Solar Irrigation for Agricultural Resilience (SoLAR) in South Asia

Year 1 Work Plan

JANUARY 2020

IWMI
International Water Management Institute

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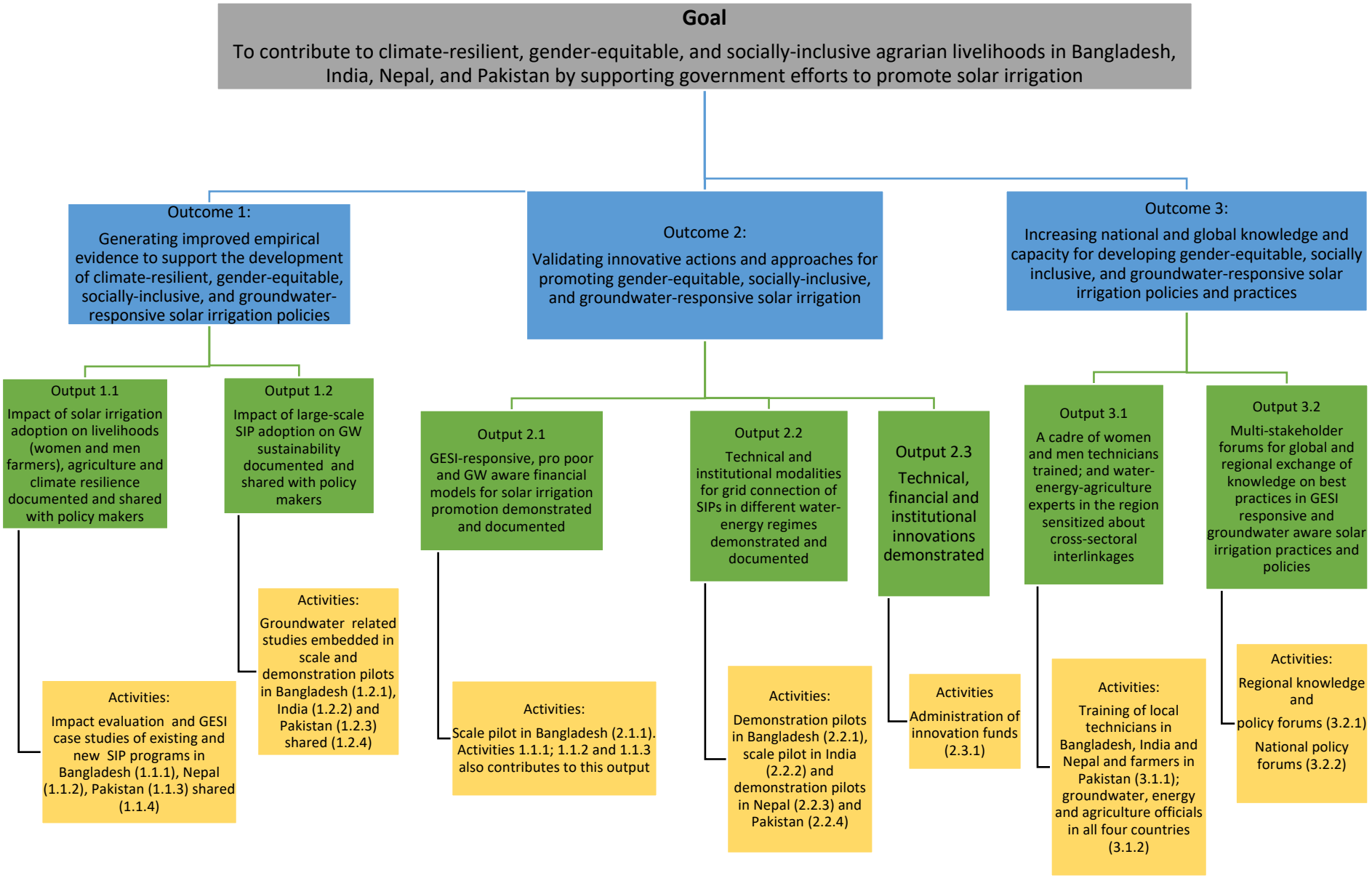
SoLAR Logical Framework



1.1.1 Impact evaluation and GESI case studies of existing and new SIP programs in Bangladesh

Justification and demand:

IDCOL – the nodal organisation in Bangladesh for financing renewable energy has financed around 1250 pumps till date, and the target is to finance 50,000 SIPs by 2025.
While there are data to show that these pumps have been beneficial for the farmers, an in-depth, comprehensive and rigorous impact evaluation (IE) is yet to be done.

Methods/components:

- Qualitative studies that captures perception of farmers, including small and marginal farmers and women farmers about benefits and challenges of SIPs;
- Quantitative surveys covering farmers/plots using solar (treatment group) and diesel pumps (control group). Farmers/plot with similar characteristics will be matched for creating credible comparison groups for evaluation.
- Analysis of secondary data on various aspects of SIPs already collected by IDCOL

Location:

Selected sites in north west Bangladesh and Khulna region

Timeline:

1.1.1 IE and GESI studies in BD	**Start Date** **01-12-2019**	**End Date** **30-12-2020**	**Outputs**
Gather relevant secondary data from existing IDCOL sites and data cleaning	01-12-2019	30-01-2020	Short Note prepared based on the analysis of secondary data
Analysis of secondary data	01-02-2020	30-04-2020	
Develop Methodology for impact evaluation	01-02-2020	30-04-2020	Methodological Note for IE
Preparation of quantitative and qualitative instruments for IE study	01-04-2020	30-05-2020	Questionnaire for survey and FGD guidelines
Finalize sampling methodology for IE	01-04-2020	30-05-2020	Sampling Strategy Note
Focus Group discussions/ Case study (concurrent with Baseline data)	01-06-2020	30-07-2020	1 Case study report
FGD report	01-08-2020	30-09-2020	
Baseline Data collection	01-06-2020	30-07-2020	Final data by mid-August 2020
Baseline Data analysis	01-08-2020	30-09-2020	
Baseline Report	01-10-2020	30-12-2020	Baseline Report (to be submitted to IDCOL and SDC Project Manager)

Deliverables:

- Cross sectional data from a representative sample of SIPs, and electric and diesel pumps: *Baseline data mid-August 2020.*
- One preliminary impact evaluation report – *Baseline report 31/12/2020. Final IE report in 4th year using end line data also.*
- One gender, equity and social inclusion (GESI)case study report - December 2020.
- At least one policy brief outlining the main findings and policy implications. *(Q4, coinciding with National forum – draft presented in National forum, finalized after that)*

1.1.2: Impact evaluation and GESI case studies of existing and new SIP programs in Nepal

Justification and demand:

- AEPC – the nodal agency for renewable energy in Nepal has financed and installed nearly 1000 SIPs till date. In addition, ICIMOD has also installed nearly 60 pumps, which have been monitored since 2016, and we intend to continue monitoring of those pumps.
- While there are data to show that these pumps have been beneficial for the farmers, an in-depth, comprehensive and rigorous impact evaluation (IE) of AEPC's SIP program is yet to be done.

Methods/components:

- Qualitative studies that captures perception of farmers, including small and marginal farmers and women farmers about benefits and challenges of SIPs using a GESI framework;
- Quantitative surveys covering farmers/plots using solar (treatment group), electric and diesel pumps (control group). Farmers/plot with similar characteristics will be matched for creating credible comparison groups for evaluation.
- Analysis of secondary data on various aspects of SIPs already collected by AEPC

Location:

Tarai districts of Province 1 and districts of Province 2. Majority of the SIPs are located in these two Provinces.

Timeline:

1.1.2 IE and GESI studies in NP	**Start Date**	**End Date**	**OUTCOMES/COMMENTS**
	01-12-2019	**30-12-2020**	
Gather relevant secondary data from existing AEPC sites and data cleaning	01-12-2019	31-12-2019	Short Note on sample size, sampling framework and guiding questions prepared.
Using the secondary data for sample size calculation and selection	01-01-2020	31-01-2020	
Develop Methodology and Instruments for impact evaluation (qualitative GESI framework and quantitative)	01-02-2020	28-02-2020	Detailed methodology, including GESI framework, questionnaires and checklists for FGDs prepared
Qualitative field work, transcription and tabulation	01-03-2020	31-03-2020	Field notes, FGD transcripts prepared
Draft qualitative report	01-04-2020	30-04-2020	Draft qualitative report submitted to AEPC
Quantitative surveys and field work	01-05-2020	30-07-2020	Quantitative data collected, cleaned, and tabulated, and summary statistics report generated; final data by end July, 2020
Quantitative Data analysis	01-07-2020	30-09-2020	Data analysis and preliminary report
Final IE report	01-10-2020	30-11-2020	Final report submitted to AEPC and SDC PM

Deliverables:

- Qualitative report based on perception of farmers and private sector about the impact of AEPC's SIP programs on livelihoods and agriculture 2: *April, 2020*
- Cross sectional data (and panel data for 53 ICIMOD pumps) from a representative sample of SIPs, and electric and diesel pumps: *Data cleaned and ready for analysis by end July 2020.*
- One draft impact evaluation report by end of November, 2020.
- At least one policy brief outlining the main findings and policy implications. *(Q4, coinciding with National forum – draft presented in National forum, finalized after that)*

1.2.1: Groundwater-related studies embedded in demonstration pilot in Bangladesh

Justification and demand:

IDCOL is the nodal organisation in Bangladesh for financing renewable energy. IDCOL financed around 1250 pumps till date, and the target is to finance 50,000 SIPs by 2025. While there are data to show that these pumps have been beneficial for the farmers, however no study has yet been done to ascertain the impact of large-scale SIP adoption on groundwater abstraction and long term sustainability.

Methods/components:

- Collection and analysis of secondary data on biophysical and groundwater characteristics in the selected project sites and selection of IDCOL SIPs and farmers for monitoring groundwater use.
- Baseline data collection on IDCOL sponsored SIPs: Well, pump details and water management practices adopted by farmers in command areas.
- Installation of instruments for measurement of water and energy data
- Monitoring of selected SIPs, farmers within SIP command area and diesel well-owners and analysing the monitored data for estimating groundwater abstraction.

Location:

In the Rangpur division in North West region of Bangladesh, Arsenic risk is minimum in the region but there may be risk of GW over abstraction in some parts of NW Bangladesh.

Timeline:

	Start Date	End Date	OUTCOMES/COMMENTS
1.2.1 GW studies in Bangladesh	**01-12-2019**	**30-12-2020**	
Collection and analysis of secondary data on biophysical and groundwater parameters in selected SIPs	01-12-2019	30-03-2020	Short Note prepared based on the analysis of secondary data
Collection and analysis of data on IDCOL SIPs on parameters of pumps characteristics, hydrogeology and existing infrastructure (water, electricity meter)	01-02-2020	30-03-2020	Selection of SIPs for groundwater monitoring
Survey at farm level in adjoining areas of SIPs to collect data on diesel pump owners and use	01-03-2020	30-05-2020	Selection of diesel pump owners for monitoring
Develop and finalise methodology and monitoring protocol for GW sustainability studies	30-03-2020	15-05-2020	Methodological and monitoring protocol note for GW sustainability studies
Selection of instruments to put in field for measuring water and energy usage	01-04-2020	30-05-2020	Note on instruments being used and instruments bought after receiving quotations
Installation of instruments in field	30-05-2020	15-07-2020	Instruments installed on monitoring sites
Monitoring and data collection	15-07-2020	31-12-2020	Databased on collected data
Data analysis	01-08-2020	31-12-2020	
Annual Reporting	01-12-2020	31-12-2020	Preliminary report on data analysis – submitted to IDCOL and SDC PM

Deliverables:

- Methodological and monitoring protocol note for GW sustainability studies – May 2020
- Baseline data on diesel pump owners, well, groundwater characteristics and water management practices and preliminary report on analysis of monitored data- Dec 2020

1.2.2 Groundwater-related studies embedded in scale pilot in India

Justification and demand

- Given that Gujarat has severe groundwater depletion problems, there is a need to know if that grid-connected solar pumps with non-trivial feed-in-tariff (as implemented under SKY) leads changes in pumping behaviour of farmers;
- However, there is no comprehensive study that has compared the groundwater abstraction under different GW-energy typologies and how they differ among different aquifers.

Methods/components:

- Collection and analysis of secondary data on biophysical and groundwater characteristics in the selected project sites.
- Baseline data collection on well, pump characteristics and water management practices used by farmers.
- Selection of feeders and farmers for monitoring.
- Installation of instruments for measurement of water and energy data and monitoring of selected sample of well-owners.
- Analysing the monitored data for developing a robust relationship between energy use and groundwater pumped.

Location:

6 feeders will be select among contrasting hydro-geologies of central (Alluvial aquifers) and western (Saurashtra hard rock aquifers) Gujarat.

Timeline:

	Start Date	End Date	OUTCOMES/COMMENTS
1.2.2 GW studies in India	**01-12-2019**	**30-12-2020**	
Collection and analysis of secondary data on biophysical and groundwater parameters in project feeders	01-12-2019	30-03-2020	Selection of feeders for groundwater study Short Note prepared based on the analysis of secondary data
Census/survey at farm level in selected feeders to collect data on Pump and well details	01-02-2020	30-04-2020	Selection of farmers in selected feeders for groundwater monitoring
Develop and finalise methodology and monitoring protocol for GW sustainability studies	01-03-2020	30-04-2020	Methodological and monitoring protocol note for GW sustainability studies
Selection of instruments to put in field for monitoring	01-03-2020	30-04-2020	Note on instruments being used and instruments bought after receiving quotations
Installation of instruments in field	30-05-2020	30-06-2020	Instruments installed on monitoring site
Monitoring and data collection	30-06-2020	31-12-2020	Database on collected data
Data analysis	01-08-2020	31-12-2020	
Annual Reporting	01-12-2020	31-12-2020	Preliminary report on data analysis & review paper – Submitted to SDC PM and GERMI

Deliverables:

- Short note based on the analysis of secondary data in project feeder areas with details on selected feeders for GW studies – April 2020
- Report on monitoring protocol for the study -April 2020
- Database on farmers' pump, well, groundwater and water management practices in selected feeders – December 2020
- Preliminary report on analysis of monitored data – December 2020

1.2.3: Groundwater-related studies embedded in demonstration pilot in Pakistan

Justification:

- Given the overall state of groundwater over-exploitation in Pakistan; there is an active debate on whether SIPs will further aggravate the problem of groundwater over-exploitation.
- So far, studies conducted by PARC, FAO and others have had somewhat contradictory results, and hence the need for a study with experimental method.

Methods/components:

- Undertake a survey of diesel and solar pump owners using a matched sample approach in province of Punjab
- Control group will be the diesel pump owners while the treatment group will be the farmers with SIPs.
- Both groups will be observed over a period of one year (two seasons) to record temporal variations and quantify the amount of groundwater extracted.
- A subset from the control and treatment group will be instrumented to measure actual flow.
- Analysis will be carried out to identify whether SIPs lead to more groundwater extraction.

Location:

- Location of the pilot will be two/three different districts of Punjab to incorporate variations in groundwater quality and demographic variability

Timeline:

	Start Date	End Date	Outcome/Comments
1.2.3 GW related studies embedded in demonstration pilot in Pakistan	**01/01/2020**	**31/12/2020**	
Collection of the data from the OFWM Punjab, FWMC, PARC about the diesel and SIPs in Pakistan	01/01/2020	28/02/2020	Short Note prepared based on the analysis of secondary data
Reconnaissance visit to the diesel and SIP sites in Punjab	01/02/2020	15/03/2020	BTOR of the field visits
Develop Methodology for impact on Groundwater use of Diesel pumps vs SIPs	15/02/2020	30/03/2020	Methodological Note for the intervention
Preparation of survey instruments and selection of groundwater instruments for the study	15/03/2020	15/04/2020	Questionnaire for survey and guidelines for the physical instrumentation
Pilot testing of methodology and survey instrument. Finalize sampling methodology	01/04/2020	30/04/2020	Sampling Strategy Note
Start Data collection on weekly basis for the Kharif season	01/05/2020	15/10/2020	Data Set
Deployment of instruments for the selected diesel and SIP pumps	01/05/2020	30/06/2020	Field deployment notes
Analysis of Data for the Kharif Season	15/10/2020	15/12/2020	Working paper submitted to SDC PM
Start Data collection on weekly basis for the Rabi season	01/11/2020	15/04/2021	Data Set

Deliverables:

- Data set on groundwater usage of diesel vs solar pumps in Punjab sites – October 2020
- A report/working paper on impact of SIPs on groundwater – December 2002
- A policy brief for the Government on promotion of SIPs – December 2020

2.1.1 Scale pilot for testing financial modalities for ownership of SIP by individual farmers in Bangladesh

Justification and demand:

- IDCOL is the main financier of solar pumps in Bangladesh and currently uses the "fee-for-service" model for promoting solar pumps. But there is another model that IDCOL will introduce soon, which is being referred to as the "ownership" model. In this model, individual farmers will buy solar pumps directly from sponsors (private sector, or NGO) through a combination of loan and equity payments. The purpose of this activity is to ensure that the financial model for individual ownership of solar pumps generates the maximum demand and does not become exclusionary and hence it is important to understand how different financial models will affect farmers' willingness to apply for ownership.

Methods/components:

- IWMI and IDCOL will co-design a choice experiment to understand which financial model for individual ownership of solar pumps generates the maximum demand and does not become exclusionary.
- Choice experiment with a sub-sample of farmers surveyed in activity 1.1.1. Our main aim is to help IDCOL design the best financial model for the promotion of individual SIPs across the country.

Location:
Selected sites in north west Bangladesh and Khulna region

Timeline:

	Start Date	End Date	OUTCOMES/COMMENTS
2.1.1 SCALE PILOT IN BD – Choice experiment	**01-12-2019**	**30-12-2020**	
Develop the Research Methodology which includes questionnaires for choice experiment, deciding the sample, exact design of the study etc.	01-12-2019	30-05-2020	Methodological Note for Choice Experiment
Conduct Choice experiment – concurrent with IE survey	01-06-2020	30-07-2020	
Data Analysis	01-08-2020	30-10-2020	
Annual Progress Report	01-11-2020	30-12-2020	Preliminary report on data analysis to be submitted to SDC PM

Deliverables:

- Methodological note on the choice experiment

2.2.1 Demonstration pilots for grid connection of SIPs in Bangladesh

Justification and demand for the activity:

- In Bangladesh, solar pumps are used primarily in initial four months of a year and they remain mostly idle the rest of the year. The idle number of days accumulate upto 180 days. Consequently, capacity utilization for these solar pumps is very low because of reduced demand in the remaining year.
- Additionally, one of the distinctive characteristics of solar pumps installed to date through IDCOL financing is that they tend to be large with significantly extra solar PV capacity built in. The main reason for this excess capacity is to maintain same discharge rate throughout the day.
- So, it becomes important to find ways to increase capacity utilization of these solar pumps. Connecting these SIPs with the grid offers a win-win solution. Results from the study will be shared with SREDA and will provide inputs towards finalisation of net metering and grid connection policy in Bangladesh.

Methods/components:

- Select around 15-20 existing IDCOL financed SIP schemes and get them connected to the grid for evacuation of excess electricity from SIPs. Based on draft net metering guidelines of the government these schemes will receive a particular tariff for each unit of electricity evacuated to the grid.
- Interconnection of pumps to limit the grid line length and reduce the transformer usage may be considered
- Conduct some case studies on single unit grid integration versus cluster-based approach to understand what works locally and what are the additional cost implications.

Location:
Rangpur, Rajshahi and Khulna Division

Timeline:

	Start Date	End Date	OUTCOMES/COMMENTS
2.2.1 Demonstration pilot in BD – Grid connection	**01-12-2019**	**30-12-2020**	
Identification of pilot sites for grid integration and developing research methodology with IDCOL	01-12-2019	30-06-2020	Methodology note for grid connection pilot
Baseline data collection and focus group discussions at selected sites (also see 1.1.1)	01-06-2020	31-07-2020	FGD and qualitative report
Identify different systems architecture and designs, and identify equipment requirement	01-06-2020	30-09-2020	Engineering and installation report
Identify the EPC for the installation and commission of grid connection equipment, and connecting SIPs to the grid	01-10-2020	31-12-2020	
Demand Generation activities and mobilization efforts in 120 Upazillas (45 days) to collect demand	15-08-2020	30-09-2020	

Deliverables:

- Methodology note for impact evaluation of grid connection study, and qualitative report based on respondent's perception.
- Technical report identifying system architectures and system component and equipment standards to match the grid integration requirement considering the nature of Bangladesh grid- December 2020.

2.2.2: Scale pilot on institutional aspects of grid-connected SIPs in Gujarat, India

Justification and demand:

- In 2018, the Government of Gujarat implemented a large-scale pilot called SKY (*Suryashakti Kisan Yojana*), initially for 137 agricultural electricity feeders of the state with an initial target of solarizing 12,400 farmers within a year. Buoyed by farmers' initial response to SKY, the government has now revised the target to solarize 100,000 farmers by the end of 2019.
- Given that Gujarat has severe groundwater depletion problems, there is a need to know if that grid-connected solar pumps with non-trivial feed-in-tariff (as implemented under SKY) leads changes in pumping behaviour of farmers;
- Currently, SKY engages with individual farmers, however, there is an ongoing discussion that organizing farmers through a feeder-level cooperative (as done through another SDC supported IWMI project) intensifies the above behaviour change.

Methods/components:

- The pilot will identify 20-30 agricultural feeders in Gujarat; with 6-10 feeders belonging to each of the following categories: agricultural electricity feeders without solar connection (business as usual); SKY feeders; and SKY feeders where feeder level solar cooperatives have been registered and are operational.
- Feeder data monitoring and collection on a set of carefully selected parameters on a monthly / bi-monthly basis.
- Regular groundwater monitoring in project sites.

Location:

Feeders will be selected from two regions in Gujarat, namely, Central Gujarat and Saurashtra.

Timeline:

	Start Date	End Date	OUTCOMES/COMMENTS
2.2.2 SCALE PILOT IN India	**01-12-2019**	**30-12-2020**	
Identification of 20-30 agricultural feeders for the study	01-12-2019	31-01-2020	Methodological Note for scale pilot
Primary survey – preparation of questionnaires and pre-testing	01-01-2020	28-02-2020	
Preparation of IWMI-GERMI feeder-level secondary data collection protocol	01-01-2020	28-02-2020	
Season wise feeder-level SKY data monitoring and compilation	01-01-2020	31-12-2020	Compiled seasonal data and reports
Primary quantitative baseline surveys	01-03-2020	31-08-2020	Draft baseline report summarizing results from qualitative and quantitative surveys – to be submitted to partners and SDC PM
Regular focus group discussions with farmers	01-03-2020	31-10-2020	

Deliverables:

- Methodological note on the activity – March 2020
- Compiled quarterly feeder level data reports – December 2020
- Draft baseline report summarizing results from qualitative and quantitative surveys- December 2020
- At least one policy brief outlining the main findings and policy implications *(Q4, coinciding with National forum – draft presented in National forum, finalized after that)*

2.2.3 Demonstration pilots on grid connected SIPs in Nepal

Justification and demand:

- All SIPs in Nepal are currently off-grid and stand-alone pumps. Nepal is also investing in hydropower and will achieve electricity self-sufficiency in the near future. National electricity grids are also being extended to every corner of the country. Grid connection of solar pumps will ensure that the stand along SIPs do not become obsolete once grid connection reaches those sites.

Methods/components:

- Develop a set of criteria for prioritizing potential pilot sites; followed by field visits and prioritize potential pilot sites after analysis and evaluation of field data
- Design the technical grid connection pilot program; identification of treatment and control sites; design impact evaluation framework, including GESI impacts, etc.
- Baseline surveys in the treatment and control sites
- Procure and install the micro-grid system, including connecting to the SIPs in at least one location

Location:
Province 1 and 2 in Nepal

Timeline:

	Start Date	End Date	OUTCOMES/COMMENTS
2.2.3 Grid connection pilot, Nepal	**01-12-2019**	**30-12-2020**	
Identification of potential field sites for grid connection	01-12-2019	28-02-2020	Technical note, methodological note and instruments for surveys
Design of technical parameters of grid connection pilot, identification of a control site; and design of evaluation framework, survey instruments etc.	01-03-2020	30-06-2020	
Baseline surveys (including GESI studies) in selected grid connection and control sites	01-07-2020	30-10-2020	Draft baseline report summarizing results from qualitative and quantitative surveys, including GESI outcomes
Procurement and installation of grid connection in one or two SIP site	01-09-2020	30-10-2020	Grid connection completed in at least one site

Deliverables:

- A report with description of finalized pilot area [Feb, 2020]
- Technical note, methodological note and instruments for surveys [June, 2020]
- Draft baseline report summarizing results from qualitative and quantitative surveys including GESI outcomes [Dec 2020]
- Technical report with installed micro-grid system and its functioning [Dec, 2020]

2.2.4 Demonstration pilots and simulation of grid-connected pumps through heat sinks in Pakistan

This activity will start in **2021**.

This activity will build on the sample of farmers using SIPs in Activity 1.2.3. It would be technically too-time consuming and expensive to connect pumps to the grid and negotiate with electricity suppliers, hence we propose to simulate feed-in-tariffs by having a heat/energy sink. The farmer will have the choice to flip a switch to run his/her pump or to send the electricity to a meter to the heat sink with the understanding that s/he will be paid at a given tariff for any electricity diverted to the heat sink. Thereby it will be possible to set different tariffs to observe the effect if any of feed-in-tariffs on farmer behaviour.

This activity offers considerable potential for groundwater pumping to be managed through feed-in-tariffs rather than through licensing and/or pumping exclusion zones. It also provides opportunities to the farmers with saline groundwater and minimal access to canal water to earn a decent livelihood by utilizing their land and selling electricity to the grid.

2.3.1 Administration of innovation funds

Justification and demand:

The Innovation Fund (IF) will support the development and field-testing of technical, financial and, institutional innovations to address the constraints and challenges of upscaling solar irrigation, with a special focus on the constraints faced by small, marginal, and women farmers. The IF will especially support innovations and practices that can influence policy or be expanded and integrated into regular programs and practices with the support of additional funding sources.

Methods/components:

IF will be used to:

- To support innovations to bridge any identified gap that hampers adoption, use, and upscaling of SIPs in South Asia;
- To support innovations targeted at reducing barriers for adoption by small, marginal, and women farmers; and
- To support innovations that are cost-effective and have potential for scaling up.

IWMI will administer a SoLAR-SA innovation fund worth USD 400,000. Through this fund, the project seeks to support 6-8 innovations total at an approximate level of USD 50,000-USD 60,000 per innovation for a maximum duration of 24 months. Three broad groups of innovations will be supported by the IF: technological, financial and institutional.

Location:

Any location in the four project countries of Bangladesh, India, Nepal and Pakistan

Timeline:

	Start Date	End Date	OUTCOMES/COMMENTS
2.3.1 Innovation Funds	**01-12-2019**	**30-12-2020**	
Identification of themes/topics of IF, finalising protocol for selection; and posting of IF call on IWMI, SDC and related websites	01-12-2019	28-02-2020	Innovation grant note
Shortlisting, selection and finalisation for grant winners of 2020-2021 (maximum 3 to 4 grants)	01-03-2020	30-06-2020	Announcement of final grantees
Beginning of project grant period, and one review meeting with grantees	01-07-2020	30-12-2020	One review meeting with all grantees

Deliverables:

- Final call for Innovation grants – with details about themes for which innovation grants will be given, selection criteria for choosing grantees, and roles and responsibilities of grantees [June. 2020].
- Three to four grant agreements; and minutes of one review meeting [December 2020]

3.1.1 Training of local technicians in Bangladesh, India and Nepal; training for farmers in Pakistan

Justification and demand:

In our preliminary research, all of our partner organizations expressed the need for a cadre of local technicians or trained farmers who can repair and maintain SIPs. Currently, all the projects funded by national governments and donors include a 2-3 year of maintenance contract with the SIP vendor. However, these initial contracts are nearing expiration in all the partner countries and thus there is an urgent need to train local technicians, including young electrical engineering diploma holders. In doing so, the project will pay extra attention to ensure that at least 33% of the technicians trained are women. We will also work closely with the national implementing agencies to ensure these trained mechanics are closely allied with the private sector players and existing SIP programs so they can find gainful employment.

Methods/components:

Each country will prepare its own training activity for the year and get it's training proposal approved at one of the C-PMC meetings. They will also share the training plans with the PMU, who will keep the PSC informed. In Bangladesh and Nepal, we will organize a 3-5 day annual technician training and have 15 participants each year. In India, we will conduct lead farmer training and farmer-to-farmer training workshops with a group of 15-20 farmers every year. In Pakistan, up to 10 farmers will be trained to use precision surface irrigation on their fields and 10 professionals will be trained to use WinSRFR software and how to design of fields using this software every year.

Location:

At a location of choice by the country leads

Timeline:

	Start Date	End Date	OUTCOMES/COMMENTS
3.1.1 National training (4 in total, one in each country)	**01-12-2019**	**30-12-2020**	
Preparation of training curricula, training modules and selection of trainers and trainees	01-03-2020	30-06-2020	Training materials finalised and trainees chosen, and all technical logistical arrangements for trainings done
Training workshop/school (3-5 days training)	01-07-2020	30-10-2020	Trainings conducted

Deliverables:

1. Training curricula, including training modules
2. Training report, including details of personnel trained

3.1.2 Training of groundwater, energy and agriculture officials in all four countries

Justification and demand:

The premise of this project is that water, energy and agricultural issues are deeply interlinked, but often these linkages are not well understood. As a result, work on one element by itself – say, water – can have unintended negative impacts on energy or agriculture. For example, highly subsidized SIPs in groundwater over-extracted areas pose immediate and long-term threats to groundwater sustainability. Professionals from each of these sectors are often not aware of the trade-offs and potential synergies. In view of this, we will organize regional training events where energy professionals will be trained in the basics of hydrogeology. And water and agriculture professionals will be trained in the basics of SIP technology. We will conduct two regional trainings over the course of the project.

Methods/components:

- Targeted at mid to senior officials from water/irrigation/groundwater, electricity/power; agriculture/food ministries/departments in all four project countries.
- 4-5 participants maximum from one country; and one week (5 days) training

Location:

Either at National Institute of Solar Energy in partnership with ISA (located in National Capital Region of India); or GERMI premises, in partnership with GERMI and ISA (located in Gujarat, India).

Timeline:

	Start Date	End Date	OUTCOMES/COMMENTS
3.1.2 Regional training (one training for all countries)	**01-12-2019**	**30-12-2020**	
Preparation of training curricula, training modules and selection of trainers and trainees; and finalisation of venue and partnership on training with ISA and GERMI	01-03-2020	30-06-2020	Training materials finalised and trainees chosen, and all technical logistical arrangements for trainings done
Training workshop/school (3-5 days training)	01-07-2020	30-09-2020	Training conducted

Deliverables:

3. Training curricula, including training modules
4. Training report, including details of personnel trained

3.2.1 Regional knowledge and policy forums

Justification and demand:
All SoLAR-SA partners and innovation fund grant recipients will meet each year to share information on progress. In the first year (2020), this gathering will take the form of an inception meeting. The SoLAR Project Steering Committee will also attend this meeting to approve work plan, review progress and provide feedback. The annual meetings will be a platform for the project partners to come together and exchange information and knowledge on various aspects of their work. Whenever feasible, field visits to SIP sites will be organized.

Methods/components:
NA

Location:
Colombo, Sri Lanka. 21st to 22nd January 2020

Timeline:
NA

Deliverables:

1. Approved workplan for year 1
2. Inception workshop report
3. All MOUs signed with partners [March, 2020]

3.2.2 National forums

Justification and demand:
The project countries will regularly organize national policy forums to solicit feedback from national, provincial and local policymakers, and to disseminate information to these groups. The frequency of these national policy forums will be need-based, but no fewer than three policy consultation forums will be held in each country during the 4-year span of the project.

Methods/components:
NA

Location:
At a location of choice by the country leads

Timeline:

	Start Date	End Date	OUTCOMES/COMMENTS
3.1.1 National forum (4 in total, one in each country)	**01-12-2019**	**30-12-2020**	
National forum (20-30 participants – mostly policy makers)	01-10-2020	31-12-2020	National forum held

Deliverables:

1. National Forum Workshop report
2. At least one policy brief around which national forum discussions are held.