International Water Management Institute

Technical Brief

# Evidence-based strategies to accelerate innovation scaling in agricultural value chains

Making innovative water management and irrigation technologies available to small farmers on a large scale is crucial to meet growing food demands while strengthening the resilience of food systems to climate change. Africa is particularly vulnerable to the impacts of climate change. There are several reasons for this, such as weak adaptive capacity, high dependence on ecosystem goods and services for livelihoods, and less developed agricultural production systems (WMO 2021). Strengthening the resilience of African agriculture critically depends on the ability of governments and their partners to bring science and innovation to the forefront of the development agenda. This requires co-creating evidence-based innovation bundles that best fit the local context while building capacity to scale these bundles in ways that are economically and environmentally sustainable.

However, many small farmers live in remote areas with underdeveloped irrigation technology supply chains. These conditions are exacerbated by high transaction costs in accessing other agricultural products and services such as financing, seeds, fertilizers and output markets. Such on- and off-farm agronomic and market challenges ultimately limit adoption of irrigation technologies. Moreover, efforts to scale irrigation technologies and other agricultural innovations often fall short because they do not sufficiently consider and address these challenges. This technical brief presents an overview of and initial results from innovation scaling and capacity building strategies that are being implemented in research-for-development projects led by the International Water Management Institute (IWMI) in Ghana, Ethiopia, Mali and Zambia.

Farmers attending a solar irrigation pump demonstration by Pumptech in Northern Ghana (*photo:* Thai Thi Minh).

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## Bridging knowledge and capacity gaps

Knowledge and capacity gaps are assessed and addressed using best-fit capacity development approaches (Vallejo and Wehn 2016). These approaches target capacity strengthening at multiple levels – individual, organizational, institutional and systemic – and via multiple pathways (Posthumus et al. 2012). One of these pathways is internship and innovation grants (I2G) (Minh et al. 2022). At the heart of this pathway is the ongoing co-identification of value chain-related business challenges and innovation needs with private sector actors. These actors play a central role in the supply of irrigation technologies and services such as information, financing and after-sales support. The I2G pathway is being implemented through five different modalities, as shown in Figure 1. The modalities are described below, along with examples of how they are being operationalized and the results achieved to date.

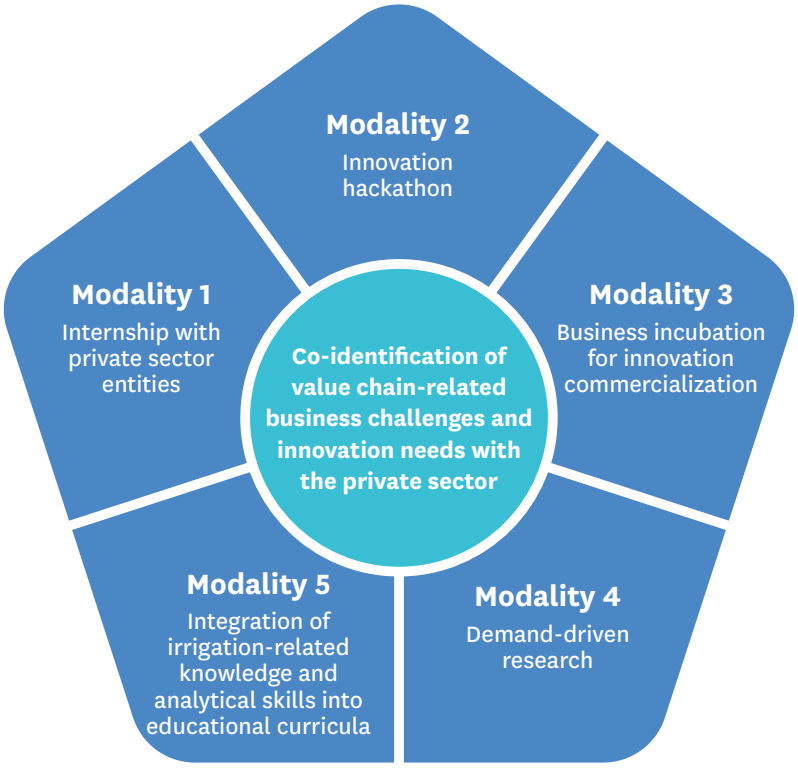


**Figure 1.** The five modalities of the internship and innovation grant (I2G) pathway for capacity development.

## Modality 1. Internship with private sector entities

Targeting young professionals and entrepreneurs, this modality aims to foster innovation and stimulate entrepreneurship. Over a period of 6-12 months, interns help to develop and test innovative solutions that address specific knowledge and capacity gaps in the company hosting them. These innovations are expected to contribute to the formulation of a profitable and sustainable business model for the company's technologies and/or services, thereby accelerating irrigation technology scaling. At the same time, the interns gain valuable work experience in the private sector, access to professional networks and mentorship as well as an appreciation for the private sector's role in scaling development solutions. The learning environment is designed to be constructive and interactive, ensuring all partners contribute to and benefit from the knowledge generated. This modality is being operationalized as part of the Innovation Lab for Small-Scale Irrigation (ILSSI) and Africa Research in Sustainable Intensification for the Next Generation (Africa RISING) projects in Ghana, Ethiopia and Mali, and the Accelerating Impacts of CGIAR Climate Research for Africa (AICCRA) project in Zambia.

In Ghana, two interns were selected to work with Pumptech, a solar irrigation equipment supplier, during the first internship period. They are developing a digital data management and marketing system that will reduce errors in capturing customer information, permit comparative analysis across projects over time, and help the company to market its products and services more effectively, especially to small farmers. The data management system, which is still being implemented, will be integrated with a mobile

money platform. The platform accepts and tracks mobile payments, including deposits made by small farmers as part of Pumptech's 'pay-as-you-own' financing model. This model allows farmers to use the irrigation equipment while making regular payments until the total cost of the pump is paid off. In terms of digital marketing, the strategy implemented by the interns has improved Pumptech's online visibility considerably, with one post on social media reaching almost 14,000 people organically (without advertising). Overall, these and other measures supported by IWMI helped Pumptech increase pump sales by more than 80% in the space of a year (WLE 2022).

In Mali, an internship has been established with EMICOM, a solar irrigation equipment supplier, to develop a pay-as-you-go credit assessment app. The app will help to identify small farmers who are creditworthy and connect them with financial and credit institutions to obtain a loan to invest in solar irrigation.

## Modality 2. Innovation hackathon

While the internship modality emphasizes co-learning, the innovation hackathon focuses on co-designing demand-driven solutions to meet the needs and challenges companies face in serving small farmers. To achieve this, IWMI has partnered with several universities. Specifically, hackathons aim to leverage the universities' technology hubs by linking student innovators with private actors in the irrigation sector. Supported by experts from various fields, students are given the opportunity to design innovative solutions through a rigorous 'learning-by-doing' method of research and development. Innovations can address actual needs put forward by private sector partners and/or more radical ideas with high potential for commercialization. Alongside technical and design skills, participants also develop soft skills such as problem solving and teamwork.

This modality is being operationalized as part of the ILSSI and AICCRA projects in Ethiopia and Zambia, respectively. In Ethiopia, the first hackathon was held in 2021 at the Bahir Dar Institute of Technology (BiT), part of Bahir Dar University. It was organized around four challenges co-identified with Rensys, a private sector irrigation equipment supplier. Out of 143 applicants, 32 students divided into six teams were selected for the hackathon training sessions. These sessions covered topics such as human-centered design, ideation techniques and pitching skills. They also included a field visit, allowing the students to see the irrigation equipment in use and ask farmers questions about any issues they face.

The teams presented their ideas for possible solutions during a pitching competition, and three ideas were selected for further development. Two of the ideas address digitization of Rensys' pre-sale client assessment and after-sale tracking tools. The


Members of the winning teams during the first hackathon at Bahir Dar Institute of Technology, Ethiopia (*photo:* Henock Mebratie).


A shop selling solar panels in Sikasso, Mali (*photo:* Thai Thi Minh).

A farmer with a solar irrigation pump in Mali (*photo:* Thai Thi Minh).

third idea – a smart irrigation watering system using a moisture sensor to alert farmers when it is time to irrigate – was a new challenge identified during the hackathon. Guided by regular feedback from Rensys, the winning teams developed their ideas and built prototypes.

Six interns chosen from across the teams were then given a three-month contract to implement the digitization tools in Rensys' office. The interns are now planning to establish their own spin-off company to commercialize the tools they developed and make them available to other private sector actors. BiT is providing the interns with training and advice on sourcing startup funding.

IWMI organized a second hackathon with BiT in early 2022, covering several new challenges co-identified with Rensys. These include a solar cold room app to enhance output market linkages for perishable agricultural products, a digital marketing and sales app, and a maintenance management app for solar products.

## Modality 3. Business incubation for innovation commercialization

This modality focuses on identifying and helping high-potential startups or small and medium-sized enterprises (SMEs) to succeed in irrigated agricultural value chains. The modality brings together capacity building partners ('incubators') – such as economic development organizations, government entities, national colleges and universities, for-profit ventures and trade associations – and young innovators, startups and BSc/MSc/PhD students ('incubatees'). Together, they seek to commercialize irrigation-related innovations and develop the competences needed to set up and grow a business. These competences include business planning, accounting and public relations. Incubators are also expected to connect incubatees to professional networks and potential investors as well as provide mentoring and advice.

The modality is being operationalized in Zambia as part of the AICCRA project. Incubatees are selected through a competitive process for an incubation period of 3-6 months. Depending on the business model, incubatees may also be awarded a grant of USD 3,000-5,000 to help de-risk the establishment of their venture and cover commercialization-related costs. The first incubatees will be selected this year.

## Modality 4. Demand-driven research

A lack of reliable data on agricultural value chains is a major barrier to irrigation market expansion in many African countries (Minh et al. 2022). This modality aims to bridge this gap by embedding demand-driven research in academic theses and private sector research

Solar technology and sustainable land management practices are boosting crop productivity in Hosana, Ethiopia (*photo:* Mulugeta Ayene).

internships while strengthening capacity for future research and application of evidence. In collaboration with national universities and research organizations, IWMI identifies the irrigation-related knowledge needs of its private sector partners and develops research topics to address these needs. Students are supervised throughout the research process, from data collection and analysis to co-generation of knowledge. An important aspect of this modality is ongoing engagement with the private sector to ensure relevant research is conducted and effective use of the results.

This modality is being operationalized in Ethiopia, Ghana and Zambia as part of the ILSSI and AICCRA projects. In Ethiopia, three MSc students are working on topics that will help guide future solar pump investment and use. Topics include adoption and impact evaluation of solar pumps, and a comparative analysis of solar and diesel pumps on farmers' economic returns.

In Ghana, an intern hosted by PEG Africa (a solar irrigation equipment supplier), is focused on cocoa, an economically important crop that is being negatively affected by climate change. Supplemental irrigation could improve cocoa yields and quality, particularly in secondary seasons. In addition, irrigation can be used to inter-crop cocoa with high-value vegetables. As cocoa is largely cultivated under rain-fed conditions, little information is available to assess the economic and environmental viability of irrigated cocoa production. Overseen by IWMI, the intern is supporting data collection and analysis of farmers' willingness and ability to invest in solar irrigation. The resulting information will be used to identify potential innovative business and/or finance models to market irrigation equipment in the cocoa value chain.

## Modality 5. Integration of irrigation-related knowledge and analytical skills into educational curricula

As with modality 4, this modality is designed to close the research-private sector divide. However, instead of focusing on academic theses and research internships, this modality aims to integrate irrigation-related knowledge and analytical skills into existing educational curricula. The modality will be operationalized in Zambia as part of the AICCRA project, once suitable university partners have been identified, and can take various forms. The main aim is to develop a new course that is a core component of BSc/MSc curricula. Other options include the creation of a practical project that students can implement under faculty supervision with public and private sector entities, or an irrigation-focused internship as a compulsory part of a degree program.

Solar-powered drip irrigation in Zambia (*photo:* Adam Öjdahl).

Solar-powered groundwater irrigation in Ethiopia (*photo:* Maheder Haileselassie).

## Conclusion

Climate change presents a unique and complex challenge to food systems everywhere, but particularly in Africa. In order to address this challenge, food system actors should have the capacity to identify, develop and/or bundle innovations that can strengthen the resilience of food systems and deliver these bundles to productive agents (e.g., farmers, livestock keepers, assemblers, processors and distributors). Furthermore, it requires individuals and institutions to produce the 'translational research' that converts scientific evidence into commercial and social benefits. Through the five modalities described in this brief, the I2G pathway is designed to bridge current knowledge gaps and strengthen a range of capacities at multiple levels. Although the modalities are presented as distinct, they can and do overlap. To ensure complementarity as well as knowledge exchange between the modalities, public and private sector entities regularly meet to discuss progress and learnings. Multi-stakeholder dialogues, for instance, offer the opportunity to bring together relevant actors to facilitate and accelerate sustainable food system transformation (Minh et al. 2020).

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Patience Wussah on her farm in Ada, Ghana (*photo:* Nana Kofi Acquah).

A farmer using solar-powered drip irrigation in Zambia (*photo:* Adam Öjdahl).


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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 13 countries and a global network of scientists operating in more than 30 countries.

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