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TECHNICAL REPORT

Context Assessment for Farmer-Led Irrigation Investment in Kenya

Christopher Agyekumhene, Joshua Mbai, and Seifu Tilahun

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Authors

Christopher Agyekumhene, Researcher- Sustainable Finance, International Water Management Institute (IWMI), Accra, Ghana.
Joshua Mbai, Independent Consultant - Evaluation and Learning, Nairobi, Kenya.
Seifu Tilahun, Senior Researcher – Hydrology and Water Resources Management, IWMI, Accra, Ghana.

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Summary

This assessment was commissioned under area of work 4 of the Scaling for Impact program to provide an overview of the context for farmer-led irrigation investment in Kenya. The study consisted of a desk review of scientific literature, government policies, and grey sources including donor reports to map the enabling environment, identify how irrigation investments are currently financed, and where critical gaps exist, particularly for smallholders.

The study reveals that farmer-led irrigation continues to grow incrementally across Kenya, but scaling is constrained by several factors including high upfront costs for irrigation systems, limited risk sharing instruments, and information asymmetries for farmers, suppliers, and financiers. These challenges translate into increased transaction costs and risks that disincentivize investment. In terms of governance, Kenya's irrigation policy framework is broad. The Water Act (2016) and Water Resources Regulations (2021) empower the Water Resources Authority to regulate water abstractions and support local water management. The Irrigation Act (2019) and Irrigation Regulations (2021) created the National Irrigation Authority to ensure sustainability through licensing based on proven water availability and efficiency. The National irrigation Sector Investment Plan (2025 - 2035) presents a strategic framework to align various policy instruments and shape investment pathways for irrigation broadly and specifically for farmer-led irrigation development (FLID). Other relevant policies impact FLID including energy and environmental statutes that regulate solar PV quality, technician licenses, and climate-smart practices.

The FLID financing ecosystem consists of several key actors acting independently or collaboratively with intertwined roles. SACCOs/MFIs, commercial banks, equipment suppliers, aggregators and off-takers have provided different financing services at farmer level including PAYGo schemes, value chain financing, co-operative lending among others that support irrigation system uptake. DFIs, Impact investors, and donors continue to play critical roles offering risk mitigating mechanisms and instruments such as concessional capital, guarantees and incentives. Research and advocacy focused institutions provide technical assistance to reduce barriers and create an enabling environment for investment. Emergent actors within Fintech and carbon market domains are also developing into high prospect pathways for FLID.

Several impactful FLID interventions are underway or recently completed within the country. Kenya is advancing blended, outcome-based finance through a results-based financing model and innovation challenge fund under NISIP. This aims to crowd-in private capital and drive outcome-tracked growth. Carbon-linked price discounts have been piloted by private vendors as well as PAYGo leasing arrangements to reduce farmer costs and spread payments over seasonal cashflows. County co-financing of micro-schemes through private-public partnerships is creating clusters of financial support mechanisms for lenders, farmers, and vendors. There continues to be a need to strengthen institutional frameworks to undergird financial innovations in the sector. A combination of financial innovation with supportive policy, governance, and technical mediation can have transformative impact for FLID investment within Kenya.

1. Introduction

1.1. What is FLID?

Farmer-Led Irrigation Development (FLID) refers to irrigation systems that are initiated, financed, operated, and expanded by farmers themselves, typically outside large public schemes (Veldwisch et al., 2019). In recent years, FLID has emerged as a transformative pathway in Sub-Saharan Africa, driven by farmer innovation, private-sector supply chains, and expanding access to solar technologies. New evidence from the International Water Management Institute (IWMI) shows that FLID is now one of the fastest-growing contributors to agricultural water use in East Africa, with farmers investing directly in pumps, solar-powered systems, on-farm water storage, and low-pressure distribution technologies (Minh & Schmitter, 2025). In Kenya, these farmer-led investments have created a vibrant and rapidly expanding irrigation ecosystem. Despite this potential, FLID remains under-supported in terms of financing, technical assistance, and policy recognition, signaling the need for deliberate, structured interventions.

1.2. Irrigation Gap

The benefits of adopting irrigation in agricultural systems for productivity, resilience, and income security have been well documented (Burney et al., 2013; Xie et al., 2014). Recent studies highlight low levels of irrigation in Africa in General and specifically in Kenya, with only 5% of irrigated cultivated land and high dependency on rainfed agricultural production, compared with more than 30% in Asia and 14% in Latin America (FAO, 2020). This disparity constrains agricultural competitiveness and leaves millions of smallholders highly exposed to rainfall variability. The complexities of irrigation financing continue to drive low investment in appropriate irrigation technologies, despite the clear needs documented (Thottoli, Zevenbergen, and Veldhuizen, 2019). Key barriers to irrigation include the lack of finance for public, private, and commercial investments. Public funding has been limited and targeted only at the most viable and investment-ready farmers. At the same time, commercial capital perceives smallholders as a high-risk and technically uncertain market segment (Izzi, Denison and Veldwisch, 2021). There is also a lack of affordable, flexible, and risk-sharing financial instruments to derisk smallholder farmers and expand access to irrigation financing (Kanda and Lutta, 2022). Additionally, donor financing typically relies on grant-based models that fail to crowd in private capital or support long-term scaling of innovation (GCA, 2020). The complexities of irrigation financing continue to drive low investment in appropriate irrigation technologies despite the clear needs documented.

1.3. Financing Gap

Among all constraints, financing remains the most significant barrier to scaling farmer-led irrigation in Kenya. Irrigation investments are capital-intensive, with a standard one-acre solar or piped system costing between Ksh 260,000 and Ksh 420,000 (~US$ 1,860–3,000 at the 2023 average USD/KES ≈ 139.89), depending on water source, pumping head, and system configuration (Denison & Maina, 2023). This cost places irrigation beyond the reach of most smallholders without risk-sharing or concessional mechanisms. Further evidence shows a more tiered financing gap. First, the National-level investment deficit with the National Irrigation Sector Investment Plan (NISIP 2025–2035) estimates that Kenya requires approximately Ksh 598 billion (~US$ 4.27 billion) to expand its irrigated area by an additional 1 million acres over 10 years, with 61% of this mobilized by the private sector (GoK, 2023). Yet, public spending on irrigation has averaged only Ksh 5 billion (~US$ 35.7 million) annually, significantly below the Ksh 23–24 billion (~US$ 164 – 172 million) required each year. This underinvestment creates a substantial national financing deficit. Second, there is limited private-sector engagement, and NISIP projects that 61% of irrigation financing must originate from private investors. However, commercial banks perceive irrigation to be high-risk due to irregular agricultural cashflows, climate variability, collateral constraints, and limited tools for technical performance verification (Izzi, Denison and Veldwisch, 2021). As a result, only a small share of agricultural lending supports irrigation assets. Third, program-level funding gaps in irrigation water programs are facing structural financing shortfalls. The 2024 design report for IFAD's Integrated Natural Resources Management Project (INReMP) highlights a US$47 million gap in financing required for planned irrigation and water management investments. Lastly, broader climate-finance constraints with Kenya's climate finance needs between 2022 and 2030 far exceeding current flows, with irrigation competing for limited adaptation resources. This further constrains the sector's ability to close the irrigation investment gap.

Collectively, these factors reflect a pronounced and systemic financing deficit that cannot be addressed solely through public funds or market-rate lending.

1.4. Opportunity for Scaling Farmer-Led Irrigation

Despite these financing and technical constraints, Kenya faces an unprecedented opportunity to scale FLID sustainably due to the following factors: First, high unmet demand- with millions of smallholder farmers living close to viable water sources but lacking the financing required to irrigate. Second, technological advancements that have expanded access to solar pumps, PAYGo and lease-to-own models, smart irrigation controllers, and remote sensing are improving affordability and reducing operational risk (IWMI, 2021). Third, policy momentum through NISIP that places FLID at the center of Kenya's irrigation expansion pathway, explicitly calling for blended finance and coordinated investment. Lastly, climate resilience imperatives in which irrigation is recognized as an essential adaptation measure in Kenya's climate-smart agriculture agenda (GCA, 2020).

1.5. Area of Work 4 of S4I

To address the persistent financing gap for farmer-led irrigation in Kenya, the area of work 4 of CGIAR scaling for impact (S4I) aims to understand the most effective financing modalities for farmer-led irrigation. It also seeks to support the development of a blended finance facility that can reduce risks, attract diverse funding sources, and scale irrigation innovations in Kenya.

This paper aims to establish a clear understanding of Kenya's agricultural and irrigation finance landscape, with a focus on identifying key barriers and opportunities for scaling farmer-led irrigation. As part of this process, this context assessment presents a desk review of scientific literature, government policies, and grey sources to map and assess the farmer-led irrigation landscape, including key stakeholders and policies, financing actors and structures, barriers and challenges, and strategic interventions for investments in Kenya.

2. The Farmer-Led Irrigation Landscape and Key Challenges in Kenya

The National Irrigation Sector Investment Plan (NISIP) notes that Kenya's irrigation sector is categorized into two broad groups: publicly owned and privately owned. Publicly owned schemes are set up by government agencies, whether at the central or county level, or by state-run organizations. Public-owned irrigation schemes on Government-owned land are developed and managed by public institutions, including the National Irrigation Authority, research institutions, and County governments. The Government is dependent on the maintenance and rehabilitation of these schemes to ensure their sustainability.

Privately owned schemes consist of irrigation facilities developed by private actors, including companies (usually agribusinesses/commercial farms), communities, and individuals involved in micro-irrigation. Large-scale irrigation technology and systems are typically utilized by commercial farms to produce high-value crops, such as vegetables and flowers, for local and international markets. Groups of farmers or local community members own the community-based irrigation schemes. These are managed through organized institutional arrangements such as water user associations, cooperatives, or self-help groups.

Farmer-led irrigation is the final sub-segment of privately owned irrigation and is observed to be widespread across Kenya, though limited data are available on actual coverage and use. In this context, the farmers, individually or in small groups, drive the emergence and sustenance of the irrigation systems within a network of diverse actors (Veldwisch et al., 2019; Mati, 2023). Irrigation systems are usually operated on small farms, mostly less than 1 hectare. It is estimated that, as some studies have shown in Ghana, Ethiopia, South Africa, and Mozambique, this sub-segment would likely host a high incidence of unrecorded irrigation activity in Kenya with major nationwide contribution (Izzi, Denison and Veldwisch, 2021)

Although the scale of farmer-led irrigation in Kenya is predicted to be wide, its growth has been uneven and unsteady. The main socio-economic challenges enabling this consist of the high costs of modern irrigation systems, unavailable credit facilities, and market inaccessibility (Kanda & Lutta, 2022). Most smallholders face high upfront costs and credit products that are poorly aligned to seasonal cash flows. Full irrigation supply using solar-pumped technology with piped distribution to hydrants has been estimated to be quite high, ranging between Ksh 260,000/acre (USD 5,000/ha) in wetter areas, and Ksh 420,000/acre (USD 8,000/ha) where groundwater development is needed (Denison & Maina, 2023). Risk-sharing instruments (eg. guarantees, insurance, results-based incentives) are not yet widespread, which raises lenders perceived default risk and keeps the cost of capital high. These challenges are particularly salient for poorer farmers and marginalized groups, where equipment affordability, installer quality, and after-sales service can make or break outcomes.

At the policy level, FLID has not always been explicitly recognized in mandates and programs, leaving coordination gaps, uncertain responsibilities across agencies, and inconsistent county-level support (Kanda & Lutta, 2022). Recent government directions through the NISIP and its FLID pathway signal efforts to streamline roles, clarify permitting, and embed standards, but implementation capacity and harmonization remain work in progress.

Information asymmetries further constrain investment quality. Farmers, vendors, and financiers often lack site-specific diagnostics on hydrology, soils, energy sizing, among others, and need practical guidance on installation and O&M, while counties have limited standardized tools and training to support FLID at scale. In addition, the prices of irrigation equipment vary widely depending on various factors, and this complexity makes it difficult for farmers to assess and determine the most affordable and suitable solutions (Hornum & Bolwig, 2020).

3. Policy and Governance for Farmer-Led Irrigation in Kenya

Various policy and institutional structures have been established to provide oversight and guidance for the development, management, and implementation of irrigation in Kenya, including farmer-led irrigation. Key governance structures and overarching policies are outlined in this section.

3.1. National Policy and Legal Frameworks

Water Resources Management Laws and Policies

- **Constitution of Kenya (2010)**: Establishes rights to water and a clean environment. Delineates the water and agriculture functions between the national and county governments.
- **National Water Policy (Sessional Paper No.1 of 2021):** Calls for an inclusive, integrated approach to water resource management, including catchment protection, appropriate technology, and strong monitoring and information systems.
- **Water Act 2016:** Institutionalized the Water Resources Authority (WRA) (replacing WRMA) to regulate water use through permits and to protect water resources.
    - All significant water abstractions (surface or groundwater) require WRA authorization.
    - This Act supports sustainability by mandating permits and user fees for water abstraction, and by empowering WRA to impose conditions (e.g., extraction limits) on permits.
    - The Act provides for Water Resource User Associations (WRUAs) at local levels to assist in managing and monitoring water use.
- **Water Resources Regulations 2021**: Subsidiary legislation under the Water Act that details the permit system and water use rules. It sets out procedures for obtaining groundwater permits, fee schedules, and conditions to ensure sustainability.
    - The regulations prioritize certain uses (e.g., subsistence irrigation). In allocating water, it requires measures like installing measuring devices and reporting usage to WRA. WRA has the power to suspend, or revoke permits if use is unsustainable or rules are violated.

Irrigation Policy and Legislation

- **National Irrigation Policy 2017:** Provides policy direction for expanding and managing irrigation in Kenya. It aims to add 40,000 ha of irrigated land per year sustainably and emphasizes efficient irrigation technologies and water conservation.
    - The policy recognizes the need for climate resilient irrigation (including adoption of solar pumping) to enhance food security. It was drawn up to inform subsequent laws and plans, such as the Irrigation Act and NISIP.
- **Irrigation Act 2019**: Established a comprehensive framework for irrigation development, aligning with the 2017 Policy. It created the National Irrigation Authority (NIA) (successor to the National Irrigation Board) to develop and manage national irrigation schemes.
    - The Act outlines roles for both national and county governments. The national government (through the Ministry and NIA) oversees policy, regulation, and large or inter-county schemes, while counties may develop county-level irrigation projects.
    - It also requires coordination with water authorities: for any new irrigation project, proponents must secure both an irrigation license (from the Irrigation Authority) and a water permit from WRA for abstraction.
- **Irrigation (General) Regulations 2021**: Issued under the Irrigation Act to operationalize it. These regulations ensure new irrigation projects meet standards for efficient water use and have access to reliable water sources. This framework, combined with water laws, is designed to prevent practices like uncontrolled pumping that could deplete aquifers.

- **National Irrigation Sector Investment Plan (NISIP) 2025–2035**: A ten-year strategy recently launched by the government to coordinate investments in irrigation. NISIP aligns with Kenya's Vision 2030 and the "Bottom-Up Economic Transformation Agenda" to expand irrigation by 1.5 million acres by 2030. FLID is one of the pathways, recognizes solar irrigation as a contributor to FLID.

Energy and Renewable Energy Policies

- **Energy Act 2019:** Consolidates laws on energy and expressly promotes renewable energy development. It recognizes both national and county roles in energy planning – each county is required to prepare a County Energy Plan addressing local energy needs.
    - The Act established the Energy and Petroleum Regulatory Authority (EPRA) to regulate the sector, including oversight of solar PV systems through licensing of technicians and enforcing quality standards (to ensure systems are safe and durable).
- **Draft Energy Policy 2025-2034**: Prioritizes harnessing renewable resources (solar, wind, etc.). Streamline approvals for renewable projects and perhaps incentivize renewable energy in productive sectors.

Environmental and Climate Change Policies

- **Environmental Management and Coordination Act (EMCA) 1999 (rev. 2015*):*** Kenya's umbrella environmental law, administered by National Environment Management Authority (NEMA).
    - EMCA requires that any project likely to have significant environmental impacts undergo an Environmental Impact Assessment (EIA) and obtain a license from NEMA.
    - Irrigation and water projects are explicitly listed in the EIA Regulations (e.g. large irrigation schemes, borehole drilling) as requiring assessment. For example, drilling a new borehole for irrigation typically mandates a hydrogeological study and EIA approval.
    - NEMA can attach conditions to EIA licenses (such as monitoring groundwater levels or mitigation measures) and is empowered to monitor compliance. In practice, however, small-scale farmers often bypass formal EIA processes, and enforcement is challenging unless a project is sizable.
    - EMCA also has Water Quality Regulations (2006) and Wetlands Regulations (2009) that protect water sources from pollution and unsustainable use.
- **Climate Change Act 2016:** Integrates climate considerations into sectoral planning. It obliges ministries (e.g., Agriculture, Water, Energy etc) and counties to mainstream climate adaptation and mitigation. For sustainable irrigation, this means policies must promote climate-smart practices.
    - The Act led to the National Climate Change Action Plans (NCCAP) and the National Adaptation Plan (NAP), which highlight actions like rainwater harvesting, efficient irrigation technologies, and solar energy use in agriculture.

Agricultural and Irrigation Sector Strategies

- **Agricultural Sector Transformation and Growth Strategy (ASTGS 2019–2029)**: A national strategy to boost agricultural productivity and food security. It identifies expanding irrigation as a key "flagship" for achieving food security and resilience.
- **Climate Smart Agriculture Strategy (2017–2026)*:*** The CSA Strategy advocates farming practices that increase productivity, enhance resilience, and reduce emissions. It explicitly encourages water efficient irrigation and integration of renewable energy (e.g. solar pumping) in agriculture.

3.2. County-Level Policies and By-Laws

- **County Water and Irrigation Laws*:*** County laws must be in harmony with the Water Act 2016 and Irrigation Act 2019, which supersede them on resource management.
    - Some counties have developed their own acts or regulations for water services and small-scale irrigation. For instance, counties like Murang'a and Nyeri have passed laws to govern local water supply and protect catchment areas (e.g., regulating sand harvesting in rivers). Makueni County has a Water Act and a Climate Change Fund that finances water harvesting and irrigation for climate adaptation.

    - The Irrigation Act allows each county to establish a County Irrigation Development Unit to plan and implement irrigation within the county.
- **County Energy Plans:** Under the Energy Act 2019, counties draft energy plans that can include promotion of solar pumping for community water projects and farms. For example, Makueni County's clean energy plan has piloted solar pumps for boreholes to reduce diesel use.
- **Environmental and Water Resource Committees:** Counties play a role in environmental management through County Environment Committees (established under EMCA) and through participation in Catchment Area Advisory Committees under WRA.
    - Counties can develop county regulations on issues like wetland protection or pollution control, which indirectly affects irrigation.
    - For instance, a county might enforce zoning by-laws preventing cultivation along riverbanks (to protect water quality and flow).

3.3. Institutional Responsibilities and Enforcement Mechanisms

Table 1 summarizes key Kenyan institutions involved in water, irrigation, energy, and environmental management, outlining their mandates and how each enforces regulations. It shows how policy direction, permitting, licensing, monitoring, compliance checks, and environmental safeguards collectively govern irrigation and water-resource use.

Table 1. Institutional Responsibilities

Institution	Responsibilities	Enforcement mechanisms
Ministry of Water, Sanitation and Irrigation (MoWSI)	Leads national policy and provides oversight for water and irrigation.	Provides direction through policy formulation and coordination across agencies, but relies on WRA, NIA, and counties for enforcement.
Water Resources Authority (WRA)	Issues permits for surface and groundwater abstraction; monitors water levels and flows.	Enforces permit conditions; can impose usage limits, suspend or revoke permits for violations.
National Irrigation Authority (NIA)	Develops and manages national/public irrigation schemes; supports smallholder irrigation; provides technical advice and extension services; promotes efficient irrigation technologies; coordinates with counties.	Issues irrigation licenses for schemes; monitors scheme performance (including water use efficiency) and enforces design and water management standards.
National Environment Management Authority (NEMA)	Oversees environmental compliance; reviews Environmental Impact Assessments (EIAs); monitors ecological impacts of irrigation and water projects.	Issues EIA licenses with conditions; conducts audits and inspections; empowered to issue improvement notices, stop orders, and prosecute offenders.
Ministry of Energy and EPRA	Sets renewable energy policy; EPRA regulates solar equipment standards and technician licensing.	Enforces Solar PV Regulations by licensing technicians and ensuring compliance with quality standards.

County Governments	Implement water, agriculture, and environmental policies at local level; provide extension services; participate in water boards and environmental committees.	Issue development permits; can halt illegal drilling through denial of permits or health/environmental rules; conduct local inspections (e.g., checking permits, rationing compliance).
Water Services Regulatory Board (WASREB)	Regulates piped water services, mainly municipal/domestic; provides guidelines affecting smallholder irrigation in community water projects.	Enforcement through regulation of water service providers, though irrigation coverage is indirect and limited.
Water Sector Trust Fund (Water Fund)	Provides grants for water and irrigation projects targeting underserved groups.	Influences sustainability indirectly by funding only projects meeting requirements (e.g., WRA permits, community management structures).
Kenya Forest Service / Water Towers Agency	Manage catchment conservation in critical water source areas (e.g., Aberdares, Mau); promote water recharge activities such as tree planting.	Enforce rules against illegal water abstraction in protected areas; monitor and act against degradation activities.

3.4. Enforcement challenges

Effective implementation of Kenya's policy and regulatory framework for water and irrigation remains constrained by enforcement gaps (Table 2). These challenges are systemic and interlinked, ranging from unclear definitions in policy texts to resource shortages within regulatory agencies. The following table outlines some key issues.

Table 2. Enforcement challenges

Challenge Area	Specific Issues	Key Risks
Policy Definitions	Ambiguity in defining irrigation schemes and categories of abstractors.	Loopholes and inconsistent enforcement.
Institutional Coordination	Overlapping mandates between national and county agencies; weak WRA–NEMA coordination.	Siloed regulation, inadequate groundwater management.
Permitting Processes	Dual licensing, high compliance costs, and inaccessible systems.	Non-compliance, informal abstraction.
Resource & Capacity Gaps	Under-resourced agencies, unregistered boreholes, lack of modern monitoring tools.	Weak monitoring, uncontrolled abstraction.
Compliance Culture	Low deterrence, reliance on voluntary awareness.	Informal/unregulated practices persist.
Balancing Priorities	Aggressive irrigation expansion under NISIP & ASTGS, limited focus on FLID.	Over-abstraction, resource depletion.

4. Key Stakeholders and Interventions in the FLID Financing Ecosystem

A network of actors plays key roles in relation to FLID financing in Kenya, including Cooperatives, Commercial banks, SACCOs, and Impact investors, among others. These leverage various instruments, either independently or collaboratively, to support FLID investments. Table 3 below presents a snapshot of key stakeholders within the country context.

Table 3. Key stakeholders in FLID financing

Stakeholder category	Typical roles/activities in FLID finance	Common instruments/inputs
Smallholders & Cooperatives	Demand generation; borrower/on-lender (co-ops); organize group guarantees and repayment discipline; O&M responsibility	Member savings, group guarantees, purchase deposits, cooperative by-laws, basic records
SACCOs / Cooperatives (financial)	Last-mile credit to members; seasonal scheduling; collections via payroll/produce; basic monitoring	Asset/working-capital loans, group guarantees, savings-linked lending, refinancing lines
Microfinance Institutions (MFIs)	Short-tenor loans; PAYGo/agent partnerships; women/youth outreach; portfolio monitoring	Individual/group loans, PAYGo servicing, digital collections, credit scoring
Commercial Banks	Larger tickets (assets + working capital); dealer/vendor finance; cooperative on-lending; cash-flow lending (with de-risking)	Term loans, revolving lines, dealer credit, escrow/tri-party, grace/seasonal schedules
Vendor/PAYGo/Leasing providers	End-user finance bundled with pumps; installation/O&M; telemetry for performance-linked payments	PAYGo contracts, leases, warranties/SLAs, repossession/redeployment protocols
Aggregators / Off-takers	Forward contracts; invoice discounting; harvest-linked repayment channels; price risk sharing	Off-take agreements, warehouse receipts, assignment of proceeds, input/output financing
Development Finance Institutions (DFIs)	Provide wholesale capital and guarantees; catalyze local banks/MFIs; set ESG/impact covenants	Credit lines, risk-sharing facilities, first-loss, portfolio guarantees, TA grants
Impact Investors / Funds	Growth capital for vendors/PAYGo; structured debt to SACCOs/MFIs; outcome-linked vehicles	Senior/mezzanine debt, revenue-based finance, blended structures, results-based tranches
Donors / Foundations / Govt Programs	Early-stage de-risking; affordability support; capacity building; public-good co-financing (e.g., water harvesting)	Grants, results-based finance (RBF), interest buydowns, matching funds, TA
Guarantee providers	Reduce PD/LGD for lenders; unlock longer tenors/lower rates	Partial credit guarantees, portfolio caps, first-loss, performance guarantees
Insurers (index & asset)	Stabilize borrower/lender risk from climate/asset failure; bundled protection	Weather-index/crop insurance, equipment insurance, service warranties, reinsurance
Equipment vendors & Service networks	Quality supply; installation; after-sales service; data for underwriting and QA	Certified products, KEBS/EPRA compliance, service SLAs, spares depots, telemetry

Technical Assistance / Research (e.g., IWMI, universities, NGOs)	Site diagnostics; sizing and ROI tools; lender/vendor training; MEL and learning	Feasibility packs, design/playbooks, cash-flow templates, QA checklists, training
Public sector (MoALD, NIA, Counties)	Policy, standards, programs; county co-financing; extension & market linkages	Guidelines/standards, county budget lines, extension services, procurement rules
Water regulator & stewardship (WRA, WRUAs)	Permits, allocation rules, and catchment safeguards informing bankability	Abstraction permits, usage conditions, compliance monitoring inputs
Standards & energy regulators (KEBS, EPRA)	Product/installer standards and licensing; consumer protection	Standards/specs, technician licensing, compliance audits
FinTechs	Low-cost payments; KYC; credit information; device telemetry; identity	Mobile money, e-KYC, credit bureaus, collateral registry, APIs/dashboards
Carbon/ESG market facilitators	Monetize diesel-to-solar abatement; channel revenues into affordability/O&M	Methodologies, MRV, advance/spot credit contracts

4.1. Select FLID financing interventions in Kenya

Kenya Off-Grid Solar Access Project (KOSAP, 2017-2023): This was a national program to expand off-grid solar access in underserved areas, including a component to promote solar water pumps in communities. The program was driven by the Government of Kenya with World Bank financing and was implemented through sector agencies and county partners.

Results-based and programmatic financing: The NISIP proposes a results-based financing (RBF) window for FLID, which the World Bank is currently designing for implementation. Key partners involved include the State Department for Irrigation and the National Irrigation Authority, among others. The RBF will seek to tie disbursements to verified outcomes complemented by challenge funds to support product and finance innovation and address bottlenecks. These instruments are intended to lower risk for counties, lenders, and vendors and aim to accelerate adoption.

Carbon-linked affordability for solar irrigation: Private actors have piloted carbon-finance–backed price discount for solar pumps using carbon credits to reduce end-user prices and expand reach. This model has been tested by SunCulture with support from British International Investment and Shell Foundation. The pilots in Kenya have been leveraged to lower the upfront costs of the pumps by ~25–30% and enabled SunCulture to serve thousands of smallholders; the company reports material sales uplift when prices are reduced via carbon revenues.

Vendor/PAYGo, leasing and cooperative on-lending: These are asset-finance models such as PAYGo provided through vendors, leases, and cooperative/SACCO on-lending. These have been widely explored and continue to be used to spread pump costs over seasons and bundle after-sales service. These can be coupled with outgrower/offtake arrangements where farmers sell to structured buyers, contracts and assignments of proceeds are used to anchor invoice/harvest-linked repayment for irrigation investments and seasonal inputs, reducing lender risk and smoothing cashflows.

County co-financing and micro-schemes (public capex + household assets):
Several counties are co-funding small water harvesting with solar/drip packages (e.g., Kwale), pairing public infrastructure and farmer contributions, and creating a path for private top-up finance. These schemes illustrate the “public good + private asset” blend proposed under NISIP’s FLID pathway.

Smallholder Irrigation Program (Blended finance): This program, sponsored by the KfW used a blended structure: approximately 50% grant and 50% loan to farmer groups/irrigation cooperatives, with the loan portion on-lent through a Kenyan commercial bank. The blend reduced upfront costs, familiarized farmers with formal finance, and tied investment to group capacity building and O&M.

5. Conclusion

The Kenyan context assessment shows a landscape that holds significant promise for farmer-led irrigation investment. The literature highlights how farmer-led irrigation has become an increasingly important pathway to support farmers to address water-linked production challenges in the country. The establishment and stepwise implementation of the NISIP marks an important milestone in this direction through its strategic framework to align policy actions and drive public, private and development finance in scaling FLID. Various interventions have been introduced to support the steady development and uptake of FLID including those from PPPs, Impact investors, DFIs, Value chain actors, Carbon focused actors etc.

At the same time, the country's context retains some systemic constraints that continue to persist and shape the FLID trajectory. Financial, institutional, and governance related barriers were identified as key barriers. Issues such as high upfront costs, limited appropriate credit products, perceived farmer risks, continue to restrict smallholder access to irrigation focused financing. On the institutional front, gaps in water governance arrangements and oversight bodies still affect the enabling environment needed for FLID. Supply chain challenges such as limited know-how on technologies on the part of farmers, high transaction costs, weaknesses in sales services and technical systems effectiveness maintain perceived and actual risks for both farmers and financial actors.

This context assessment highlights the need for even more streamlined and integrated approaches to scaling farmer-led irrigation particularly in terms of attracting investment. This includes the exploration of innovative financing models and instruments that directly address risk perceptions and incentivize private sector investment. Instruments such as guarantees, concessional windows, performance-based mechanisms are being explored and need to be scaled. Financial structuring such as blended finance models are likely to be particularly impactful within this domain. There is a need to strengthen institutional frameworks to undergird these financial interventions. A combination of financial innovation with supportive policy, governance, and technical mediation can have transformative impact for FLID investment within Kenya.

References

Burney, Jennifer A., Rosamond L. Naylor, and Sandra L. Postel. 2013. "The Case for Distributed Irrigation as a Development Priority in Sub-Saharan Africa." Proceedings of the National Academy of Sciences 110, no. 31: 12513-12517.

Denison, Jonathan, and Joel Maina. 2023. *Irrigation Development Experiences in Kenya*. Nairobi https://www.scribd.com/document/789184355/Irri-Dev-Lessons-in-Kenya-2023-FINAL

Food and Agriculture Organization (FAO). 2020. *The State of Food and Agriculture 2020*: Overcoming Water Challenges in Agriculture. In brief. https://doi.org/10.4060/CB1441EN

Global Center on Adaptation (GCA). 2020. *State and Trends in Adaptation Report 2020* – Rotterdam: Global Center on Adaptation. https://gca.org/reports/state-and-trends-in-adaptation-report-2020/

Government of Kenya. 2023. *National Irrigation Sector Investment Plan (NISIP)*. Nairobi: Ministry of Water, Sanitation and Irrigation. https://www.irrigation.go.ke/sites/default/files/downloads/NISIP_compiled%20GREEN_19.03.2025%20V19-1.pdf.

Hornum, Sebastian T., and Suneetha Bolwig. 2020. "The Growth of Small-Scale Irrigation in Kenya: The Role of Private Firms in Technology Diffusion". Copenhagen: UNEP DTU Partnership. https://orbit.dtu.dk/en/publications/the-growth-of-small-scale-irrigation-in-kenya-the-role-of-private/

International Water Management Institute (IWMI). 2021. *Solar Photovoltaic Technology for Small-scale Irrigation in Ghana: Suitability Mapping and Business Models*. IWMI Research Report 178. Colombo, Sri Lanka: International Water Management Institute. https://doi.org/10.5337/2021.209.

Izzi, Gabriella, Jonathan Denison, and Gert Jan Veldwisch , eds. 2021. *The Farmer-led Irrigation Development Guide*. Washington, DC: World Bank. https://documents1.worldbank.org/curated/en/721191624266146245/pdf/The-Farmer-led-Irrigation-Development-Guide-A-What-Why-and-How-to-for-Intervention-Design.pdf

Kanda, Edwin K., and Vincent O. Lutta. 2022. "The Status and Challenges of a Modern Irrigation System in Kenya: A Systematic Review." *Irrigation and Drainage* 71 (S1): 27–38. https://doi.org/10.1002/ird.2700.

Mati, Bancy. 2023. "Farmer-led irrigation development in Kenya: Characteristics and opportunities." *Agricultural Water Management*, *277*, 108105. https://doi.org/10.1016/J.AGWAT.2022.108105

Minh, Thi T., and Petra Schmitter. 2025. "Adaptive Scaling Ecosystem for System Transformation: Operationalizing Solar-Based Farmer-Led Irrigation in Sub-Saharan Africa." *Cleaner Food Systems* 2 (December): 100004. https://doi.org/10.1016/j.clfs.2025.100004

Thottoli, Vandana, Hannah Zevenbergen, and Laurens van Veldhuizen. 2019. *Platforms for Brokering and Learning: Lessons on Multi-Stakeholder Collaboration for Farmer-Led Irrigation Development*. SWA Kenya. The Hague: SNV Netherlands Development Organisation.

Veldwisch, Gert Jan, Jean-Philippe Venot, Philip Woodhouse, Hans C. Komakech, and Daniel Brockington. 2019. "Re-introducing Politics in African Farmer-Led Irrigation Development: Introduction to a Special Issue." *Water Alternatives* 12 (1): 1–12. http://www.water-alternatives.org/index.php/alldoc/articles/vol12/v12issue1/475-a12-1-1.

Xie, Hua, Liangzhi You, Benjamin Wielgosz, and Claudia Ringler. 2014. "Estimating the Potential for Expanding Smallholder Irrigation in Sub-Saharan Africa." *Agricultural Water Management* 131: 183–193. https://doi.org/10.1016/j.agwat.2013.08.011

Contact
Christopher Agyekumhene, Researcher- Sustainable Finance, International Water Management Institute (IWMI), Accra, Ghana (C.Agyekkumhene@cgiar.org)

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