FEED THE FUTURE
The U.S. Government's Global Hunger & Food Security Initiative

REPORT ON

Small-scale irrigation's contributions to increased income,

ECONOMIC GROWTH

and market opportunities

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FEED THE FUTURE INNOVATION LAB FOR SMALL SCALE IRRIGATION

Improving incomes and agriculture-led economic growth through small-scale irrigation

Millions of smallholder farmers, studies show, could adapt to climate change and increase income through irrigated production of nutrient-dense crops and fodder.

Farmers, entrepreneurs, and businesses are already leading the way by expanding irrigation in response to climate variability and the growing demand for vegetables and fruit through supplemental and dry-season irrigated production.

Increasing commercialization creates market opportunities throughout irrigated value chains. The Feed the Future Innovation Lab for Small Scale Irrigation (ILSSI), has supported research and partnerships with companies and producer groups to innovate technologies, share information, and develop inclusive, market-based approaches that catalyze investment in irrigation.

COUNTRY	Smallholder farmers benefitting	Net profit per year for farming households
Ethiopia	around **5.8 million**	US**$2.6 billion**
Tanzania	around **3 million**	US**$781 million**
Ghana	around **0.7 million**	US**$285 million**

POTENTIAL NUMBER OF FARMERS AND FARMER PROFIT PER YEAR FROM SMALL-SCALE IRRIGATION

Increasing small-scale irrigation leads to higher incomes for smallholder farmers and others along the value chain

Small-scale irrigation (SSI) increases returns to land and labor and reduces risk for producers, produce buyers, and processors. **Small-scale irrigators are able to improve the stability and quality of produce and increase profit from farming enterprises.** Differing combinations of small-scale irrigation technology and crops result in different profit profiles. For example, producing high-value vegetables with motorized pumps generates three to five times the net profit of irrigating staples with manual water-lifting devices. In Ethiopia, returns from solar-powered irrigation of vegetables enable profit and equipment loan payback within two years.

Where fuel prices are high and after-sales services limited, solar pumps provide higher returns than fossil fuel pumps, especially over time.

Farmers express strong demand for irrigation technologies, including motorized or solar pumps and other agricultural water management tools. But multiple factors affect farm households' decisions to invest their resources. Labor is a major constraint to the expansion of SSI, especially for women farmers, so labor-saving technologies for lifting, applying, and managing water for irrigation and multiple uses can incentivize investment. Likewise, increasing seed availability for irrigated crops such as vegetables and fodder is also essential to farmer investment decisions. Regulatory reforms in Mali could increase local vegetable seed production under irrigation, improving farmer access to seed and creating business opportunities for seed producers. In Ethiopia, ILSSI-supported partnerships with cooperatives helped fill fodder seed gaps through irrigated production, encouraging hundreds more farmers to irrigate fodder. In addition, farmers in Ethiopia indicate that they would be more likely to invest in irrigation if there is support to develop water sources and reduce related uncertainties, for example, assistance for boreholes. Finally, affordable and appropriate financing encourages smallholder farmer investment in irrigation equipment and other inputs. Market and public interventions around complementary inputs are all entry points to catalyze farmers' own investments in irrigation.

Strengthening markets for irrigation equipment and irrigated produce creates "win-win" outcomes for smallholder farmers, companies, and communities

As farmers are already expanding small-scale irrigation, ILSSI partners have taken steps to understand and overcome constraints within the market system to bolster access to irrigation equipment and services for resource-poor farmers.

At policy level, project partners analyzed policies and institutions, technology diffusion networks, and blocks and enablers in the equipment market. This information, in addition to studies on marketing margins, helps companies and projects identify ways to reduce costs to farmers. For example, ILSSI analysis for Ethiopian agencies showed that equipment tariff exemptions reduce pump prices, decrease additional costs to farmers, and increase commercial potential, generating broader economic and nutritional benefits.

Within the market, ILSSI has partnered with four solar pump suppliers in Ethiopia, Ghana, and Mali, as well as one unfunded knowledge partnership in Ghana. **Private partnerships helped to offset risks and generate information for companies entering nascent markets.** ILSSI provided suitability maps that enable companies to target high potential areas based on water availability, irrigable land potential, and socio-economic factors. ILSSI also facilitated linkages between partner companies and thousands of farmers through market segmentation and demand-supply linkage workshops in irrigating areas.

Through competitive internships, students placed with company partners supported client segmentation studies and app development for managing sales, after-sales services, and inventory. The partnerships led to strong results and advanced marketing strategies, despite multiple global and local crises.

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SOLAR-POWERED PUMPS SOLD BY ILSSI PARTNER COMPANIES FROM 2020 THROUGH 2022

Increasing trust, collaboration, and cooperation across sectors and stakeholders fosters innovation and knowledge exchange toward scaling farmer-led irrigation

Information exchange is central to market and food system innovation, particularly increasing trust across sectors. ILSSI has convened thirteen multi-stakeholder dialogues on farmer-led, small-scale irrigation in Ethiopia, Ghana, and Mali. Dialogues have provided spaces to bring together the private sector, government agencies and Ministries, research organizations and universities, and agricultural value chain actors to catalyze change around specific challenges. These dialogues provide an umbrella for coordination and adaptive learning and opportunities to share recommendations, best practices, and institutional innovations in agricultural water management. The dialogues have led to private companies participating in public agency meetings for the first time and market-based ventures between companies. Other development actors plan to continue convening the dialogues after ILSSI ends.

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ILSSI-CONVENED MULTI-STAKEHOLDER DIALOGUES ON FARMER-LED, SMALL-SCALE IRRIGATION

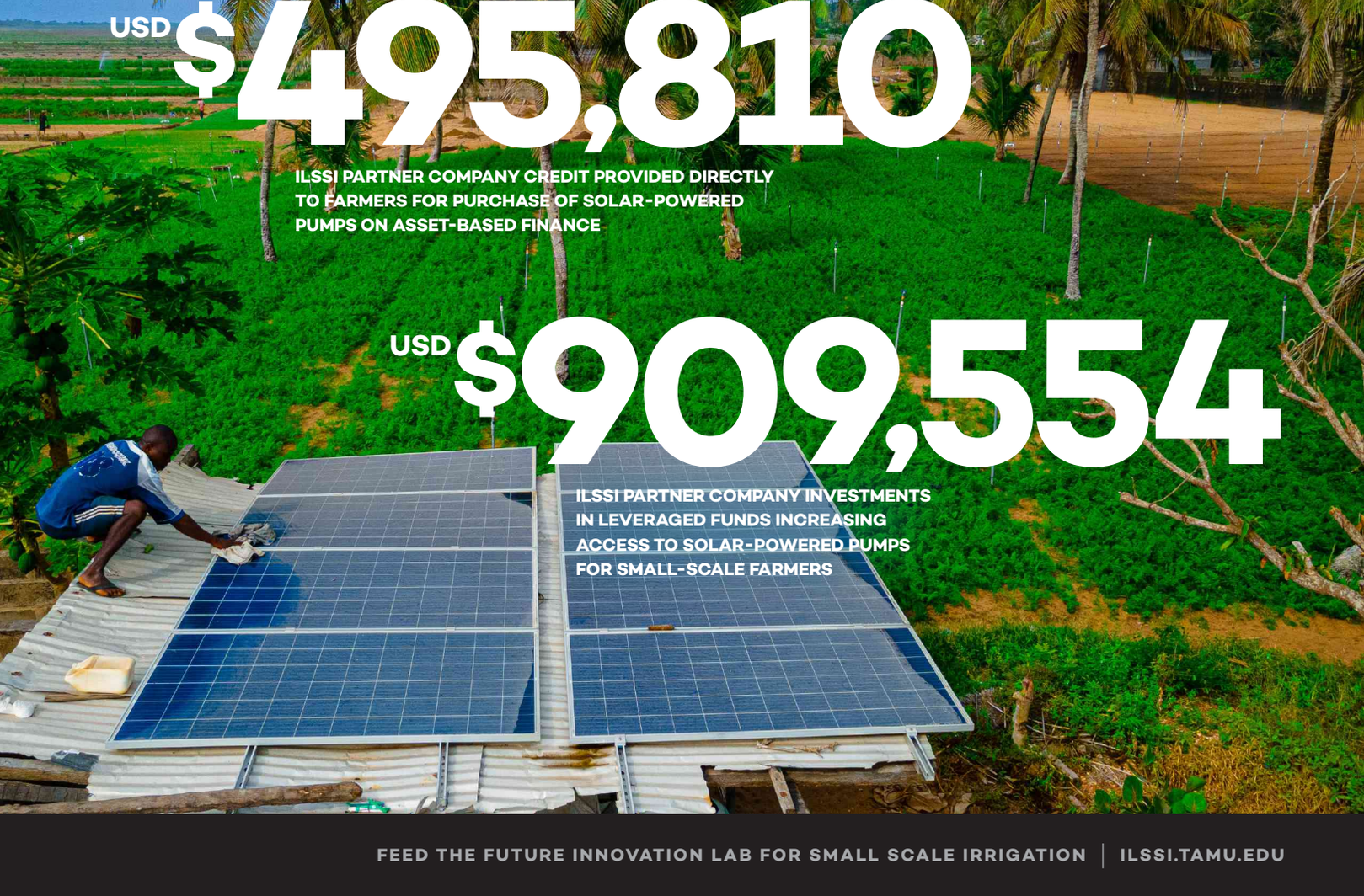
Enhancing the pathways to empowerment is achievable through gender-sensitive public and private investments

Small-scale irrigation development brings many benefits but might only achieve its full potential with women farmers. At the same time, women and households could greatly benefit from improved access to irrigation and enhanced yields by integrating the right tools into both private and public sector interventions. ILSSI has worked with private companies to encourage recognition of women as a viable market segment and to co-design approaches that enable women to invest in irrigation. For example, ILSSI worked with a partner in Ghana on an irrigation service provision model that can reach women who lack resources or are too risk-averse to buy equipment. In Ghana, a private partner developed the capacity of potential women clients to establish creditworthiness for pump finance and also rolled out a gender-sensitive credit assessment tool. In Mali, a partner established a localized distribution network of women and men agents trained to develop capacity and provide sales and after-sales services to women farmers. **Given recent and anticipated food crises, public investments must target women** and align complementary initiatives with the private sector to achieve potential empowerment and irrigation outcomes for climate adaptation and economic growth.

Innovating suitable finance solutions for farmers and companies enables expansion of profitable irrigation

The most innovative finance tools consider both demand- and supply-side issues. While credit supply factors, such as low availability of rural and agriculture credit or high costs of borrowing, place constraints on farmers' own investments in irrigation, research in Tanzania and Ethiopia shows that **demand-side credit constraints, such as risk-aversion, financial illiteracy, and high transaction costs, are as important as supply**. ILSSI private partners have aimed to reduce clients' demand-side concerns, such as training potential clients on financial management and offering more flexible payment terms. Through collaboration, ILSSI company partners have been better able to match finance products with the needs of different market segments of smallholder farmers.

ILSSI has worked with irrigation equipment companies and other private entities to explore and test finance approaches within different business models. Examples of financial instruments offered by project partners include asset-based finance, lease-to-own, and seasonally appropriate repayment plans. Expanding irrigation service provision and "uber for irrigation" requires additional investment. Promoting greater awareness of the limitations of finance in the agriculture sector is helping to shape the design of new, appropriate finance mechanisms.



Partnering between research and private companies can contribute to water and natural resource sustainability

Scaling up the use of pumps for irrigation needs to balance the risks to water scarcity and groundwater depletion. Energy is also important for identifying the type of technology for a company or development agency to promote, for example, understanding where solar-powered pumps are more advantageous than fossil fuel pumps.

Given the limited capacity for public planning and monitoring water use, aligning the resilience of people with the environment needs support. Fortunately, private companies have a stake in the sustainability of water and other natural resources because water availability and business prospects are interlinked for future irrigation-related enterprises. Yet, companies often need more internal capacity to develop equipment and irrigated value chains within planetary boundaries.

Toward enabling more self-regulation within the industry, **ILSSI has worked with companies to understand their information needs while also providing research-based evidence to support sustainability of marketing plans.** ILSSI utilized various analytical tools to support companies, such as providing business models with integrated irrigation suitability maps in Ethiopia and Ghana. With partial support from ILSSI, an online tool was developed that supports users to identify suitable areas for solar-based irrigation depending on water sources and pumps. Maps were then tailored for ILSSI's private company partners.

KEY POINT:

Achieving potential for climate adaptation, increased income, and economic growth through the market requires coordinated research, public, and private sector actions

Farm-level profitability and the broader economic benefits from small-scale irrigation are clearer than ever. Market incentives are motivating more farmers to invest in irrigation, though targeted business models, finance tools, and capacity development will be needed to enable resource-poor farmers, such as women and youth, to access irrigation technologies and services.

Greater collaboration and cooperation are enabling irrigation equipment suppliers to expand equipment distribution in frontier markets. ILSSI's research and engagement with private companies have helped to strengthen market-based approaches to scaling solar-powered irrigation in Ghana, Ethiopia, and Mali. Lessons are relevant for other markets in the region, as well.

As small-scale irrigation increases, greater capacity is needed across sectors to manage and mitigate trade-offs. Cross-sector partnerships are fostering innovation for sustainable scaling.

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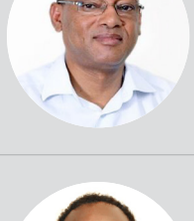

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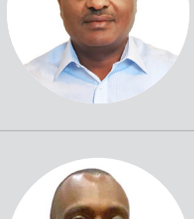

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