delayed by a shortage of funds. In response, Hendrasto et al. (2024) developed a proposed productive waqf-based financing model informed by interviews with seven stakeholders. Under the proposed arrangement, cash *waqf* collected through a Baitul Maal wat Tamwil (BMT) would support equipment, operations and maintenance; asset *waqf* would provide buildings and equipment; and land *waqf*, managed in

cooperation with a pesantren, would provide installation sites. A *nadzir* (*waqf* manager) would oversee the arrangement, while surplus returns could be reinvested in other *waqf* projects and community needs. Importantly, the *waqf* model is a proposed design rather than an arrangement that financed the existing solar installation or has demonstrated the projected outcomes.

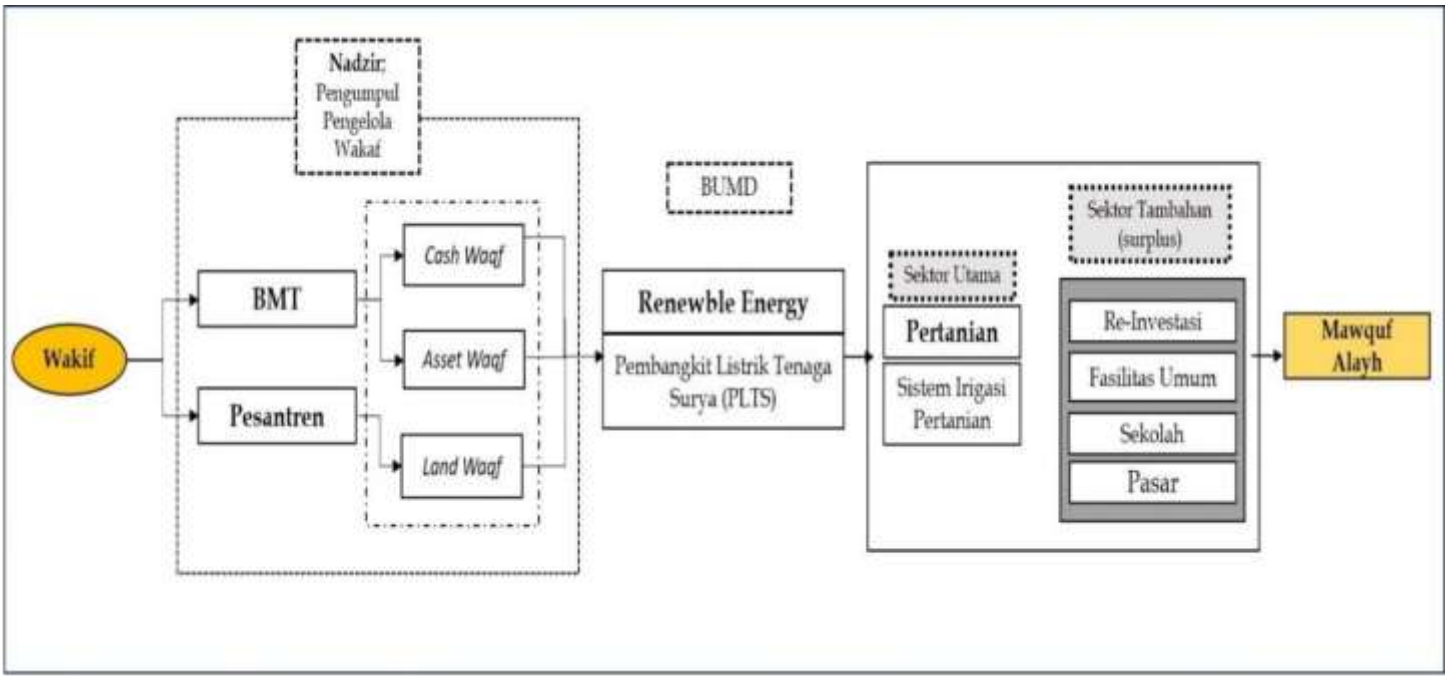


Figure 1: Productive waqf-based financing model for solar-powered irrigation in Krandegan Village, Central Java, Indonesia

Source: Hendrasto et al. (2024)

The Krandegan example nevertheless offers useful insights for the proposed Nigerian framework. It illustrates how cash, asset and land *waqf* could be combined to support shared green infrastructure, while community institutions could contribute to resource mobilisation and asset management. For Nigeria, Islamic microfinance institutions could potentially coordinate cash *waqf* mobilisation and financing, while relevant community organisations and technical partners could support land access, installation and maintenance. However, the transferability of the Indonesian model depends on differences in the legal, institutional and agricultural contexts of both countries. Its application in Nigeria would therefore require context-specific adaptation, professional *waqf* management and transparent governance.

Infaq-Supported Resilience Building and Climate-Smart Agriculture

Infaq, which refers to voluntary charitable expenditure, offers another potential source of support for strengthening climate resilience and promoting the adoption of climate-smart agricultural practices among smallholder farmers. According to Elbanna (2024), *infaq* involves voluntary spending in the cause of Allah and may take different forms, including financial contributions to charitable organisations and support for community projects. In the Nigerian context, where smallholder farmers face increasing climate-related risks and difficulties accessing formal finance, *infaq* could provide additional resources for adaptation activities that may not attract commercial financing. Its voluntary nature also offers an opportunity for philanthropic organisations, community groups and individual donors to contribute to agricultural resilience initiatives.

The relevance of *infaq* is particularly evident in addressing the immediate and longer-term challenges associated with climate change. Enejo and Idoko (2023) identify altered growing seasons, increased heat stress, water scarcity, droughts, floods, pest outbreaks and biodiversity loss as factors affecting agricultural productivity in Northern Nigeria. Through Islamic microfinance institutions and other appropriate community organisations, *infaq* contributions could support emergency assistance for farmers affected by climate-related disruptions. They

could also help finance adaptation activities, including access to drought-resistant seeds, efficient irrigation systems and soil-conservation measures. These applications correspond with the broader climate-adaptation approach described in the Global Commission on Adaptation (2019), which emphasises the need to reduce climate risks, prepare for their effects and restore livelihoods and systems following climate-related shocks. In this regard, *infaq* could support both immediate recovery and the adoption of practices that strengthen farmers' capacity to manage future climate risks.

Infaq also complements other Islamic social-finance instruments by addressing needs that may not be adequately covered by their respective functions. *Zakat* is distributed to beneficiaries who meet prescribed eligibility conditions, while *waqf* supports designated purposes through the productive use of endowed assets and their returns. *Infaq*, by contrast, provides a voluntary source of assistance that can be directed towards charitable and community-development activities in accordance with applicable donor intentions and requirements. It could therefore support emergency relief, agricultural training, access to climate-smart inputs and community-based resilience projects, without imposing the repayment obligations associated with financing arrangements such as *qard hasan*. When coordinated with *zakat*, *waqf* and Islamic microfinance, *infaq* could strengthen the range of support available to climate-vulnerable smallholder farmers. However, effective implementation would require transparent management, appropriate allocation of contributions and clear accountability for the use of donated resources.

Integrated Public–Private–Philanthropic Financing Framework for Inclusive Green Finance in Nigeria

This study proposes an integrated Public–Private–Philanthropic Partnership (PPPP) framework for improving access to inclusive green finance among underbanked smallholder farmers in Nigeria. The framework seeks to coordinate Islamic social finance with conventional green-finance mechanisms by bringing together public institutions, private financial organisations and philanthropic actors. Rather than treating Islamic social finance as a standalone funding source, the proposed approach positions it as a complementary mechanism for mobilising resources, supporting vulnerable beneficiaries and facilitating access to climate-related investment. Through this arrangement, the different stakeholders can contribute their financial resources, institutional capabilities and technical expertise towards climate-resilient agricultural development.

The public pillar comprises government ministries, regulatory agencies and development finance institutions responsible for providing policy support, institutional coordination, appropriate regulatory arrangements and access to eligible public resources. These institutions could also facilitate concessional financing, guarantees and technical assistance to encourage investment in climate-related agricultural activities. The private pillar includes Islamic microfinance institutions, commercial banks, private investors and agribusiness enterprises that could contribute investment capital, financial services, technical expertise and agricultural value-chain support. The philanthropic pillar comprises *zakat* and *waqf* institutions, charitable foundations, Islamic social finance organisations and individual donors that mobilise resources through *zakat*, *waqf*, *sadaqah* and *infaq*. Coordination among these three pillars is intended to improve the mobilisation and delivery of finance to underserved farming communities.

Within the proposed framework, Islamic social finance and Islamic financing contracts perform different but complementary functions. *Zakat* could provide targeted assistance to farmers who satisfy the prescribed *asnaf* eligibility conditions, while *waqf* could support productive agricultural assets and shared infrastructure in accordance with the terms governing the endowment. *Sadaqah* and *infaq* could provide additional voluntary support for eligible beneficiaries and community resilience activities, subject to donor intentions. In contrast, *qard hasan* provides repayable, interest-free financing, *murabahah* can facilitate the acquisition of agricultural inputs and equipment, and *ijarah* can support access to machinery and irrigation facilities through leasing arrangements. Maintaining these distinctions is essential to ensure that each instrument is used in accordance with its relevant legal, contractual and Shariah requirements.

The integration of these instruments with conventional green finance could expand the range of resources available for climate-resilient agricultural development. Korkut (2025) proposes a two-tier climate-financing structure in which *zakat* supports eligible beneficiaries while *waqf* contributes to longer-term community assets,

with possible connections to cash *waqf*, green *sukuk* and Islamic microfinance. Similarly, Ibrahim (2023) presents a conceptual community green *waqf* model involving local communities, private investors and philanthropic contributions to support renewable-energy infrastructure and agricultural irrigation. These proposals illustrate possible ways of connecting Islamic social finance with wider investment mechanisms. However, they remain conceptual approaches and would require adaptation to Nigeria's institutional, regulatory and Shariah-governance context.

Despite these opportunities, the effectiveness of the proposed framework would depend on strong institutional coordination and transparent governance. Saad and Farouk (2019) identify fragmented administration, weak governance and limited public trust as constraints affecting *zakat* and *waqf* institutions in Nigeria. Cohen et al. (2021) emphasise the importance of transparency, accountability and independent evaluation in development partnerships, while Maulina et al. (2023) highlight the need for legal certainty and stronger institutional arrangements when integrating Islamic social and commercial finance. Accordingly, the proposed PPPP framework would require clearly defined stakeholder responsibilities, transparent resource allocation, appropriate risk-management arrangements, Shariah oversight and regular monitoring. Particular attention would also be needed to ensure that financing reaches financially excluded smallholder farmers rather than being concentrated among more commercially established agricultural producers.

An illustrative application of the framework involves the Green Climate Fund (GCF) and the Development Bank of Nigeria (DBN). The GCF provides climate-finance support through instruments such as grants, concessional loans, guarantees and equity, while accredited entities develop and implement funding proposals in accordance with the Fund's requirements. In Nigeria, the National Council on Climate Change (NCCC) serves as the National Designated Authority, providing an institutional link for country-level engagement with the GCF. As a GCF-accredited national Direct Access Entity, DBN could potentially provide a channel for developing and administering climate-finance programmes targeting underserved agricultural communities.

Subject to GCF approval and applicable funding conditions, DBN could develop a climate-finance programme incorporating a revolving *qard hasan* facility for underbanked smallholder farmers. Under this proposed arrangement, approved grant resources could support the establishment of the facility, which DBN could administer through participating Islamic financial institutions or other eligible intermediaries. Farmers would receive interest-free financing and repay the principal according to agreed terms, allowing repayments to be recycled for additional eligible beneficiaries. Participating institutions could be responsible for farmer assessment, financing administration and repayment monitoring, while technical assistance, financial literacy and climate-smart agricultural training could be incorporated to strengthen farmers' capacity. Clear procedures would also be required to address repayment difficulties, agricultural losses and other risks that could affect the sustainability of the revolving facility.

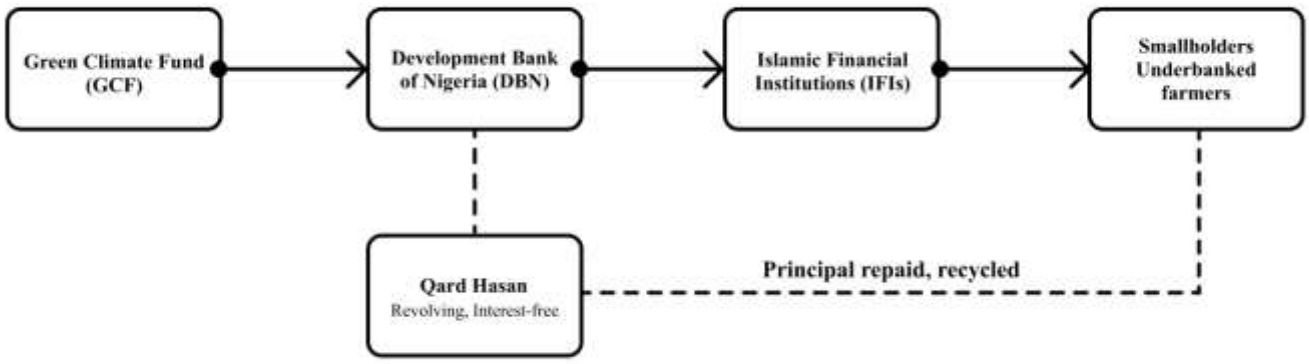


Figure 2: Illustrative GCF–DBN pathway for a Shariah-compliant Qard Hasan facility for underbanked smallholder farmers

Source: Authors' illustration based on the proposed framework

Islamic social finance could complement the proposed GCF–DBN arrangement through separate and appropriately governed financing streams. *Zakat* could provide assistance to farmers who meet the prescribed beneficiary conditions, while *waqf* could support productive agricultural assets in accordance with endowment requirements. *Sadaqah* and *infaq* could provide additional non-repayable support for eligible farmers and community resilience activities, consistent with donor intentions. Other financing needs could be addressed through murabahah for agricultural inputs and equipment or *ijarah* for machinery and irrigation facilities. Overall, the proposed PPPP framework and illustrative GCF–DBN pathway demonstrate how public resources, private investment and philanthropic contributions could be coordinated to improve access to Shariah-compliant green finance. Nevertheless, the arrangement remains conceptual and would depend on institutional capacity, regulatory and Shariah compliance, appropriate financing structures, effective farmer identification, technical support and transparent monitoring before it could be implemented.

CONCLUSION AND RECOMMENDATION

This study examined the potential integration of Islamic social finance and conventional green finance as a pathway for advancing inclusive green finance in Nigeria amid persistent financial exclusion and increasing climate vulnerability. The analysis suggests that conventional green-finance mechanisms may remain difficult to access for financially excluded households, micro, small and medium-sized enterprises (MSMEs), and underbanked smallholder farmers due to collateral requirements, formal documentation and financing costs. Consequently, climate-vulnerable populations may face difficulties accessing financing opportunities despite their exposure to the impacts of climate change. The study therefore highlights the potential of Islamic social finance and Shariah-compliant financing arrangements to complement conventional green finance in addressing these barriers. Through appropriate institutional coordination, these instruments could support financial inclusion, strengthen socio-economic resilience and facilitate participation in climate-smart agricultural activities.

Zakat (mandatory almsgiving) performs a redistributive function by directing resources to individuals who meet the prescribed beneficiary conditions. Evidence from Pakistan suggests that *zakat* can contribute to reducing financial exclusion by providing targeted assistance to underprivileged populations (Hunjra et al., 2024; Khan et al., 2019). In the Nigerian context, *zakat* could complement existing support mechanisms by assisting eligible underbanked farmers, particularly those affected by poverty and climate-related shocks. Such assistance could support basic livelihood needs and, where appropriate, enable beneficiaries to participate in climate-resilient agricultural activities. However, *zakat* distribution must remain consistent with the prescribed *asnaf* categories and should not be treated as a general source of repayable agricultural financing.

Waqf (endowment) and *infaq* (voluntary charitable expenditure) can complement *zakat* by supporting longer-term development and immediate community needs. While *waqf* can provide resources for productive assets, agricultural infrastructure, training facilities and community development in accordance with endowment conditions, *infaq* and *sadaqah* can provide voluntary, non-repayable assistance for eligible beneficiaries and resilience-building activities (Hunjra et al., 2024; Mustaffha & Johari, 2026). For underbanked farmers, these instruments could support an enabling environment for inclusive green finance by improving access to shared agricultural facilities, knowledge and community-based support. Their effective application would, however, depend on transparent management, appropriate institutional arrangements and compliance with donor intentions and endowment requirements.

Qard hasan (benevolent loans) provides repayable, interest-free financing to individuals and small businesses that may face difficulties accessing conventional credit (Lamraoui Boudoukha et al., 2026; Md Saad et al., 2026). For underbanked smallholder farmers in Nigeria, this instrument could provide access to financing for agricultural inputs, climate-smart technologies and small-scale productive activities without interest-based obligations. Other Shariah-compliant financing arrangements, including murabahah for agricultural inputs and equipment and ijarah for machinery and irrigation facilities, could address different agricultural financing

requirements. These products offer potential ways of extending financing opportunities to underserved farmers while maintaining compliance with Islamic financial principles.

Islamic microfinance institutions (IMFIs) can facilitate the delivery of these financing arrangements through appropriate financial products and institutional partnerships. Models involving profit-and-loss sharing and other Shariah-compliant financing mechanisms have been associated with financial inclusion and sustainable development in countries such as Bangladesh, Malaysia and Turkey (Md Saad et al., 2026). In Nigeria, Abdullahi et al. (2021) identify factors influencing the intention to adopt Islamic microfinance, including attitudes, subjective norms and perceived behavioural control. This indicates the importance of public awareness and perceptions in encouraging potential adoption, although intention should not be equated with actual uptake. Integrating suitable green-finance objectives into Islamic microfinance operations could therefore provide underbanked farmers with financing opportunities for environmentally sustainable agricultural activities.

Despite this potential, the integration of Islamic social finance with conventional green finance in Nigeria faces regulatory uncertainty, institutional capacity constraints, governance challenges and limited public awareness. Fragmented *zakat* and *waqf* administration, insufficient technical expertise in green-project assessment and weak coordination among relevant stakeholders could restrict the effective mobilisation and distribution of resources. In response to these challenges, the study proposes a Public–Private–Philanthropic Partnership (PPPP) framework that brings together government institutions, private financial organisations and philanthropic actors. The illustrative Green Climate Fund–Development Bank of Nigeria (GCF–DBN) pathway further demonstrates how approved climate-finance resources could potentially support a revolving *qard hasan* facility through DBN and participating Islamic financial institutions or eligible intermediaries. This arrangement would remain subject to the relevant GCF approval requirements, institutional capacity and appropriate financing and governance structures.

Accordingly, the study recommends strengthening the regulatory and institutional framework for Islamic social finance and its coordination with national climate-finance and financial-inclusion strategies. Development finance institutions, particularly DBN, should explore the feasibility of climate-finance programmes targeting underbanked smallholder farmers, subject to applicable GCF approval and funding conditions. Islamic financial institutions should develop suitable Shariah-compliant products, including *qard hasan*, *murabahah* and *ijarah*, to address different agricultural financing needs. *Zakat* and *waqf* institutions should strengthen professional fund management, transparency and accountability while maintaining the distinct requirements of each instrument. Capacity building, digital financial services, financial literacy and climate-smart agricultural training should also be incorporated into financing programmes to improve farmer access and effective use of funds. Finally, further empirical research is needed to assess the institutional feasibility, financial sustainability and potential outcomes of the proposed PPPP framework and GCF–DBN pathway. Since the framework remains conceptual and has not been empirically validated, its practical implementation would require further assessment involving relevant institutions and smallholder farming communities.

ACKNOWLEDEMENT

AI Usage Statement

During the preparation of this study, we employed AI tools, including ChatGPT 4o, to improve the article's readability, and Grammarly to ensure grammatical accuracy. Following the use of these tools, we carefully reviewed and validated the final version of the manuscript. As the authors, we assume full responsibility for the content of the published work.

REFERENCES

1. Abdullahi, A., Othman, A. H. A., & Kassim, S. (2021). Financial inclusion enhancement through the adoption of Islamic microfinance in Nigeria. International Journal of Ethics and Systems, 37(3), 486-505. https://doi.org/10.1108/IJOES-02-2021-0040

2. Abdullahi, A., Othman, A. H. A., & Kassim, S. H. (2022, March). Promoting the adoption of Islamic microfinance in Nigeria: the moderating role of religiosity. In International Conference on Business and Technology (pp. 603-618). Cham: Springer International Publishing.
3. Abiola, B. (2011). Impact analysis of microfinance in Nigeria. International Journal of Economics and Finance, 3(4), 217-225.
4. Abraham, T. W., & Fonta, W. M. (2018). Climate change and financing adaptation by farmers in northern Nigeria. Financial innovation, 4(1), 11.
5. Adedeji, M., Sidique, S. F., & Rahman, A. A. (2020). Green banking practice and sustainable development in Nigeria. Environment, Development and Sustainability, 22(6), 5661-5683.
6. Adeola, O., & Evans, O. (2017). The impact of microfinance on financial inclusion in Nigeria. The Journal of Developing Areas, 51(4), 193-206.
7. Al-Ameen, A. (2016). Implementing Islamic microfinance in Nigeria: a matter of equity and social justice. Journal of Sustainable Development Law and Policy (The), 7(2), 211-246.
8. Alaro, A. A., & Alalubosa, A. H. (2019). Potentials of Sharī'ah Compliant Microfinance in Alleviating Poverty in Nigeria: A Lesson from Bangladesh.
9. Benjamin, E.O., Ola, O., Lang, H. et al. Public-private cooperation and agricultural development in Sub-Saharan Africa: a review of Nigerian growth enhancement scheme and e-voucher program. Food Sec. 13, 129–140 (2021). https://doi.org/10.1007/s12571-020-01130-y
10. Cohen, M. J., Godfrey, C., Jeune, H., & Kindornay, S. (2021). "Flash blending" development finance: how to make aid donor–private sector partnerships help meet the SDGs. Development in Practice, 31(7), 946–960. https://doi.org/10.1080/09614524.2021.1911948
11. Darius, R., Billot, A., Massetti, E., & Vernon-Lin, N. (2025). Macroeconomic Implications of Climate Challenges: Nigeria. International Monetary Fund: Selected Issues Papers, 2025(097). https://doi.org/10.5089/9798229018692.018.A001
12. Ehiedu, V. C., & Eyamu, F. O. (2023). Green financing initiatives and economic stability in Nigeria. Advance Journal of Management, Accounting and Finance, 8(6), 10-20.
13. Enhancing Financial Innovation & Access (EFInA). (2026). Access to Financial Services in Nigeria 2026 Survey — Key Highlights. Lagos: EFInA. https://a2f.ng/download/8756/?tmstv=1792494571
14. Elbanna, M. (2024). The Development of Zakat, Infaq, Sadaqah in Egypt: A Literature Review Approach. Demak Universal Journal of Islam and Sharia, 2(03), 375-388.
15. Elo, S., & Kyngäs, H. (2008). The qualitative content analysis process. Journal of advanced nursing, 62(1), 107-115.
16. Enejo, D. O. W., & Idoko, G. J. (2023). Assessing Green Finance Solutions To Mitigate Climate Change Risks For Farmers In Northern Nigeria.
17. Flammer, C., Giroux, T., & Heal, G. (2024). Blended finance (NBER Working Paper No. 32287; revised May 2026). National Bureau of Economic Research. http://www.nber.org/papers/w32287
18. Global Commission on Adaptation (2019), Adapt Now: A Global Call for Leadership on Climate Resilience. Washington, DC: The New Climate Economy.
19. Gumel, G. B., Saad, N. M., & Kassim, S. H. (2014). Assessing the impact of Islamic microfinance on poverty alleviation in Northern Nigeria. Journal of Islamic Economics, Banking and Finance, 10(4), 37-49.
20. Havemann, T., Negra, C. & Werneck, F. Blended finance for agriculture: exploring the constraints and possibilities of combining financial instruments for sustainable transitions. Agric Hum Values 37, 1281–1292 (2020). https://doi.org/10.1007/s10460-020-10131-8
21. Hendrasto, N., Mukhlısın, M., Harisuddin, H., & Chairiyati, F. (2024). Designing Productive Waqf-Based Financing Model for Renewable Energy Investments Project : Empirical Evidence From Indonesia. Karatay İslam İktisadı Ve Finans Dergisi, 2(2), 159-171. https://izlik.org/JA29TT62NR
22. Hunjra, A. I., Arunachalam, M., & Hanif, M. (2024). The Role of Islamic Social Finance in Poverty Eradication. In Islamic Finance in the Modern Era Digitalization Fintech and Social Finance. https://doi.org/10.4324/9781003366751-3
23. Hussaini, M. (2017). Islamic Micro Finance Bank: an alternative tool for poverty alleviation in Northern Nigeria. İslam Ekonomisi ve Finansı Dergisi (İEFD), 3(1), 59-70.

24. Ibrahim, A.-J. (2023). Renewable energy financing in Islamic finance: A community green waqf financing model for rural electrification. SSRN. https://doi.org/10.2139/ssrn.4341419
25. Ismail, A. G., & Possumah, B. T. (2013). Theoretical model for zakat-based Islamic microfinance institutions in reducing poverty. International Research Journal of Finance and Economics, 103(1), 136-150.
26. Jegede Abimbola. O (2011). Analysis of factors that affect the performance of micro enterprises in selected local government area of Oyo State, Unpublished M.Tech Thesis presented to the department of Management and Accounting, Ladoke Akintola University of Technology, Ogbomoso.
27. Jimoh, A., Bamigbade, D., & Kolawole, K. (2024). Islamic microfinance as a panacea for poverty alleviation. European Journal of Islamic Finance, 11(1), 17-30.
28. Khan, S., Sheikh, A. E., Abu Bakar, M., & Abidullah. (2019). Zakat - financial inclusion nexus: Empirical evidence from pakistan. International Journal of Innovation Creativity and Change, 8(9), 18–30.
29. Korkut, C. Waqf and zakat as drivers of community-based climate resilience in the net zero transition. Discov glob soc 3, 178 (2025). https://doi.org/10.1007/s44282-025-00333-y
30. Krippendorff, K. (2018). Content analysis: An introduction to its methodology. Sage publications.
31. Lamraoui Boudoukha, R., Obaid Hasan Saleh, A., & Sharofiddin, A. (2026). The Role of Islamic Finance in Achieving Financial Inclusion in Algeria. In Innovation and Transformation of Islamic Economics. https://doi.org/10.4018/979-8-3373-2655-9.ch006
32. Maishanu, U. A., & Nabiha, A. K. (2024). An Analysis of Nigeria's Islamic Microfinance Institutions Challenges and Future Prospects. Global Business & Management Research, 16(3).
33. Maulina, R., Dhewanto, W., & Faturohman, T. (2023). The integration of Islamic social and commercial finance (IISCF): Systematic literature review, bibliometric analysis, conceptual framework, and future research opportunities. Heliyon, 9(11), e21612. https://doi.org/10.1016/j.heliyon.2023.e21612
34. Md Saad, N. Bt., Uddin, M. N., Ismail, Y. B., & Nahar, L. (2026). An Impact Assessment of Islamic Microfinance on Achieving Sustainable Development Goals (SDGs): A Comparative Study in Bangladesh, Malaysia, and Turkey. In Modern Trends in Islamic Economy Philanthropy Finance and Marketing Innovations. https://doi.org/10.1108/978-1-80592-543-9
35. Morduch, J. (1999). The microfinance promise. Journal of economic literature, 37(4), 1569-1614.
36. Moruf, O. (2013). Evaluation of the Nigerian microfinance banks credit administration on small and medium scale enterprises operations. International Review of Management and Business Research, 2(2), 505-517.
37. Mustaffha, N. & Johari, N. (2026). Synergizing Islamic Social Finance With Maqasid Al-Shariah. In M. Ab. Aziz, A. Rafiki, & F. Johari (Eds.), Synergizing Islamic Finance for Sustainability (pp. 331-358). IGI Global Scientific Publishing. https://doi.org/10.4018/979-8-3373-1842-4.ch012
38. Niang, I., Ruppel, O.C., Abdrabo, M.A., Essel, A., Lennard, C., Padgham, J. and Urquhart, P. (2014) Africa. In: Barros, V.R., Field, C.B., Dokken, D.J., Mastrandrea, M.D., Mach, K.J., Bilir, T.E., Chatterjee, M., Ebi, K.L., Estrada, Y.O., Genova, R.C., Girma, B., Kissel, E.S., Levy, A.N., MacCracken, S., Mastrandrea, P.R. and White, L.L., Eds., Climate Change 2014: Impacts, Adaptation, and Vulnerability. Part B: Regional Aspects. Contribution of Working Group II to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change, Cambridge University Press, Cambridge, 1199-1265.
39. Nwangwu, G. (2019). Improving agriculture in Nigeria through public-private partnerships . African Journal of Business Management, 13(8), 256-263. https://doi.org/10.5897/AJBM2018.8690
40. Okpara, G. C. (2010). Microfinance banks and poverty alleviation in Nigeria. Journal of Sustainable development in Africa, 12(6), 177-191.
41. Otali, M., & Monye, C. (2023). IMPLEMENTATION OF GREEN FINANCE AS A CATALYST FOR GREEN INFRASTRUCTURE DEVELOPMENT IN NIGERIA. Journal of Contemporary Research in the Built Environment, 7(2), 51-64. https://doi.org/10.68128/jocrebe.2023.segx7z8s
42. Pat-Natson, H. F., George, S., & Nwoye, M. I. (2025). Green Finance and Environmental Sustainability in Nigeria: Evaluating the Role of Carbon Finance, Green Credit, and Green Securities. https://doi.org/10.57239/PJLSS-2025-23.1.00520

43. Saad, N. M., & Anuar, A. (2009). 'Cash Waqf'and Islamic Microfinance: Untapped Economic Opportunities. ICR Journal, 1(2), 337-354.
44. Saad, R. A. J., & Farouk, A. U. (2019). A comprehensive review of barriers to a functional zakat system in Nigeria: what needs to be done?. International Journal of Ethics and Systems, 35(1), 24-42.
45. Salaudeen, A. O., Camdzic, E., & Redzuan, N. H. (2025). The Role of Islamic Social Finance in Strengthening Islamic Microfinance Institutions for Poverty Alleviation in Nigeria: A Synergistic Conceptual Framework. Journal of Islamic Finance, 14(2), 45-57.
46. Salaudeen, A. O., & Zakariyah, H. (2022). Challenges hindering islamic microfinance banks' sustainable financial inclusion: A case of al-hayat microfinance bank in Ogun State, Nigeria. El Barka: Journal of Islamic Economics and Business, 5(1), 24-50.
47. Sengupta, R., & Aubuchon, C. P. (2008). The microfinance revolution: An overview. Federal Reserve Bank of St. Louis Review, 90(January/February 2008).
48. Tanko, Y., Magaji, S., & Musa, I. (2025). Effect of green finance on climate change mitigation in Nigeria.
49. Volz, U., J. Böhnke, V. Eidt, L. Knierim, K. Richert, and G.-M. Roeber (2015), Financing the Green Transformation – How to Make Green Finance Work in Indonesia, Houndmills, Basingstoke: Palgrave Macmillan.
50. Volz, U., Knaack, P., Nyman, J., Ramos, L., & Moling, J. (2020). Inclusive green finance: From concept to practice. Kuala Lumpur and London: Alliance for Financial Inclusion and SOAS.
51. White, M. D., Marsh, E. E., Marsh, E. E., & White, M. D. (2006). Content analysis: A flexible methodology. Library trends, 55(1), 22-45.
52. Zauro, N. A., Saad, R. A. J., Ahmi, A., & Mohd Hussin, M. Y. (2020). Integration of Waqf towards enhancing financial inclusion and socio-economic justice in Nigeria. International Journal of Ethics and Systems, 36(4), 491-505. https://doi.org/10.1108/IJOES-04-2020-0054
53. Umeaduma, Chidimma Maria-Gorretti (2023). Financial inclusion strategies for poverty reduction and economic empowerment in underbanked rural populations globally. World Journal of Advanced Research and Reviews, 2023, 18(1), 1263-1280. https://doi.org/10.30574/wjarr.2023.18.1.0709