



Solar Irrigation for Agricultural Resilience (SoLAR) Project

Workshop Report
12 February 2019
Hotel Yak and Yeti,
Kathmandu



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1. Introduction

The project titled “Solar Irrigation for Agricultural Resilience (SoLAR)” is a new regional partnership program of Swiss Agency for Development Cooperation (SDC) and the International Water Management Institute (IWMI). SoLAR aims to support climate-compatible development of energy and water systems in rural South Asia for resilient livelihoods, particularly in four countries: Bangladesh, India, Nepal, and Pakistan). This project will contribute to mainstreaming context-specific, and socially, economically, and institutionally-viable models for solar-powered irrigation systems (SIPs) to reduce the carbon footprint of irrigation sector while promoting efficient use of groundwater resources under climate-induced uncertainties in the region. The objectives of the project are:

- To assess and evaluate continuously the various approaches to managing the Water-Energy-Climate nexus in South Asia;
- To develop, propose, and undertake field experiments and pilots to demonstrate techno-social, economic, and institutional viability of such projects; and
- To undertake policy outreach and market uptake activities with objective of mainstreaming successful solutions/approaches to managing the Water-Energy-Climate nexus at local levels.

The project implementation is has been planned in three phases. In this **entry phase**, we identify, assess, and prepare a detailed design of the pilot interventions through literature review, field visits, and stakeholders consultations in each of the proposed countries to identify suitable models (social, economic, and institutional) for promoting solar irrigation pumps (SIP).

A one-day national stakeholders’ consultation was held in Kathmandu, with participation of stakeholders from across Nepal, on 12 February 2019. The objectives of the workshop were as follows:

- to gather input for mapping the concerns of key stakeholders;
- to learn from their experience and reflections, to identify potential options/sites for the pilots;
- to explore potential partners who can also leverage the fund for solar installation; and
- to develop a detailed design of the most suitable model for promoting solar-irrigation systems in Nepal.

The consultation was divided into following sessions:

1. Opening and welcome;
2. Experiences from solar pump irrigation project (SIP) pilots in Nepal;
3. Panel discussion on “policies and finance landscape for solarisation of agriculture in Nepal”;
4. Experience sharing from IWMI’s field experiments with solar irrigation in India; and
5. Moderated discussion on “Implementing SoLAR in Nepal: Opportunities for pilots and partnerships”.

Please refer **Annex 1** for the full agenda and program. The experiences from IWMI’s field experiments with solar irrigation in India were shared using videos developed by the IWMI-Tata Partnership (IPT) program. The two videos highlighted the work of the Dhundi Solar Pump Irrigators’ Cooperative at Anand in Gujarat (link: <https://www.youtube.com/watch?v=SneJ3plzz5I>) and Chhakaji Village in Samastipur, Bihar (link: <https://www.youtube.com/watch?v=CJsMAfaeTR4>).

In the opening session, IWMI Country Representative for Nepal, Dr. Manohara Khadka, welcomed all the participants on behalf of organizers. Dr. Khadka highlighted the need for improved irrigation in Nepal and the sharp increase in solar pumps across South Asia over the past five years. She also outlined the new SDC-IWMI regional partnership program and its objectives to support for resilient livelihoods in South Asia. Mr. Shilp Verma followed Dr. Khadka, elaborating the objectives of the National Stakeholders’ Consultation.

The program was attended by 67 persons, representing 41 institutions, including five individuals from outside Kathmandu with personal experience with SIPs. Twenty-one percent of the participants were female. Please refer **Annex 2** for the full participant list.



Photo 1: *Participants at the SoLAR national stakeholders' workshop in Kathmandu, Nepal*

2. Experience from SIP Pilots in Nepal

This session was dedicated for sharing experience from SIP pilots in Nepal, which included six presentations from Winrock, Sunfarmer, the Alternative Energy Promotion Center (AEPC), the Department of Water Resources and Irrigation (DWRI), the International Center for Integrated Mountain Development (ICIMOD), and Integrated Development Enterprises (IDE).

The presentations ranged in topic from different scales of SIP operation (e.g., individual, community, private sector) to the various financial models that have enabled SIP uptake (e.g., grants, subsidies, grant-loans, rent-to-own, service fees, monthly fees).

Each of the presenters also share the challenges they have faced in promoting SIP technology. Common challenges include:

- High upfront costs;
- Lack of community coordination;
- Lack of access to finance;
- Lack of after-sales service;
- Lack of skilled labor for repair and maintenance;
- Lack of value-chain linkages; and
- Sub-optimal use of assets.

There was also significant discussion of the Renewable Energy Subsidy Policy (2017), which provides a maximum subsidy of 60% to a ceiling of NPR 1.5 - 2 million per system for solar irrigation.

Below we summarize each of the presentations in this session.

2.1 Chaitanya Prakash Chaudhary, AEPC

- AEPC is focused on rural electrification and supply chain building and works to develop standards and policy for renewable energy, which includes proper implementation of Photovoltaic Power Systems (PVPS) for drinking and irrigation.
- AEPC uses a demand-driven approach, where it publicizes the offers, takes applications, conducts feasibility studies and other assessments, and then selects recipients. Identification as a woman or member of a marginalized group is a favored criterium.
- AEPC is also exploring a “Challenge Fund” approach.

- AEPC has a grant provision in which they provide up to 60% of the cost of solar pump as subsidy, with a ceiling of NPR 1.5 to 2 million.
- Primary challenges include high upfront costs, few financing options, lack of value chain linkages, technical issues (such as improper sizing), and threat of theft of solar equipment from fields.

2.2 Nabina Lamichhane, ICIMOD

- ICIMOD experiments have tried to assess financial models that were most useful for SIP adoption and used a randomized control trial (RCT) model to evaluate adoption through three financial models – grant; grant cum loan, and rental.
- ICIMOD provided extra discounts to women farmers on the condition that land is transferred in the name of the woman farmer.
- Results showed that grant-cum-loan models were most popular, followed by rentals. The majority of applicants were women farmers.
- Research findings suggest that with SIP area under irrigation and yield have increased, and more farmers have taken up aquaculture.

2.3 Dr. Madan Pariyar and Rabindra Karki, IDE

- IDE has been implementing solar multiple-use water systems (Solar MUS) that are community-managed with 40% grant from the NGO.
- IDE is looking to expand to household-scale SIPs and to include larger agricultural packages for training, technology, and demonstration.
- Challenges of their work include: high upfront costs, shortage of trained manpower, short time frame of project, and lack of supply chain linkages.

2.4 Resha Piya, Winrock

- Winrock is working to increase farmer awareness of SIP, to increase access to finance for installing SIPs, and developing supply chains, business models, and effective policy to improve their outreach to farmers interested in SIP.
- Winrock is experimenting with various financial models: direct purchase with cost sharing, financing with local cooperative financing institutions, fee for service, and rent to own.
- Observed impacts include increase in yields, crop diversification, increased community farming, and increased farmer revenue.

- Challenges to SIP include irregular subsidy delivery, lack of irrigation infrastructure ownership, unreliable service providers, sub-optimum use of solar power, and poor after-sale service of pumps.

2.5 Avishek Malla, Sunfarmer

- Sunfarmer has experimented with a variety of financial models. Rent-to own model has been the most successful with high repayment/ownership rate. Engineering, procurement and construction (EPC) and asset management models have also been successful.
- A new digital finance platform with bank partnership is working well and decreasing the collection costs.
- Primary challenges include payment collection and community coordination (individual projects have been more successful).
- Community-managed systems are good for economies of scale but are more difficult to coordinate. Individual SIPs are easier to manage but need a certain density for after-sales service costs.

2.6 Shiv Kumar Basnet, Integrated Energy and Irrigation Special Program (IEISP)

- The Government of Nepal (GoN) is constructing a tunnel to divert water from the Bheri River to the Babai River and providing solar pump systems in the Babai Corridor.

- GoN has launched the Integrated Energy and Irrigation Special Program (IEISP) with a large budget that could support solar projects in the future.



Photo 2: Panel members sharing their experiences with SIPs and SIP implementation

3. Policies and Financing Landscape for Solarization of Agriculture in Nepal

An enabling environment for solarization of agriculture can be created through supportive policies and financing. To understand the policies and financing landscape for solarizing agriculture in Nepal, five individuals representing the private, government, and finance sectors contributed their insights in a panel discussion:

- Narayan Prasad Adhikari, AEPC
- Shiv Kumar Basnet, DWRI
- Madhav Belbase, Water and Energy Commission Secretariat (WECS)
- Dinesh Dulal, NMB Bank
- Bishwa Raj Bhattarai, Ghampower

Dr. Aditi Mukherji (IWMI) facilitated the discussion, which generated the following major themes:

- Changes in the solar landscape over the last few years include an increase in awareness, an increase in the willingness of farmers to pay for SIPs, and an increase in banks' willingness to finance SIPs.
- There is interest in new financing vehicles and blended financing, but financial institutions need to identify new modalities. Lending for solar pumps is a priority, but farmers rarely get the concessional 5% interest rate earmarked for priority sectors— so more financial innovations are needed.
- More discussions about groundwater recharge and mountain springs are needed. Focus cannot be on pumping alone. In Nepal, the Terai (especially the eastern Terai) groundwater use is within sustainable limits, but mountain springs are vulnerable.
- There is high demand among farmers for government solar projects.
- The overall success of the solar irrigation will depend on the degree to which it can increase the profitability of agriculture. For that to happen, we need to look at the broader policy landscape and intervene at the policy level. Assuring certain prices for major crops would be one example of a needed policy intervention.
- WECS has a mandate to streamline energy-water policies and is currently finalizing a Water Resource Policy that addresses groundwater recharge, and solar and alternative energy. The new Water Policy will consider the importance of new technologies like solar pumps, but the Irrigation Master Plan by the Ministry of Water Resources, does not consider lift irrigation (especially useful on hill terraces for installation of solar pumps).

- The primary challenge is to find workable ways for upscaling. Mobilizing local governments, increasing financing, and providing more holistic support services to address other parts of farming were offered as possible solutions. The role of **local governments** is important not only for up-scaling but also for creating intra-departmental synergies.
- Coordination between national government agencies and between the federal and local levels governments is necessary and will likely be determined by the size of a SIP project.

4. Implementing SoLAR in Nepal: Opportunities for Pilots and Partnerships

A second discussion session focused on opportunities for pilots and partnerships for implementing SoLAR project in Nepal. Dr. Vishnu Pandey of IWMI moderated this session. To streamline the discussion, four groups, each consisting of 5-8 people, were formed. Each group was assigned one of the following themes:

- Suitable institutional models of SIPs for different agro-ecological zones of Nepal;
- Suitable financial models for different agro-ecological zones of Nepal;
- Barriers and challenges for SIP adoption and ways to overcome these barriers (including the role of local government); and
- Ways for making SIP policies more inclusive and equitable.



Photo 3: *Participants broke into small groups to discuss better ways to implement SIPs in Nepal.*

From this list of themes, the following points emerged in group discussion:

Suitable institution models of SIPs for different agro-ecological zones of Nepal

- Individual v. group model

- Individual ownership are the preferred option of farmers in the Terai, especially for irrigation, while group ownership is preferred in the mid hills, especially for drinking water schemes.
- Pump size
 - Depends upon local context (head, discharge in litres per day etc.), comparatively small size pumps in Terai (1-3 HP), 5-10kW size of pumps in hills
- Water Market
 - Can be sold by nearby farmers, small pumps may not have surplus power to sell, first come, first service could be a good model (i.e. Gujarat and Bihar), grid connected solar irrigation pump, engagement of local government to own system and distribute amongst farmers, secure tenure for landless, GESI linkages and women friendly systems

Suitable financial models for different agro-ecological zones of Nepal

- Grant + upfront
- Grant + loan (subsidized, commercial)
- Loan (commercial)
- Revolving fund
- Rental
- + insurance

Conversation focused on ways to decrease the per unit cost of SIP. There was also some back and forth about whether there were too few or a sufficient number of SIP suppliers. Those who believed there were too few SIP suppliers. Some expressed concern that heavy regulations over SIP supply effectively created a monopoly as few businesses could meet these regulations. The remoteness of sites, import taxes, and after-sales service costs were also cited as major impediments.

Barriers/challenges to adoption of SIPs and ways to overcome them (including role of local government)

- Threat of theft of SIP (e.g., Saptari and Nawalparasi)
- Lack of flexibility in water use compared to diesel and electric pumps (SIP variability determined by weather and sunshine hours)
- After-sale services
 - Lack of technical know-how, long response times from repair companies

- Investment costs
 - High upfront costs, low access to finance, high interest rates
- Limited irrigation demand, and hence low utilization of SIPs
- Local governments have a large role to play including: information dissemination, coordination with community, liaising with the private sector, monitoring SIP implementation, and improved resource mobilization (e.g., finance, local materials, and human resources)

Potential solutions for these barriers:

- Proper fencing, anti-theft measures, and insurance to securitize SIPs;
- Low-cost water storage and battery provision to offset variable weather and low sunshine days;
- Provide training at local, provincial, and federal government levels for SIPs repair and maintenance and allow private sector individuals to participate with a goal to provide such services in their communities;
- Provide uniform subsidies through different government agencies and higher than normal subsidy to marginalized to encourage SIP adoption;
- Create easier financing mechanisms (e.g., wholesale lending and cooperatives); and
- Use of SIP-generated energy for other productive purposes (than irrigation) sell to grid where possible.

Ways for making SIP policies more inclusive and equitable

- Promote community ownership;
- Target marginalized groups, women's associations or mother's group, and women's agri-cooperatives;
- Provide additional incentives to women and marginalized groups to adopt SIPs;
- Conduct capacity building and awareness campaigns;
- Provide end to end support and market linkages that promote high-value crops;
- Role of local government in promoting and financing SIPs; and

5. Conclusion

The objective of the day-long SoLAR consultation was for the IWMI team to learn more about the prospects for and challenges in front of solar irrigation. The workshop not only provided a good overview of the country's policy priorities and the industry landscape, but it also offered an excellent introduction to efforts by NGOs and civil society groups who have been promoting SIPs in their communities.

At the conclusion of the event, Mr. Shilp Verma of IWMI said that he and his colleagues from the IWMI-Tata Program – Manisha Shah and Gyan Prakash Rai – have planned fieldwork in Nepal Terai to follow this consultation. He said he hoped they would be able to visit solar pumps promoted by some of the organizations represented in the event and gain first-hand experience.

The consultation ended with a shared hope that the IWMI-SDC collaboration under SoLAR bring several of the participating agencies together to work towards rapid and effective promotion of SIPs in Nepal.

Annex 1: National Stakeholders' Consultation Program/Agenda

Solar Irrigation for Agricultural Resilience (SoLAR) Project

National Stakeholders' Consultation

12 February 2019 | Hotel Yak and Yeti, Kathmandu, Nepal

Facilitator: Vishnu Prasad Pandey (IWMI)

FROM	TO	AGENDA	PEOPLE
08:30	09:00	Welcome and Registration	
09:00	09:15	Opening Remarks	Manohara Khadka (IWMI)
09:15	09:30	Objectives	Shilp Verma (IWMI)
09:30	11:10	Session 1: <i>Experience from SIP pilots in Nepal</i>	Chaitanya Chaudhary (AEPC); Nabina Lamichhane (ICIMOD); Madan Pariyar (iDE); Avishek Malla (Sunfarmer); Resha Piya (Winrock)
11:10	11:30	Tea Break	
11:30	12:30	Session-2: <i>Panel discussion on Policies and Finance for Solarisation of Agriculture in Nepal (Facilitator: Aditi Mukherji)</i>	Narayan Prasad Adhikari (AEPC); Shiva Kumar Basnet (DWRI), Madhav Belbase (WECS); Dinesh Dulal (NMB Bank); Bishwa Raj Bhattarai (Ghampower)
12:30	13:30	LUNCH BREAK	
13:30	14:00	<i>IWMI's Field Experiments with Solar Irrigation in India</i> <i>ITP Video: The Promise of Dhundi Solar Pump Irrigators' Cooperative</i> <i>ITP Video: Equitable Water Markets, Powered by the Sun</i>	Tushaar Shah / Shilp Verma / Neha Durga
14:00	14:20	SoLAR: Solar Irrigation for Agriculture Resilience	Shilp Verma
14:20	16:00	MODERATED DISCUSSION – Implementing SoLAR in Nepal: Opportunities for Pilots and Partnerships <i>(With a Tea Break in between)</i>	Vishnu Prasad Pandey (Facilitator)
16:00	16:30	Conclusion and Ways Forward	Shilp Verma (IWMI)

**Annex 2: List of Participants in the National Stakeholders Consultation
(Kathmandu, Nepal)**

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