
Promoting Climate Adaptation by Upscaling Solar Irrigation Technology Options for Smallholder Farmers in Ghana through Innovative Financing Mechanisms, Technology Policy and Training

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April 2024



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Background: Technical Assistance

- Promoting and upscaling appropriate solar irrigation technology options for smallholder farmers in Ghana through climate adaptation financing mechanisms, technology policy framework and training
- TA Submission : April 30, 2021
- Implementation : CARES/INTee
- Period : April 2022 – October 2024
- Total Cost : About 250K USD

- The TA advances the following Sustainable Development Goals



Background: Agriculture and Livelihoods in Ghana

The agriculture sector is the major employer; mostly smallholder farmers

Most farms are less than 2 hectares and depend on rain-fed agriculture

Climate change impacts; raised temperatures, reduced length of wet seasons, increased number of dry days and heatwaves, leading to increased drought risk

Few smallholders can afford irrigation, due to Capex and high fuel costs, and need assistance to switch to commercial agriculture and modern technologies for more efficient use of scarce water resources

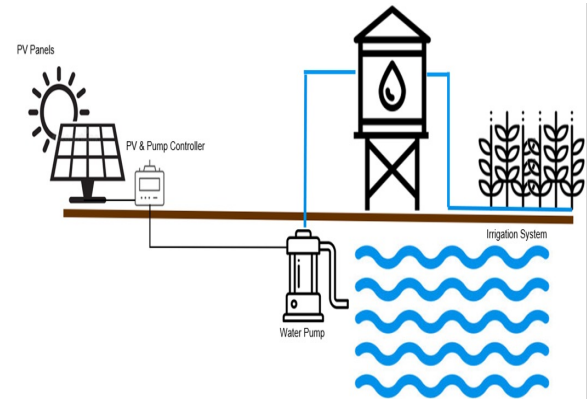


Background: SPIS Opportunities

The introduction of **Solar Powered Irrigation Systems (SPIS)**, as an adaptation intervention, addresses the water insecurity issues caused by climate change and secures benefits for productivity and profitability:

- Reliable and affordable energy, especially in remote areas
- Flexible and climate-friendly, with reduced CO2 emissions
- Low maintenance and relatively long lifespan

. Reducing Capex costs for SPIS equipment make it a more viable adaptation option for smallholder farmers



Background: SPIS Constraints

Several barriers exist that constrain the uptake of SPIS by smallholder farmers in Ghana, including:

High capital costs, few smallholders able to access finance

Lack of information and training on SPIS

Absence of an integrated equipment supply chain and certification standards

Insufficient enabling policies and institutional frameworks





Objectives and Outputs

- Consultants (CARES/INTee) are implementing the TA by providing a sustainable and efficient means of irrigation through the assessment of solar technology options, the design of an appropriate and sustainable business model(s) for the lowest income, and the formulation of a policy framework for the use of Solar Powered Irrigation System (SPIS) in Ghana.
- **The TA is divided into four main outcomes, as follows:**
 - Outcome 1: Benchmark Solar Powered Irrigation Technologies Suitable to Smallholder Farmers in Ghana and Assess their Respective Cost-Benefits
 - Outcome 2: Define a Business Model Targeting Smallholder Farmers for the Use of Solar Pumping Irrigation Systems in Ghana
 - Outcome 3: National Framework on Solar Powered Irrigation Technology
 - Outcome 4: Capacity Training to Raise Awareness on the Benefits of Solar Pumping Irrigation Systems for Smallholder Farmers in Ghana

Implementation Activities: Outcome 1

- **Outcome 1:** Benchmarking suitable SPIS technologies:
 - Stakeholder mapping and formation of a Stakeholder Working Group (SWG)
 - Inception meeting
 - Desk studies of existing agricultural and irrigation practices
 - Stakeholder workshop to introduce SPIS to future users, officers, investors etc
 - Development of guides to appropriate SPIS technologies for Ghana
 - Cost analysis





Implementation Activities: Outcome 2

- **Outcome 2:** Define Business Model(s) targeting smallholder farmers:

Community ownership model

- Community owned and managed
- Avoids cost of 3rd party operations
- Farmers can decide tariff themselves
- Suitable for smaller systems (up to 1 ha)

Operator ownership model

- 3rd party brings in equity investment and manages the system
- Sells water to farmers
- Professional O&M
- Higher tariffs for farmers
- Viable for larger systems (from 1 ha)

Shared ownership model

- Multiple parties bring in equity to reduce (or completely eliminate) need for debt financing
- More affordable tariff
- Professional O&M
- Viable for small and medium systems (up to 5 ha)

Next Steps: Outcome 3

- **Outcome 3:** National Framework on solar powered irrigation technology:
 - High level governmental meeting (April)
 - Consultations with the private sector suppliers and distributors
 - Draft policy framework for compliance standards and certification (May)
 - Circulate for review, workshop and update with official feedback from national ministries, governing authorities and SWG (June-July)
 - Incorporate comments and finalise policy framework (August 2024)



Next Steps: Outcome 4

- **Outcome 4:** Capacity and Awareness Raising on the benefits of smallholder SPIS:
 - Training modules to address gaps for smallholder farmers and investors
 - Validate the modules at a meeting with the SW/G (June)
 - Create an SPIS webpage hosted in the EPA website (July)
 - Disseminate the training modules through workshops with smallholders, private sector and officials (August 2024).



Lessons and Challenges



Reduction of about 50% in CAPEX per hectare for farm sizes of 5 ha onwards

While irrigation costs increase linealy with farm size, PV, pump and storage do not increase proportionally



Drip irrigation requires regular replacement of application network

Higher OPEX are compensated by better resource efficiency (water and land) and higher productivity



Crop selection is dependent on region, soil type, water availability and market price

Farmers to be supported in transitioning from 1 cycle (rain fed) to 3 cycles annually to a good crop mix



For small sizes (up to 1 ha), farmers are better off with community operated systems

Directly managing smaller farms allows for eliminating margins of 3rd operator (high tariffs for small sizes)



Interest payments are the major hurdles to viability of SPIS in all sizes

Innovative ownership models could be considered to reduce (potentially eliminate) need for debt financing



Lessons and Challenges

No single technology, scheme configuration or business model suits all situations

Limited and unreliable financial data for costings and analyses

Upscaling SPIS adoption Will always require some level of subsidy, justifiable by environmental benefits to the nation

Smallholders can manage Opex costs, but will struggle with Capex

Group lending can only benefit farms that are located closely together

Long-term sustainability requires improved extension services, markets and all aspects of the Value Chain

Commercial banks need to consider lower interest rates, revolving funds and loans specific for the farmers

Progress on policies, standards, certification, training and awareness already achieved



Thank you!