

Catalyzing farmer-led irrigation development in Africa: Vision and pathways drawing from business, research and development practices

The context

Farmer-led irrigation development (FLID) has been part of the farming system for hundreds of years, but has only recently attracted increased attention from government institutions, donors and development organizations. Yet, despite its vast potential, FLID has only been expanding slowly. Barriers to scaling include inadequate policy and legal frameworks, underdeveloped irrigation technology and supply chains, a lack of affordable finance, and limited access to input and output markets. Transformative scaling of FLID requires identifying the sociotechnical innovation bundles that fit, designing and implementing effective scaling strategies, and fostering multi-actor engagement and partnerships to achieve impact and trigger changes across farm, local, national, regional and global scales (IWMI 2021).

Key messages

- While political and economic stability and a supportive policy framework are incentives, de-risking and harnessing FLID investments are essential to instituting contextually relevant innovation bundles, digital solutions, inclusive financing, partnerships, cross-sectoral learning, institutional capacity strengthening, and gender equality and social inclusion.
- Catalyzing resilient, inclusive and sustainable FLID in sub-Saharan Africa (SSA) takes multiple pathways, including capitalizing innovation bundles, fostering scaling partnerships, developing innovative and adaptive investments, enabling gender equality and social inclusion, scaling capacity pipelines, brokering knowledge for sustainability, and unlocking an enabling environment.
- Joint efforts by stakeholders and actors in the FLID system are key, as each group has unique roles and resources to contribute as agripreneurs, investors and facilitators.

Key issues

Small-scale farmer-led irrigation development (FLID) has been part of farming systems for hundreds of years. It is now attracting increased attention from government institutions, donors and development organizations. FLID can help transform food systems by enhancing climate resilience, increasing and diversifying agricultural production, reducing poverty, and supporting youth and women's empowerment. However, despite its substantial potential, FLID has been expanding only at a slow pace. Encouraging experiences are now emerging across Africa due to various research, development and investment efforts. Catalyzing FLID expansion at scale in SSA in the next 5 to 10 years will require sustainable and inclusive strategies, and joint efforts to address the barriers and gaps, as well as seizing opportunities present across the business, research and implementation spaces.



Women farmers harvesting tomatoes, Gorogo, Upper East Region, Ghana (photo: Desire Dickson).

Capitalizing FLID: Lessons learned from practices

To develop such strategies and stimulate joint efforts, a two-day conference titled 'Investing in Farmer-led Irrigation Development in Sub-Saharan Africa: Business, Research and Development Practices' was organized, bringing together about 90 participants and 40 online attendees from the public and private sectors, research institutions, and stakeholder groups such as donors and farmers. Hosted by the International Water Management Institute (IWMI), the event was jointly sponsored by the Innovation Lab for Small Scale Irrigation (ILSSI) project (funded by the United States Agency for International Development [USAID]), the CGIAR Initiative on West and Central African Food Systems Transformation (TAFS-WCA), World Bank, and the Water and Energy for Food (WE4F) initiative. The conference aimed at sharing insights on improving practices through lessons learned from business, research and development activities across stakeholders to catalyze efforts, create synergies, and sustainably and inclusively boost irrigation for high-value crops and other farming activities in Africa. It provided an opportunity to share knowledge and experience, discuss the lessons learned on catalyzing FLID, exchange deep dives on topics covering water and environmental sustainability, innovation, inclusion, investment and financing, and strengthen capacity among implementers, investors, innovators, farmers and researchers. The participants highlighted a range of promising solutions that have been or are being developed to address the remaining barriers and gaps in and exploit the opportunities for investment in FLID.

Contextualizing the investment starts with segmenting farmers' demands

The context determines farmers' needs and abilities to invest in FLID, available technologies and services, and the existing business models for supplying irrigation equipment. Socioeconomic dynamics such as population growth,

What is farmer-led irrigation development?

Farmer-led irrigation development is a process by which farmers strive to improve their agricultural water use, bringing in or developing new ideas and technologies, changing investment patterns and creating new knowledge (Veldwisch et al. 2019). FLID is not one typology, and it is not linked to any one technology; it is best viewed as a dynamic and unfolding development process (Izzi et al. 2021). Estimates of FLID expansion in SSA range from 1 to 2 million hectares (Mha), benefiting 185 million farmers with net annual revenues of USD 20 billion (Wiggins and Lankford 2019).

urbanization and increasing water use, and demands due to climate change affect water availability for irrigation. Understanding the multifaceted context, therefore, is essential for bundling and catalyzing irrigation equipment, products and services that meet different demands in specific geographical areas, as highlighted in the presentation titled 'Bundling and Catalyzing Solar-based Technologies and Services: Experiences from Ghana, Ethiopia and Mali' summarized in Box 1.

Demand segmentation is essential to making investment decisions, developing marketing strategies, and tailoring business models, as shared in the presentation titled 'Tailoring Business Models for Ghana's Inclusive Solar Irrigation Market' (Box 1). The segmentation can be based on land ownership and size, water access and use, farming systems and irrigation practices, financial capital, financing management, equipment and service preferences, and other relevant factors. Examples of specific needs identified through market segmentation studies are theft-prevention technology for solar panels, and multi-use and gender-responsive technology for women.



Different scenes from the conference titled *Investing in Farmer-led Irrigation Development in Sub-Saharan Africa: Business, Research and Development Practices* (photo: Barbara van Rijn, BVR Productions Ltd., and Maxwell Amponsah Twumasi and Kwaku Andoh Amponsah, IWMI, Ghana).

Box 1. Highlights from conference presentations.

Bundling and Catalyzing Solar-based Technologies and Services: Experiences from Ghana, Ethiopia and Mali. Investments in solar-based irrigation are limited primarily due to the high initial cost, diverse demand, and need for more availability of innovation bundles that address the complex problems and needs of producers and businesses. An action research approach to co-develop solar-based irrigation bundles involves four interrelated steps: Analyze, co-develop, engage and reflect (Minh and Schmitter 2020). Several strategies have been used to contextually catalyze solar-based irrigation bundles (SBIBs) addressing diverse conditions in Ghana, Ethiopia and Mali. These include business research partnerships, scaling grants, targeted investment, demand-driven capacity building and multistakeholder dialogue.

Tailoring Business Models for Ghana's Inclusive Solar Irrigation Market. Pumptech, Ghana's private sector irrigation equipment supplier, has tailored its business models for different segments of the solar-powered pump market. The payment and installation model is for resource-rich farmers who demand high-capacity pump systems. The PAYOWN model is for resource-limited farmers holding cultivated lands with access to dugouts and well water. The PAYGO model is for farmer groups with limited upfront capital to pay for SBIBs. Movable solar-powered pumps with a plug-and-play accessory system are customized to mobile farmers. Win-win partnerships are applied through institutional clients, i.e., government agencies, development partners, and training institutions introducing SBIBs to farmers. Thus, by customizing its business models, Pumptech has promoted inclusive SBIB investment for smallholder farmers, reaching multidimensional scales.

Carbon Financing: A Case from the Ghana Cocoa Forest REDD+ Program. Many countries have established the REDD+ framework to protect forests as part of the Paris Agreement on climate change. Within this framework, developing countries receive results-based payments for reducing deforestation. In Ghana, the Forestry Commission and the Ghana Cocoa Board aim to reduce deforestation and forest degradation by supporting farmers in adopting climate-smart intensive expansion methods. Based on its performance, Ghana will obtain USD 5 per ton of carbon under an emission reduction payment agreement with the World Bank (LEGKL 2019).

Digital Awareness and Outreach: IrriTrack and Microscale Irrigation MIS. To support sustainable animal, crop and fish production, Uganda's Ministry of Agriculture, Animal Industry and Fisheries compiles, analyzes, maintains and disseminates data on soils, water resources, wetlands and irrigation development in semi-arid areas and rangelands. The ministry's IrriTrack app allows extension staff to collect data on farmers using Android tablets and phones. This supports planning, resource allocation, performance monitoring, and improves accessibility and transparency in resource use and decision-making by the private sector and other stakeholders.

Ensuring the Capacity to Sustain Water for Agriculture and Resilience in Ethiopia. AgriTech hackathons are conducted as part of the collaboration between research institutions and the private sector. These hackathons build the capacity of university students to develop innovative solutions for private-sector businesses. Through such hackathons, Rensys Engineering has developed information and communications technology (ICT) systems to improve marketing, client assessment, and sales and market linkages. The hackathons also build the capacity of universities to host and manage similar events in the future, and arrange internships with the private sector to train youth, giving them opportunities to network and develop their professional skills within relevant or related industries.

Inclusive solar-based Irrigation: Lessons on Women's Access to Credit. Demand and supply constraints limit women's ability to afford solar-based irrigation technologies. One inclusive approach to overcome this constraint is asset-based financing. The challenges in this approach must be addressed, focusing on credit assessment, targeting, marketing, and after-sales support. Inclusion focuses on four main steps: customer identification, customer credit evaluation, payment transactions, and agronomic and market support. Customer identification must be targeted at women and the poorest farmers and included in the training of the sales force. Customer credit evaluation must be designed using asset-based finance tools and processes that are gender- and farmer-responsive. Payment transactions must adapt terms of repayment and must manage subsidies to reduce risks to companies and farmers. Agronomic and market support must focus on finance for diverse crops and complementary inputs.

Subsidies for Microscale Irrigation Development in Uganda. Through the Microscale Irrigation Program, the Government of Uganda supports farmers acquiring microscale irrigation equipment by providing matching grants/partial subsidies. Support from the government is between 25% and 75% of the cost, with a maximum contribution of USD 2,000 per 0.4 ha per farmer. Smart partial subsidies have greatly enhanced technology uptake. Farmer co-funding ensures ownership and sustainability. It also reduces the burden on government investment. For implementation to be successful, there is a need for awareness creation to manage expectations, innovativeness on credit access, and purposeful targeting of farmers who can co-fund. A periodic review is essential to know what works and what does not and to improve processes.

Multistakeholder Dialogues: An Interactive Learning Platform for FLID. FLID multistakeholder dialogues bring stakeholders together to address common challenges. These include competing stakeholder priorities, more synergy in small-scale irrigation interventions, and coordination among sectors and programs. Others are limited innovation scaling efforts, limited information flow and cross-sector learning, and the need for consolidated efforts on the stakeholders' front to contribute to policy direction. Cross-learning from these dialogues helps actors co-design and co-implement suitable models for scaling context-specific irrigation solutions.

Source: IWMI conference on 'Investing in Farmer-Led Irrigation Development in Sub-Saharan Africa: Business, Research and Development Practices'



Farmers planting shallots in Volta Region, Ghana (photo: Barbara van Rijn).

Inclusive financial modalities for accelerating FLID at a larger scale

Access to finance is a significant challenge to catalyzing FLID. There is a need to develop cost-effective solutions to support farmers' investments and de-risk private sector businesses. In Ghana, Mali, Ethiopia and many other countries in SSA, affordability remains an issue for smallholder farmers, even with subsidies and pay-as-you-go (PAYGO)/pay-as-you-own (PAYOWN) financing models. PAYGO/PAYOWN financing offers farmers affordable credit compared to the conventional loans provided by profit-oriented commercial banks and financial institutions. These financing methods may also include after-sales services, agronomic input provision or multiple-use services such as drying, freezing and milling to enable farmers to recoup their investment. However, despite their benefits, PAYGO/PAYOWN financing may bring a high debt burden to smallholder farmers, and increase investment and business risks in the private sector.

Nevertheless, the availability of PAYGO and PAYOWN financing methods has significantly shifted the private sector business portfolio, improving their ability to sell irrigation technologies to smallholders. Lessons from practice show that there is a need to find cost-effective ways for farmers to repay credit. Companies offering these services require early-stage equity through grants or soft loans from impact investors or donors. Government support is vital for developing suitable financing models. These include blended financing, where government subsidies and loans are disbursed through financial institutions. Financial institutions need institutional instruments to lend to green energy, agriculture and climate change adaptation initiatives. The government must regulate (smart) subsidies

such as matching and results-based grants to improve smallholder farmers' access while enabling their transition from subsidy dependence to market participation.

Impact investments offer other sustainable and inclusive financing options for catalyzing FLID. Credit scorecards are an alternative to standard documentation on profit/loss and costs/revenues. However, this approach tends to limit women's access where there is a lack of documents to prove ownership of the assessed assets. Sociocultural norms do not support women owning property, limiting their access to agricultural land, on-farm income and the desire to register property in their name. For instance, pumps purchased by women may be in the name of a spouse or jointly registered, or in the name of a male relative. Rethinking the indicators for women's financial management capacity and creditworthiness is critical. Distribution models that deploy women and community-embedded sales agents, and offer flexible subsidy repayments help to improve women's access and reduce the risk of default.

Recently, carbon credits have emerged as an opportunity for financing FLID. The presentation titled '*Carbon Financing: A Case from the Ghana Cocoa Forest REDD+ Program*' (Box 1) highlighted that a carbon credit model could be adapted to FLID. Carbon financing is an alternative to bilateral/multilateral funding, the sources of which are declining in SSA countries such as Ghana, Kenya and others. Research to quantify carbon emissions from motor pump irrigation will support the case for a carbon credit model to support green energy for FLID. Countries could use carbon credits to solicit climate funding for FLID. In such a scenario, robust measurement, reporting, and verification systems will help track and monetize carbon reduction. Political transparency will ensure engagement,

inclusiveness, and effective national and subnational structures to manage carbon funds.

Digital solutions as opportunities for FLID scaling and behavioral change

Irrigation- and investment-related behavioral change is required for sustainable FLID in SSA. The availability of past and current data helps with key actors' decision-making. Data are most beneficial when they are in a helpful format, easy to use and affordable. Information and innovations on the possible use of unconventional water sources, i.e., recycled water, greywater, stormwater, brackish water and atmospheric moisture, can change irrigation practices. Conventional communication channels and digital innovations can help inform farmers and other value chain actors about available irrigation technologies and services. They help to disseminate information and stimulate actions to guide technology selection and farming practices. This is the case in Uganda, as shown in the presentation titled '*Digital Awareness and Outreach: IrriTrack and Microscale Irrigation MIS*' (Box 1). Digital solutions help to collect data at the farm level and beyond, even in remote areas, to document indigenous knowledge and support the private and public sectors in making informed decisions. These solutions help to fill data gaps that inhibit investment in and expansion of FLID. These solutions include surface water and groundwater governance, sociotechnical constraints to water access, and

financing opportunities. Digital solutions offer opportunities for youth and start-ups, and enable stakeholder engagement in co-designing contextually relevant solutions.

Individual and institutional capacity strengthening, gender equality and social inclusion

Capacity strengthening is essential to foster FLID and achieve large-scale impact. Training builds farmers' technical capacity to irrigate sustainably and improves their financial literacy to be able to invest in FLID. Similarly, innovation and internship develop the ability of the young labor force and universities to address practical business challenges, especially when it is built into the curricula of universities, as shown in the presentation titled '*Ensuring the Capacity to Sustain Water for Agriculture and Resilience in Ethiopia*' (Box 1). The private sector requires the capacity to test and develop business models and decision-support systems, e.g., client assessment tools, and digital marketing and sales applications. Capacity strengthening also helps to generate demand-driven solutions to solve real problems. Clearly defined roles, responsibilities, expected deliverables for innovation hackathons and incubation, and internships with private sector entities will improve the actors' effectiveness in the education and capacity strengthening domain.

Women and youth face socioeconomic hindrances that limit their access to production factors and participation in FLID.



A farmer irrigating maize using a sprinkler in Volta Region, Ghana (photo: Barbara van Rijn).

Multi-pathway approaches are required to make FLID more inclusive of women and youth, as shared in the presentation titled *'Inclusive Solar-based Irrigation: Lessons on Women's Access to Credit'* (Box 1), which draws from the ILSSI project in Ethiopia, Ghana and Mali. These approaches attain equity, including co-designing digital inclusive financial assessment and credit tools, labor-saving technology for women, job creation for youth, and agronomic support targeting women and youth.

Political and economic stability and supportive policy frameworks as incentives

Political and economic stability is an incentive for the private sector because instability creates uncertainty and endangers current and future investments in catalyzing FLID. Favorable policies such as tax exemptions and smart subsidies motivate private sector investment. Moving FLID toward inclusivity and sustainability requires adapting and enforcing water and irrigation governance systems that help communities self-regulate. All this requires a long-term commitment from political decision-makers and implementers, as advocated in the presentation titled *'Subsidies for Microscale Irrigation Development in Uganda'* (Box 1). In politically unstable locations, implementers may use project-based business-to-business models to introduce, pilot and scale irrigation technologies and services.

Partnerships and cross-sectoral learning to harness implementation synergies

There is consensus that no single actor can work alone on catalyzing FLID. Multi-actor, win-win partnerships can enable the scaling of FLID. Partnerships built on trust with clearly defined roles and responsibilities will enable gains for FLID.

These partnerships must balance profitability and social impact, and address multistakeholder interests. Sharing knowledge, tools, biophysical information, remote sensing and water governance information is critical to support cross-country learning for FLID across SSA. The presentation titled *'Multistakeholder Dialogues: An Interactive Learning Platform for FLID'* (Box 1) has examples from Ghana and Ethiopia on how multistakeholder dialogues can be used to share knowledge on FLID.

Vision and pathways for catalyzing farmer-led irrigation development

A shared vision of the pathways to follow and investments needed to scale FLID in SSA in the next 5 years is presented in Figure 1. This shared vision will guide activities and investments to tap the significant and transformational potential in SSA, in which FLID can be the game-changer in terms of agri-food system transformation, food security and climate change resilience.

Pathway 1. Developing and catalyzing innovation bundles

Piloting and promoting single innovations are standard practices to support FLID across the SSA region. In many contexts, the inclusiveness and sustainability of such support are issues due to biophysical, political, economic and sociocultural obstacles. Bundling irrigation technologies, services and processes can bring synergies to minimize these obstacles and the trade-offs associated with introducing individual innovations while de-risking farmer and private sector investments. It provides context-specific solutions for farmers, combining existing and innovative technologies, products and services.

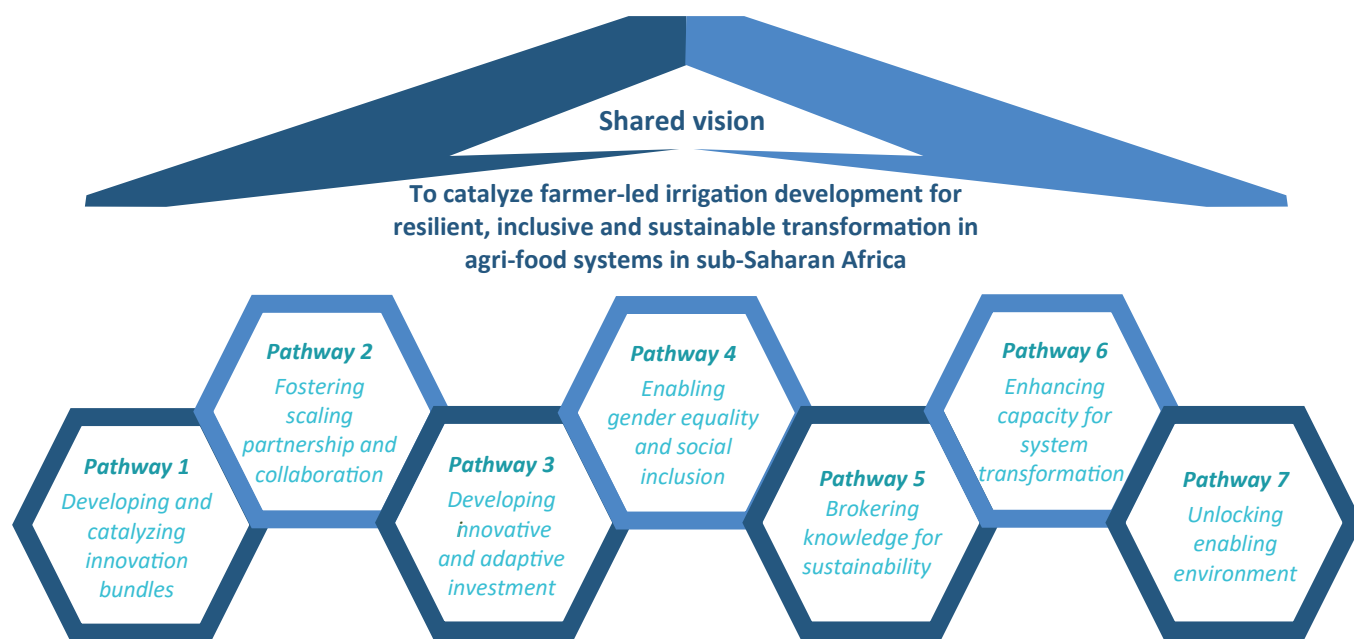


Figure 1. A shared vision and pathways to catalyze farmer-led irrigation development in sub-Saharan Africa.

Developing and catalyzing innovation bundles aim at putting together innovations, services and practices to make context-specific FLID solutions available to farmers. Technologies such as solar-powered irrigation pumps may serve as a core innovation that can be bundled with, for example, water conveyance, storage and application equipment, soil moisture monitoring sensors, PAYGO/PAYOWN financial services, other agricultural inputs and good agricultural practices. When catalyzing these bundles at a large scale, bundling tools and digital innovations for land and water resource mapping, climate information services and advisory, and targeting investment decisions are necessary to achieve sustainability and inclusion.

Innovation bundles should be relevant to specific contexts and needs, and must be accessible and affordable to farmers and their communities. Co-designing, co-developing and co-bundling are vital principles that make the bundles cost-effective, built on farmer experiences, and leveraging existing government, local extension, farmer, private sector and other value chain actor networks. Enhancing the effectiveness of the bundles requires awareness creation through participatory demonstrations and road shows, the use of digital platforms, intelligent incentives for early adopters, and monitoring, evaluation and learning. The willingness of partners to bundle products and services is the first step to successful bundling. This is achieved by aligning their interests, agreeing on a shared vision, building trust and managing trade-offs. Bundling is resource- and time-consuming and should be adaptive, evidence-based, and continually improved based on the context and changes in the context. It, therefore, requires joint actions from multiple stakeholders, including the government, private sector, research organizations, non-governmental organizations (NGOs) and development partners. The bundling process is the backbone for linking stakeholders and sharing data for inclusive decision-making.

Pathway 2. Fostering scaling partnership and collaboration

Market linkages within irrigated agricultural value chains are weak, limiting farmers' ability to participate effectively in FLID. Several stakeholders manage land, water, soil, mining, agriculture and other water-related industries as separate sectors while addressing sector-specific challenges. Given the complexity of food systems and the diversity and dynamism of FLID, no single actor and sector can do all the work effectively. Multi-actor and multisectoral partnerships and collaboration are vital to breaking these silos while leveraging each other's strengths and resources.

Fostering scaling partnerships and collaboration aims to mobilize joint efforts and resources to invest in sustainable catalyzing of FLID and innovation bundles and an inclusive FLID market. Public and private sector partnerships can invest in agricultural water management, financing, product and service demonstrations, development of clean energy sources, farmer group engagement for co-creation and capacity building, and behavioral change campaigns. The government, private sector, NGOs, and research and development partners can collaborate

to develop multiple cropping seasons and improve irrigated farming systems using irrigation technologies and services, Internet of Things (IoT) sensors, good agricultural practices, and blockchain technology information sharing. Research, the private sector and public actors can partner to create linkages between the private and public sectors, farmers and input suppliers, off-takers, output markets and supporting services, including extension and credit access. Strong market linkages support the effective scaling of innovation bundles. Governments must lead in natural resource planning that incorporates water resources for irrigation and how to sustainably meet these needs.

Pathway 3. Developing innovative and adaptive investment

Financing FLID investments remains a significant challenge to catalyzing the practice in SSA. The desire of smallholder farmers to borrow from commercial banks and financial institutions is low due to high interest rates, collateral requirements, lengthy application processes and lack of credit history. Furthermore, banks and financial institutions have a strong risk aversion to lending for agricultural purposes. Hence, there is an urgent need for sustainable and inclusive financing services for smallholder farmers' investment in expanding FLID.

The private sector can use innovative financing models such as PAYGO and PAYOWN to improve farmers' access to irrigation technologies and services. However, it requires liquidity to expand lending to farmers, which may limit the ability to offer PAYGO and PAYOWN financial services. PAYGO and PAYOWN financing may prioritize established farmers over new and small farmers who tend to be riskier. Subsidizing the first pumps of small farmers using results-based financing will improve their access to these technologies. Other funding sources for FLID include carbon financing, green bonds and insurance, blended financing, concessional finance, revolving funds, and performance-based subsidies and grants that can de-risk the market actors' investment, enabling FLID supply businesses to be inclusive of diverse demands.

Farmers thus play a more significant role in shaping and investing in their irrigation practices while the implementing agencies provide safety nets for farmers by facilitating access to credit. Investments in FLID, therefore, must be adaptive to supplement farmers' investments. To be adaptive, capacity strengthening of financial sector actors must empower them to provide farmers with reasonable and practical products and services. To be effective, developing and engaging the new generation of private, innovative finance providers in bundling and other financial products and services in agricultural value chains as their core business are essential. Financial institutions require capacity development on the high-value irrigated agricultural value chains and agricultural financing. Creating and maintaining linkages among financial institutions, irrigation equipment suppliers and farmers will further improve the ability of financial institutions to lend for agricultural purposes. Minimizing duplication and waste of resources requires government guarantees and coordination from development partners and impact investors.

Pathway 4. Enabling gender equality and social inclusion

Women and youth should be more recognized and integrated into irrigation planning, decision-making and marketing efforts. Their participation in FLID is limited to small areas due to sociocultural barriers limiting access to factors of production. Women, for example, have lower access to extension services because social norms may permit them to interact only occasionally with male extension agents. Some women also require the permission of a male to access loans or to buy farm equipment. Interventions that intentionally improve women's and youth's access to production factors and support services are limited. Moreover, pathways targeting women in male-headed households may differ from those required for female-headed households.

Enabling gender equality and social inclusion in FLID aims to minimize such barriers. New pathways are needed to reach these groups, such as employing women sales agents, minimizing the risk of failure by improving their access to seeds, labor-saving and more efficient technologies, and facilitating transportation and childcare support for women during training to encourage their participation. At the same time, existing approaches can sometimes be adjusted to be more inclusive. Collaboration among stakeholders is required to ensure women and youth inclusion in FLID. Farmers, researchers, the private sector, NGOs and development partners can work with government agencies to co-design inclusive innovation bundles for women and young farmers. These include improving financial access for women and youth through subsidies, grants, revolving funds and other financial instruments, and designing suitable irrigation technology and service bundles. Business models on digital platforms provide cost-effective ways to provide women and youth with access to water, land, extension, and improved farming technologies and services. Other ways include training of female researchers, internship and early-career programs targeting women, and entrepreneurial skill training programs for women that highlight their needs.

Pathway 5. Brokering knowledge for sustainability

Initiatives and investments in catalyzing FLID exist in many SSA countries. However, technical assistance and multistakeholder dialogues are limited to projects, interventions and the national level. Therefore, knowledge sharing at national and regional levels is limited to providing support to learning and investment in FLID. Furthermore, knowledge gaps exist in resource availability and quality, market insights, business investment and the financial ecosystem.

Brokering knowledge for sustainability aims to foster cross-learning in SSA, manage trade-offs, leverage synergies and optimize impacts from the catalyzing of FLID by providing data-driven tools and technical assistance, and enhancing multistakeholder dialogues. Simple digital knowledge-sharing platforms are accessible to multiple stakeholders. Multi-actor collaboration is required to create reliable natural resource maps and use them to guide policy and project implementation. The information includes the quantity and quality of surface

water and groundwater, soils, sustainable irrigation, agricultural water management, and environmental sustainability. The knowledge-sharing platforms integrate good agricultural practices, and market, financial and climate information into services provided to farmers and other users.

Existing irrigation-related digital tools include pump sizing, maintenance and payment apps. Further digitalization, such as real-time pricing information for input and output markets, could help farmers maximize their return on investment and encourage other farmers to adopt irrigation. Data-driven planning and monitoring tools are important to improve water governance and prevent overexploitation of water resources. Digitalization and institutionalization of data collection and storage, and information management are needed to facilitate multistakeholder engagement and dialogues, capacity building, interactive learning, and sustainable and inclusive FLID investments at a large scale.

Pathway 6. Enhancing capacity for system transformation

Value chain actors operate in silos with varying degrees of knowledge about improved technologies and services for catalyzing FLID. Knowledge sharing and better linkages have resulted in sustainable interventions and investments. Multiple skills training is required to equip value chain actors to work together to improve synergies. Farmers and extension officers require training in modern and cost-effective irrigation technologies and services available to support and improve farming activities.

Enhancing capacity for system transformation aims to develop the capacity of public and private sector actors to use existing and innovative technologies, services and processes to impact FLID positively. Capacity development is required continuously to address challenges identified in the irrigated agricultural value chain. Partnerships between the government, NGOs, development partners and farmers to train extension agents and other value chain actors will ensure consistency and sustainability in capacity building. Research organizations can support this process by sharing experiences on irrigation solutions that may be adapted to fit various contexts.

Pathway 7. Unlocking enabling environment

Although FLID has recently received increased attention from governments and development communities, the enabling environment often does not support bringing innovations beyond pilot programs. For decades, irrigation development in SSA has prioritized large public schemes. Unfavorable policy environments and programs hinder FLID investments by farmers and the private sector. Where policies exist, relevant institutions must be resourced to implement irrigation regulations and interventions to catalyze FLID while supporting the private sector to thrive.

Unlocking enabling environment aims to improve the policy and business environments to incentivize FLID to realize its potential. The governments should set up policies specific to FLID, guiding interventions and enhancing private sector



Bucket irrigation in Volta Region, Ghana (photo: Barbara van Rijn).

participation. These include policies on clean energy, capacity development to train local technicians to design, repair and maintain the irrigation infrastructure, and cross-learning among SSA governments to improve synergies. Favorable tax policies and simplified import processes will attract private sector investors to import and locally manufacture irrigation equipment at affordable prices. State institutions with adequate funding, training and logistics will monitor the use of groundwater and other resources to ensure sustainability. Research institutions help to identify relevant irrigation solutions and partnerships to catalyze FLID while contributing to policy direction. Cooperatives, water user associations and farmer-based organizations implement policies and regulations at the local level.

Moving forward

The recognition of and enthusiasm for multi-actor partnerships as an enabler of FLID was clear from [the interactive discussions and networking during the conference](#). As participants continue operating in their respective countries, it is hoped that a shared vision for FLID is more firmly embedded in agricultural policies and practices to make irrigation a reality for millions of African farmers. [Different pathways bring about many practical solutions for tangible impacts](#). Consensus and commitment to building a solid community of practices and jointly advancing cross-sectoral strategies are essential to transformative and impactful FLID.

Stakeholders and actors in the FLID system participate in catalyzing FLID based on their capabilities and desires. Operationalizing each pathway requires joint efforts from various actors, each with unique roles and resources to contribute. As a core group of agents, they attract the participation of other actors and stakeholders. Their involvement and contributions can be clustered into three core groups: agripreneurs, investors and facilitators.

Agripreneurs such as farmers, agribusiness entities and other value chain actors are the champions of Pathway 1 and Pathway 2 (Figure 1). *Farmers and farmer communities* are at the center of FLID as their needs determine the innovations and innovation bundles the actors focus on. By piloting innovations, they provide feedback that helps product/service improvement and thus contribute to policy development. They support the FLID vision by sharing indigenous knowledge that may be used individually or in combination with modern approaches to address challenges to catalyzing FLID. This includes local ways of locating groundwater, managing water and water conflicts, and storing the harvest. *Private sector entities* contribute to co-designing irrigation products, services and bundles that meet the specific needs of farmers. They offer farmers products and services, including irrigation equipment supply, input and transportation services, and aggregation. Private sector entities support research organizations, farmers and other actors to test, refine and scale innovations for irrigated agriculture. Collectively, the private sector has the potential to influence business policy to address challenges related to taxes, importation, manufacturing and financial services to support business.

Investors include public institutions, private commercial and impact investors and financial institutions who lead the way in Pathway 3 and Pathway 4 while supporting Pathway 1 and Pathway 2 (Figure 1). For example, *development partners and organizations* provide funding for FLID interventions. Their support may be provided at the regional, national or local levels, focusing on value chain development and skills training. Such organizations operating across SSA include, but are not limited to, the World Bank Group, African Development Bank, United States Agency for International Development (USAID), Bundesministerium für wirtschaftliche Zusammenarbeit und Entwicklung (BMZ), International Fund for Agricultural Development (IFAD), World Vision and iDE. They also contribute to the FLID vision by supporting governments' policy direction and private sector capacity development. *Credit and financial institutions* offer financial products and services to farmers to acquire irrigation equipment and other inputs. They contribute to the FLID vision by modifying their products and services to include smallholder farmers, especially women and youth. This may be achieved through financial literacy training for farmers, modifying credit assessment tools to include non-financial indicators, and improving group lending and sourcing for climate funds.

Facilitators include the government, research and knowledge partners, and NGOs that enable Pathway 5, Pathway 6 and Pathway 7 (Figure 1). *Governments* develop and implement policies to support farmers investing in advanced irrigation technologies and adopting good agricultural practices and innovations while linking them to new and existing markets. To support the FLID vision, government institutions in agriculture and related sectors collaborate to address challenges and conflicts and maximize synergies. *NGOs* support farmers to innovate irrigation technologies and farming practices to improve yields and address farming and market challenges. Governments also support farmers with financing models such as grants, results-based financing and group loans. *NGOs* support the FLID vision through collaborations with other NGOs, the government and other value chain actors to minimize duplication of interventions and improve synergies. *Research and knowledge partners* engage with value chain actors to co-design solutions to challenges in irrigated agriculture. They create market linkages between farmers and other value chain actors and contribute to policy direction. They support FLID through information brokering, and help to create and sustain linkages between actors.



Solar-based irrigation bundle demonstration, Yendi, Northern Region, Ghana (photo: Thai Thi Minh, IWMI).

Research continuously helps to identify emerging challenges that partners can deliberate on to find joint solutions. Research and knowledge partners also support partners working in natural resource management.

Several guiding principles must be considered for successful and impactful operationalizing and investing in FLID pathways. First, the participation and ownership of multiple stakeholders and actors are needed to enhance their commitment and accountability. Second, flexibility and adaptability are key to adapting well to real circumstances and flexibly dealing with changes and particular conditions. Third, partnership and co-investment are essential to ensure that sufficient resources can be mobilized and leveraged from the private and public sectors and development partners to ensure long-term investment for catalyzing FLID. Finally, interactive learning and institutional capacity strengthening are critical to continual improvement in processes and providing support to FLID.



A woman farmer picking pepper in Volta Region, Ghana (photo: Barbara van Rijn).

References

- IWMI (International Water Management Institute). 2021. *Adaptive scaling to achieve system transformation in One CGIAR*. Colombo, Sri Lanka: International Water Management Institute (IWMI). 8p. (Technical Brief). <https://hdl.handle.net/10568/113924>
- Izzi, G.; Denison, J.; Veldwisch, G.J. (Eds.) 2021. *The farmer-led irrigation development guide: A what, why and how-to for intervention design*. Washington, DC, USA: World Bank. Available at <https://pubdocs.worldbank.org/en/751751616427201865/FLID-Guide-March-2021-Final.pdf> (accessed on November 21, 2023).
- LEGKL (Legal, Knowledge and Learning Practice Group). 2019. *Official Documents - ERPA between the Republic of Ghana and IBRD as Trustee of Tranche B of the Carbon Fund of the Forest Carbon Partnership Facility Ref. P160339*. Washington, DC: World Bank Group. Available at <http://documents.worldbank.org/curated/en/481841563999411195/Official-Documents-ERPA-between-Republic-of-Ghana-and-IBRD-as-Trustee-of-Tranche-B-of-the-Carbon-Fund-of-the-Forest-Carbon-Partnership-Facility-Ref-P160339> (accessed on July 4, 2024).
- Minh, T.T.; Schmitter, P.S. 2020. *Co-identification of value chain-based pathway for scaling of irrigation technologies and services: Cases in Basona Worana and Lemo woredas in Ethiopia*. Nairobi, Kenya: International Livestock Research Institute (ILRI). <https://hdl.handle.net/10568/110592>
- Veldwisch, G.J.; Venot, J.P.; Woodhouse, P.; Komakech, H.C.; Brockington, D. 2019. Re-introducing politics in African farmer-led irrigation development: Introduction to a special issue. *Water Alternatives* 12:1–12. Available at <https://www.water-alternatives.org/index.php/alldoc/articles/volume-12/v12issue1/475-a12-1-1/file> (accessed on November 21, 2023).
- Wiggins, S.; Lankford, B. 2019. *Farmer-led irrigation in sub-Saharan Africa: Synthesis of current understandings*. London, UK: Development and Economic Growth Research Programme (DEGRP). (Policy Brief). Available at <https://odi.org/documents/7922/DEGRP-Synthesis-Farmer-led-Irrigation.pdf>

Authors

- Thai Thi Minh**, Senior Researcher – Innovation Scaling, International Water Management Institute (IWMI), Accra, Ghana
Abena Ofofu, Senior Research Officer – Innovation Scaling, IWMI, Accra, Ghana
Olufunke Cofie, Principal Researcher – Integrated Circular Economy Transformation, Regional Representative - West Africa, IWMI, Accra, Ghana
Ruyi Li, Climate Resilient Irrigation Consultant, World Bank, Washington, DC, USA
Saadia Bobtoya, Regional Programme Coordinator, IWMI, Accra, Ghana
Macben Makenzi, East Africa Regional Coordinator, GIZ Sun4Water-WE4F, Nairobi, Kenya
Petra Schmitter, Research Group Leader – Climate Mitigation & Adaptation Pathways (CMAP), IWMI, Colombo, Sri Lanka

Acknowledgement

This work was supported by the United States Agency for International Development (USAID) (Grant AID-OAA-A-13-00055 and AID-BFS-G-11-00002), World Bank, the Water and Energy for Food (WE4F) initiative, the CGIAR Initiative on West and Central African Food Systems Transformation (TAFS-WCA), and the CGIAR Initiative on Excellence in Agronomy (EiA).



United States Agency for International Development (USAID) - Feed the Future Initiative



The World Bank - Global Water Security and Sanitation Partnership



Water and Energy for Food (WE4F) is a joint international initiative of the German Federal Ministry for Economic Cooperation and Development (BMZ), the European Union (EU), and other partners.



INITIATIVE ON

West and Central African
Food Systems Transformation

The CGIAR Initiative on West and Central African Food Systems Transformation aims to improve nutrition, incomes, and food security within the context of climate change in West and Central Africa through nutritious, climate-adapted, and market-driven food systems.



INITIATIVE ON

Excellence in
Agronomy

The CGIAR Initiative on Excellence in Agronomy aims to deliver an increase in productivity and quality per unit of input (agronomic gain) for millions of smallholder farming households in prioritized farming systems by 2030, with an emphasis on women and young farmers, showing a measurable impact on food and nutrition security, income, resource use, soil health, climate resilience and climate change mitigation.

We would like to thank all funders who supported these initiatives through their contributions to the CGIAR Trust Fund (<https://www.cgiar.org/funders/>).

For more information, or to request the full report on which this brief is based, contact:

Thai Thi Minh (t.minh@cgiar.org)

IWMI West Africa Regional Office

CSIR Campus, Agostinho Neto Road, Council Close, Airport Residential Area, Accra, Ghana

Mailing address: PMB CT 112 Cantonments, Accra, Ghana

Citation

Minh, T. T.; Ofosu, A.; Cofie, O.; Li, R.; Bobtoya, S.; Makenzi, M.; Schmitter, P. 2024. *Catalyzing farmer-led irrigation development in Africa: vision and pathways drawing from business, research and development practices*. Adaptive Innovation Scaling - Pathways from Small-scale Irrigation to Sustainable Development. Colombo, Sri Lanka: International Water Management Institute (IWMI). 12p. (IWMI Water Issue Brief 29). doi: <https://doi.org/10.5337/2024.219>

/ farmer-led irrigation / irrigation development / research for development / innovation scaling / small-scale irrigation / sustainable development / financing / business models / investment / value chains / policies / incentives / partnerships / stakeholders / private sector / public sector / donors / development organizations / non-governmental organizations / collaboration / gender equality / social inclusion / women / youth / irrigation technology / solar powered irrigation systems / farming systems / capacity development / learning / entrepreneurs / credit / risk / political aspects / Africa South of Sahara /

Copyright © 2024, by IWMI. All rights reserved. IWMI encourages the use of its material provided that the organization is acknowledged and kept informed in all such instances.

Please send inquiries and comments to IWMI-Publications@cgiar.org

For access to all IWMI publications, visit www.iwmi.org/publications/

IWMI
International Water
Management Institute



IWMI is a CGIAR Research Center

The International Water Management Institute (IWMI) is an international, research-for-development organization that works with governments, civil society and the private sector to solve water problems in developing countries and scale up solutions. Through partnership, IWMI combines research on the sustainable use of water and land resources, knowledge services and products with capacity strengthening, dialogue and policy analysis to support implementation of water management solutions for agriculture, ecosystems, climate change and inclusive economic growth. Headquartered in Colombo, Sri Lanka, IWMI is a CGIAR Research Center with offices in 15 countries and a global network of scientists operating in more than 55 countries.

**International Water
Management Institute (IWMI)**

Headquarters

127 Sunil Mawatha, Pelawatte,
Battaramulla, Sri Lanka

Mailing address:

P. O. Box 2075, Colombo, Sri Lanka

Tel: +94 11 2880000

Fax: +94 11 2786854

Email: iwmi@cgiar.org

www.iwmi.org