

Sustainable and inclusive scaling of irrigation technologies and services in Ethiopia

The context

In the face of climate change and variability, agricultural water management and irrigation can help increase production, productivity, food and nutrition security, livelihood resilience and rural economic growth. Fully realizing the potential of irrigation development requires smallholder farmers to adopt agricultural water management solutions and innovative irrigation technologies and services on a large scale. However, innovations remain largely underutilized. In addition, women and youth are often excluded from accessing and benefitting from these innovations. Understanding the hindering and enabling factors that influence smallholder farmers' adoption of irrigation technologies and services is, therefore, essential to ensure sustainable and inclusive innovation scaling.

Key messages

- A comprehensive analysis of Ethiopia's policy, intervention and informal institutional context provides new understanding of the systemic barriers to smallholder farmers' adoption of irrigation innovations.
- Although important steps have been taken to revise and strengthen policies related to irrigation, certain groups continue to be left behind.
- Overcoming the current barriers requires, among others, improving institutional and human capacity for effective and gender-sensitive policy implementation, and facilitating access to irrigation technologies that meet local needs and preferences.

Key issues

There is significant potential for irrigation development in Ethiopia (MoFED 2013), including small-scale, [farmer-led irrigation](#). However, innovative irrigation technologies and services largely remain underutilized, and many smallholder farmers continue to use rudimentary practices (Minh et al. 2021). One reason for this is that many interventions end at the piloting stage, with the assumption that scaling will occur spontaneously. For sustainable and inclusive innovation scaling to take place, an enabling environment is needed in which a set of conducive policies, informal institutions and support services bring together value chain actors in a cooperative manner (Herman and Minh 2021). Furthermore, many scaling efforts have overemphasized technical replication and reaching high numbers of end users, neglecting critical 'softer elements' (Minh et al. 2021). These include people, supply/value chains, markets, financing mechanisms, policies and regulations, professional knowledge, power relations and incentives.

While piloting plays a key role in testing the success of innovations, transitioning from controlled pilot environments to the real world at scale requires different attitudes, skills and approaches as well as consideration of the organizational and institutional processes intertwined with the innovation. Understanding the hindering and enabling factors in a particular operating environment is, therefore, crucial for the sustainable and inclusive scaling of irrigation technologies and services (Lefore et al. 2019).



Farmers are shown irrigation equipment during a demand-supply linkage workshop in Lemo, Ethiopia (photo: Thai Thi Minh/IWMI).

Analytical framework

To contribute to this understanding, the International Water Management Institute (IWMI) carried out a comprehensive analysis of Ethiopia's policy, intervention and informal institutional context (Figure 1) (Melaku et al. 2022). This was done using a previously developed enabling environment analysis tool (Minh et al. 2021) adapted for this study. The work was carried out under the Innovation Lab for Small-Scale Irrigation (ILSSI) and Africa Research in Sustainable Intensification for the Next Generation (Africa RISING) projects, Technologies for African Agricultural Transformation (TAAT) program, and the CGIAR Research Program on Water, Land and Ecosystems (WLE), which ended in December 2021.

The policy framework encompasses relevant policies, strategies, programs and legislation that establish the basis for irrigation development and actors' behaviors and power relationships affecting the scaling of irrigation technologies and services. Interventions encompass programs and projects as well as services and support provided by government and nongovernmental organizations (NGOs), the private and public sectors, and other practitioners that support irrigation and agricultural development. Finally, informal institutions can refer to a variety of rules that are not established by the government. Instead, they are embedded in societies/communities and are used to manage communal resources, mediate access to and allocation of benefits among users, determine contributions for collective action in resource protection and maintenance work, and enforce sanctions on free riders (Yami et al. 2011).

In total, 43 policies, 43 interventions and relevant informal institutions were analyzed to identify how they hinder or enable

sustainable and inclusive scaling. The results from the analyses were then synthesized as a basis for making recommendations for future scaling success.

Policy framework: Inadequate regulatory support

The transformation of the Ethiopian economy, including the agriculture sector, has increasingly focused on climate resilience, market-oriented agricultural development as well as participatory approaches, stakeholder engagement and (private sector) partnerships. A notable example is the Ten years perspective development plan (GoE 2020a), which also explicitly mentions reduced agricultural dependence on rainfall, inclusive irrigation development, and alternative financing for water and irrigation. However, there is weak alignment of federal-, regional- and district-level investment plans with national development goals. In addition, there is poor regional coordination as well as inter- and intra-regional disparities in infrastructure development and access to services.

In terms of water resources development and management, policies aim to enhance national efforts to ensure efficient, equitable and optimum use of available water resources for significant, sustainable socioeconomic development. These policies emphasize multipurpose water resource development, management and supply, with a focus on water for drinking and sanitation, irrigation and livestock, and hydropower generation. They also promote private sector involvement in water infrastructure development and management, and a greater role for communities in water resources management. Although gaps currently exist in the mechanisms necessary to regulate water fees and charges, enforce water protection measures and

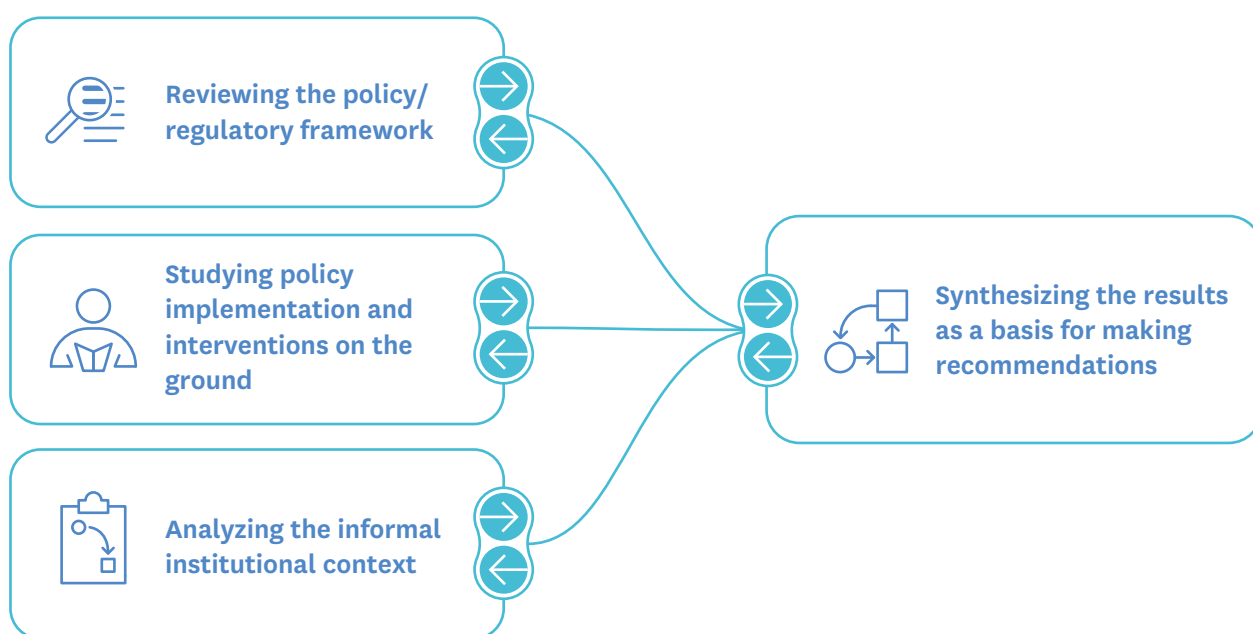


Figure 1. Analytical framework.

Source: Minh et al. 2021



Irrigation can support vegetable production in home gardens, which are often managed by women. This drip irrigation system in Ethiopia's Amhara region is solar powered (photo: Mulugeta Ayene/WLE).

provide incentives, the introduction of the *National guideline for setting water abstraction/use and treated wastewater discharge charge* (AAiT 2018) and the draft Regulation on water use charges (GoE 2019) is for the first time expected to provide guidance and a legal framework for tariff setting and payment for water abstraction (including for irrigation).

Agricultural finance policies play an important role in irrigation scaling by hindering or enabling the provision of financial services to access irrigation technologies and services. At the time of writing, several policies were being revised to improve collateral-based lending practices and include land certifications and other moveable assets as collateral. This is expected to increase access to financial services for smallholders, particularly women, youth and resource-poor farmers who typically own less or no land.

Gender equality and social inclusion are also starting to be addressed through the gender mainstreaming guidelines (GoE 2020b). The guidelines aim to fill the previous regulatory gap by paying greater attention to a gender equality strategy and considering the specific issues of female-headed households as well as emerging issues such as women, climate change and nutrition.

Interventions: Limited consideration of the local context

Interventions generally aim to promote local adaptive capacity, enhance the resilience of households to climate-related shocks, and enable poor farmers to strengthen their food and income security. In terms of irrigation, interventions primarily focus on

small-scale irrigation development, and irrigation practices and technologies. These include water-lifting technologies such as drip, solar, and rope and washer pumps and low-cost (hand-driven) pumps for micro-irrigation systems.

The challenges identified mainly relate to program design. The limited involvement of beneficiaries in program design, implementation, and monitoring and evaluation has resulted in a poor understanding of the local context and thus failure to meet objectives. While gender-sensitive approaches were found across the interventions, only a few interventions included a well-planned gender strategy. Moreover, significant challenges in achieving the desired gender-sensitive outcomes and a low level of women's participation were reported.

More broadly, limited adoption of innovations, best practices and technologies was observed. For instance, the low adoption of water-harvesting and irrigation technologies was due to the high cost of constructing water-harvesting structures and possibly also land tenure and security issues.

Informal institutions: Underlying restrictions exclude certain groups

Informal institutions were analyzed to better understand their role in and influence on irrigation development and the scaling of irrigation technologies and services. For instance, customs, beliefs and traditions provide localized frameworks for collective natural resource management, contributing significantly to biodiversity conservation, protection of landscapes and animals (Maru et al. 2020), resource mobilization and conflict resolution (Ratner et al. 2017; Yeboah-



Farmer Shaga Makoro is part of an Africa RISING project activity to improve fruit and vegetable market linkages in Lemo, Ethiopia (photo: Thai Thi Minh/IWMI).

Assiamah et al. 2017). However, collective actions can be highly inequalitarian and collectively exclude certain groups from accessing land and irrigation. In addition, gendered social and power relations converge in irrigation governance, including the division of labor, unequal education opportunities, differentiated benefit-sharing mechanisms and uneven gender participation.

Bureaucratic culture continues to enforce more hierarchical and paternalistic relationships and discourages the flow of agricultural innovations through informal networks (Hailu 2009). At the same time, misunderstanding of context leads to the assumption that one technology model can serve everyone. This overlooks the diversity of and varying interests among groups and negatively influences equity, inclusion and adoption. Unfavorable attitudes toward gender equality and social inclusion also lead to challenges in effective mainstreaming of gender and engagement. This results in the low involvement of women and other marginalized groups in irrigation and agriculture programs.

Finally, informal incentive structures influence value chain actors' decision-making regarding promoting or not promoting irrigation technology scaling (Minh et al. 2021). These

structures relate to social capital, networks and informal socioeconomic platforms. They help reduce information asymmetry and transaction costs, enabling knowledge and information sharing among communities and other network members and addressing access to key services such as finance, extension and information (Wossen et al. 2015). A lack of social capital may hinder the adoption of profitable technologies when individuals have limited access to formal labor, capital and information. This can serve to widen the gap between those with higher and lower levels of social capital. Moreover, information flow through social networks may not reach men and women equally and, in some cases, may enforce existing inequalities (Beaman and Dillon 2018).

The way forward

The findings show that Ethiopia has taken important steps to revise and strengthen policies related to agricultural water management and irrigation. Policy gaps remain, however, and issues in policy and intervention implementation coupled with restrictive informal institutions mean that interventions continue to leave certain groups behind. Based on the challenges and opportunities described in this brief, this section lays out a vision for sustainable and inclusive scaling



Demand-supply linkage workshops, like this one in Lemo, Ethiopia, aim to strengthen irrigated value chains for all actors (photo: Rahel Mesganaw/IWMI).

of irrigation technologies and services and provides key recommendations to achieve it.

Enhance the enabling environment for scaling irrigation technologies and services

- Improve the institutional environment and increase institutional and human capacity for effective policy implementation.
- Review, improve and update finance and land administration policies, procedures and practices to accommodate the needs of smallholders, women and youth.
- Address irrigation-related gaps in research, extension and information management.

Enhance the credibility and efficiency of irrigation development and interventions

- Improve the technical, financial and environmental sustainability of irrigation initiatives.
- Plan strategically for communication, stakeholder participation, gender mainstreaming and scaling.
- Assess the local context and ensure there is a comprehensive understanding of the local challenges, technology needs and preferences, socioeconomic context, and access to inputs and services.

- Adopt integrated and bundled approaches (e.g., agronomic inputs, technology, finance, infrastructure) to ensure the relevance and credibility of irrigation development.

- Facilitate linkages in irrigated value chains to ensure irrigated agriculture is profitable for all actors.

- Co-develop comprehensive strategies for sustainable and inclusive scaling of irrigation technologies and services.

Strengthen technology supply chains and partnerships

- Stimulate private sector-led supply of small-scale and micro-irrigation technologies and services.
- Attract private sector companies by addressing technology import complications such as a shortage of foreign exchange and lengthy import procedures.
- Develop and enforce national quality standards and technical specifications that apply to both locally manufactured and imported irrigation technologies.
- Encourage private sector investment and financing by devising innovative mechanisms to de-risk agricultural lending.
- Adjust collateral-based lending policies and highly formal lending practices, and consider alternatives to land, such as moveable assets, as collateral.



Sewagegn, a smallholder farmer, and Gebeyaw, a data collector, set up a solar-powered irrigation pump for Sewagegn's home garden in the Amhara region, Ethiopia (photo: Mulugeta Ayene/WLE).

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Farmers attend a field demonstration of solar-powered irrigation pumps in Lemo, Ethiopia (photo: Thai Thi Minh/IWMI).

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