TERMS OF REFERENCE

Solar Irrigation for Agriculture Resilience (SoLAR) in India

BACKGROUND OF THE RESEARCH PROJECT

Solar Irrigation for Agricultural Resilience in South Asia (SoLAR-SA) project aims to sustainably manage the invidious water-energy and climate interlinkages in South Asia (Bangladesh, India, Nepal, and Pakistan) through the promotion of solar irrigation pumps (SIPs). The project is funded by the Swiss Agency for Development and Cooperation (SDC) and led by the International Water Management Institute (IWMI). The main goal of the project is to contribute to climate-resilient, gender, and socially inclusive agrarian livelihoods in Bangladesh, India, Nepal, and Pakistan by supporting Government efforts to promote solar irrigation. In the process, the project will also pave the way for sustainable and equitable groundwater governance by tackling some of the policy distortions such as perverse electricity subsidies which have created the current negative interlinkages between the water and energy sectors in South Asia. This project will be implemented in four South Asian countries of Bangladesh, India, Nepal, and Pakistan in partnership with government agencies that have the mandate to implement policies and programs on SIPs in their respective countries. The duration of the project is four years, from January 2020 to June 2024.

India is the largest user of groundwater in the world extracting about 86% of the total groundwater resources for irrigation. It has been estimated that the country has around 30 million tubewells, of which 70% are electric-powered and 30% are powered by diesel (MNRE, 2017). The agricultural sector consumes about 22 % of the total electricity produced in the country and about 15 per cent of the total diesel used. It is estimated that around 2.4 billion litres of diesel were used by irrigation pumps in 2011. Coal still remains the major source (73%) of electricity generation in India. It is estimated that the annual fossil fuel use associated with diesel and electric pumps amounts to more than four billion litres of diesel and 85 million tonnes of coal for electricity generation. In order to reduce GHG emissions, the country has laid out a very ambitious policy to promote renewable energy and planned to install 175 gigawatts (GW) of renewable power capacity by 2022, of which 100 GW will be from solar. Solar power is one of the distinct forms of energy with great potential in the country, particularly in agriculture. It provides solutions to a two-pronged challenge; it enables an uninterrupted supply of clean electricity during the daytime hours and can also prevent the rising electricity demand from the agricultural sector from weakening the already financially burdened DISCOMs. India is rapidly emerging to become a leader in solar energy; the number of solar irrigation pumps (SIPs) has increased from a few thousand in 2010-11 to nearly 250,000 by March this year (MNRE 2020). If India remains on the current trajectory of a 68% annual growth rate, it is predicted that solar pumps will outnumber diesel and electric pumps by 2025.

Gujarat has long been at the forefront of solar irrigation policies. Our focus is on the Surya Shakti Kisn Yojana (SKY) which was introduced in 2018 to promote renewable energy and increase farmers' incomes across Gujarat while reducing the financial burden of the four DISCOMs. As of now, the scheme is implemented in 93 agricultural feeders covering about 4500 farmers and with a total installed capacity of 98 MW. Under SKY, adequately sized solar PV modules are installed on the farmer's field either for existing/new pumps and connected to the grid while it is net-metered. Electricity generated from the Solar PV is fed to the grid and the pump, and when operational, draws electricity from the grid. Therefore, the solar PV system is generating and evacuates the solar energy for the whole day but the pump is drawing electricity only when it is operational. The feed-in-tariff (FiT) is designed to remunerate farmers for the net of energy evacuation and withdrawal. A tri-party agreement among DISCOM, farmer, and solar system suppliers is carried out to contract the

responsibilities of the three parties. The supplier is obligated to provide operation and maintenance services for seven years apart from installing the system. Farmers are responsible for the upkeep of the system and protecting it from avoidable damages. DISCOMs have to ensure reliable and constant grid energization to allow energy evacuation and also administer the power purchase agreement between them and the farmer.

The SDC supported SoLAR project activities in India have been planned around the scale pilot being implemented by GUVNL (Gujarat Urja Vikas Nigam Limited) in Gujarat. IWMI aims to closely follow and support the implementation of SKY and its capacity-building activities; understand and assess its impacts, and draw lessons for the design and effective implementation of similar solar irrigation expansion schemes. IWMI's key argument behind upscaling grid-connecting SIPs and offering farmers a feed-in-tariff for evacuating surplus solar power is that it will incentivise farmers to become more efficient energy (and therefore, groundwater) users.

The primary objective of the study is to conduct an impact assessment of the SKY scheme on a wide range of parameters; energy outcomes, electricity supply environment, irrigation behavior, cropping pattern, agriculture technologies (seed varieties, irrigation-related technologies), farmer income, and institutional functioning, at both the feeder and farmer levels. In doing this, the study explores the role of social networks and capacity-building activities on energy-related and agricultural outcomes.

PURPOSE OF THIS ASSIGNMENT

As part of this research work, IWMI is looking for an organization that will support our work through its presence in India and also lead the data collection. The vendor will work closely with IWMI and will report to Dr.Aditi Mukherji(Regional Project leader, SoLAR) and Dr. Deepak Varshney (Country Lead for India, SoLAR). The studies' designs, sample designs, and questionnaires will be developed by IWMI. Similarly, IWMI will lead the analysis, but we expect the partner to contribute and become co-authors of research outputs in accordance with standard research practices. IWMI has already identified the treatment and control feeders for the surveys covering all four DISCOMS (UGVCL, PGVCL, DGVCL and MGVCL).

TASKS AND RESPONSIBILITIES

The first activity is the one round of detailed ‘household surveys’ for 1000 farmers along with 50-60 ‘key informant interviews at the village/feeder level’. The list of households along with the village/feeder to be surveyed will be given by IWMI. The survey needs to be conducted in 20-25 districts of Gujarat. The household survey is expected to be initiated in January 2023 and completed by March or April 2023.

The responsibilities and tasks are as follows:

1. **Translate the survey instrument & obtain authorizations**

    a) IWMI will provide the questionnaires in English. The 'household questionnaire' and ‘key informant interviews at the village/feeder level’. It is the responsibility of the vendor to translate these questionnaires into Gujarati.

    b) **Obtain authorizations for data collection and inform authorities:** While IWMI will provide a letter introducing the project and obtaining IRB approval, the vendor is

responsible for making sure that their organization has secured all permissions and authorizations for collecting data and sending enumerators into the field. Similarly, representatives from the local government institutions should be informed of the data collection by the vendor.

2. **Questionnaire needs to be converted into the CAPI program by the vendor**.

3. **Pretest the questionnaires**. The vendor will pretest the survey modules and provide the the data and their feedback to IWMI, with recommendations on how to modify, add or remove questions in both questionnaires in order to increase their effectiveness for the intended purpose.

4. **Training of enumerators to implement the surveys and field pilot**
   a) The provision of experienced enumerators is the responsibility of the vendor. Particular attention should be given to the prior experience of the enumerators in implementing quantitative surveys in field settings. The enumerators should have good knowledge of the rural context and agricultural issues in rural Gujarat.
   b) The training of the enumerators will be undertaken before the survey begins. The training should include a classroom part to define the questions and then a practical part (in the field) to train the enumerators to conduct the 'household' and 'key informant survey'. Training enumerators might take 2-3 days including the classroom and piloting the CAPI in the field. The vendor will be responsible for providing all the logistics regarding training.

5. **Provide electronic devices and design the data entry template for the survey**

6. **Implementation of the household and key informant questionnaires**
   a) The household questionnaire will be implemented across 25-30 SKY feeder and 25-30 non-SKY feeders covering 1000 farmers in Gujarat. The selection of farmers from each sampled feeder will be done by IWMI and the list will be provided to vender. Each interview is expected to take 75-90 minutes. The GPS location of the all the household surveyed and their pumps needs to be recorded.
   b) The key informat questionnaire will be implemented at the village/feeders level. The total number of key informant survey is between 50-60.
   c) Provide and manage all the logistics of the data collection: The vendor will be responsible for the organization and all costs related to the survey administration, oversight and quality control. This should include the provision of electronic devices, the printing of materials (maps, sample lists, code lists, etc.), staff travel and accommodation costs, staff costs, data compilation, and quality checking.

7. **Data entry, checking, and post-survey verification**
   a) The vendor will be responsible for data entry and checking data after collection. In cases of problem or inconsistency detected either by the vendor or by IWMI, the vendor will be responsible for contacting the respondents again and clarifying/correcting the data for transmittal to IWMI. This applies equally to each of the survey instruments.
   b) Data need to be submitted every week for the IWMI team for consistency check. One data researcher should be identified by the vendor to communiticate the data related matter with IWMI researchers.

Throughout the process, the vendor and all staff will treat all survey subjects with courtesy and respect, and take all steps to respect their privacy (such as in the choice of settings to collect personal or household data and obtaining consent prior to interviewing) and to protect the confidentiality of information that has been collected.

Task agreed to, their deadlines and payment release dates

Activities	Tasks	Deadlines	Payment disbursement
A	**Contract signing**	January 2023	10 %
B	**Phase 1:** 1. Translate the survey instrument 2. Pretest the questionnaires (2% of the sample) 3. Training of enumerators to implement the surveys 4. Provide electronic devices and design the data entry template for the survey	January 2023	25%
C	**Phase 2 :** Completion of half of the specified samples for household and key informant surveys (submission of interim datasets along with status report)	February 2023	35%
D	**Phase 3 :** Completion of total sample for the houshold and key informant surveys.	March 2023	20 %
E	**Phase 4 :** Data submission, consitency checking, and post-survey verification along with final status report	April 2023	10%

The final timeline will be agreed between the vendor and IWMI, provided that the completion of all the tasks and the delivery of all the outputs will occur by April 2023. The vendor shall design a timeline to implement the tasks and deliver the outputs consistent with these indicative deadlines.

DELIVERABLES TO BE SUBMITTED

1. Translated questionnaire.
2. CAPI preparation and the module.
3. Training of enumerators and the team.
4. Data set for pilot farmers, and a brief report with recommendations for changes to be incorporated.

5. Household and key informant questionnaire data set (in excel or STATA format)**.**The datasets delivered by the vendor should be clean and ready to use for analysis by IWMI scientists.
6. Final report of the survey (incorporating feedback and suggestion by IWMI researchers)

ESSENTIAL QUALIFICATIONS

1. The vendor should be registered organisation to undertake the activity (in accordance with the Government of India guidelines).
2. Experience of conducting household surveys in the context of agricultural settings in rural India.

PREFERRED QUALIFICATIONS

1. Previous experience in conducting large household/farmer level surveys in agricultural context.
2. Significant experience in conducting surveys related to mapping social network of farmers, and the experience of collecting network data within the sampling approach.
3. Previous experience in collecting data related to seed varieties,irrigation-related technologies, and measuring the irrigation volumes.
4. Previous experience in data collection related to capacity building activities.
5. Previous experience in data collection in impact assessment designs.

EVALUATION OF VENDOR PROPOSAL

In order to assist IWMI in justifying the selection of the vendor best suited to the requirements of this project, please provide the following information as part of your proposal.

1. Technical proposal

A. Documents in support of essential qualification.

B. Brief decription in terms of the name of the project/studies that you have undertaken in the last 5 years related to the preferred qualifications.

C. A brief note (not more than two pages) regarding the vendor's perspective on the most important risks, obstacles, or impediments to be expected in undertaking this assignment, along with the vendor's approach to managing these risks and to ensuring successful implementation of the entire assignment**.**

2. Financial proposal

Please provide the proposed budget in the prescribed format :

Particulars/Description	**Budget (INR)**
Personnel	
Survey operation (travel, accommodation, logistics)	
Other cost (coding, translation, equipments etc)	
Miscellaneous/Indirect cost	
Goods and Service Tax (GST)	
Total cost including GST	

TIME LINE

- The last date/time for submitting both technical and financial proposals is 10th December 2022 before 5 pm IST.
- The last date for any query/clarification is 8th December 2022 before 5 pm IST.
- No extension of date and time will be considered for submitting the proposal.