Solar Irrigation for Agricultural Resilience (SoLAR) in South Asia

Impact Pathways

IWMI
International Water Management Institute

SoLAR
Solar Irrigation for Agricultural Resilience

Schweizerische Eidgenossenschaft
Confédération suisse
Confederazione Svizzera
Confederaziun svizra

Swiss Agency for Development and Cooperation SDC

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Acknowledgement: The Solar Irrigation for Agricultural Resilience (SoLAR) in South Asia project aims to sustainably manage the water-energy and climate interlinkages in South Asia through the promotion of solar irrigation pumps (SIPs). The main goal of the project is to contribute to climate-resilient, gender-equitable, and socially inclusive agrarian livelihoods in Bangladesh, India, Nepal and Pakistan by supporting government efforts to promote solar irrigation. This project responds to government commitments to transition to clean energy pathways in agriculture. All countries in this project have Nationally Determined Contribution (NDC) commitments to reduce greenhouse gas (GHG) emissions and SIPs can play a significant role in reducing emissions in agriculture.

The project is supported by the Swiss Agency for Development and Cooperation (SDC). Read more: **solar.iwmi.org**

Acronyms and Abbreviations

AEPC	Alternative Energy Promotion Centre
BADC	Bangladesh Agricultural Development Corporation
BARC	Bangladesh Agricultural Research Council
BMDA	Barind Multipurpose Development Authority
BREB	Bangladesh Rural Electrification Board
BTF	Bhutan Trust Fund
CPMC	Country Project Management Committees
DAE	Department of Agricultural Extension
GCF	Green Climate Fund
GERMI	Gujarat Energy Research and Management Institute
GESI	Gender Equality and Social Inclusion
GHG	Greenhouse Gas
Hp	Horsepower
ICAR	Indian Council of Agricultural Research
IDCOL	Infrastructure Development Company Limited
IWMI	International Water Management Institute
KfW	Kreditanstalt für Wiederaufbau
KARMA	Kalinga Renewable Energy Manufacturers Pvt. Ltd.
MNRE	Ministry of New and Renewable Energy
MoU	Memorandum of Understanding
NDC	Nationally Determined Contributions
NEA	Nepal Electricity Authority
PARC	Pakistan Agricultural Research Council
PM-KUSUM	Pradhan Mantri Kisan Urja Suraksha evam Utthaan Mahabhiyan
SDC	Swiss Agency for Development and Cooperation
SHG	Self-help Group
SIP	Solar Irrigation Pump
SKY	Suryashakti Kisan Yojana
SoLAR	Solar Irrigation for Agricultural Resilience
SREDA	Sustainable And Renewable Energy Development Authority
UPNEDA	Uttar Pradesh New & Renewable Energy Department Agency
WUGs	Water User Groups

Foreword

Solar Irrigation for Agricultural Resilience (SoLAR) is a programme supported by the Swiss Agency for Development and Cooperation (SDC) and implemented by the International Water Management Institute (IWMI).

- The program worked across four countries in South Asia - Bangladesh, India, Nepal, and Pakistan - to help test solar irrigation solutions that promote triple wins, improved livelihood outcomes for women and marginal farmers; reduced emissions of GHG from agriculture and; sustainable groundwater use.

- Through evidence-based knowledge generation, consultations and dissemination the program has:
  - Shaped clear shifts in SIP policies and programs in all four countries, contributing to ambitious, inclusive and effective policy development for solar energy generation for agriculture
  - Generated robust evidence of the effects of SIPs on groundwater sustainability, diesel-use, crop diversification, irrigation costs, gender, and farmers income
  - Launched and commissioned first of its kind pilots on grid integration in Bangladesh and Nepal which have contributed to government efforts to scale solar irrigation
  - Led capacity building efforts through training, outreach, and exchange visits that have enhanced technical expertise of SIP farmers, implementation agencies, technicians, and academics in the four countries

- Recognizing the interdependence of water, energy, and food systems, program findings advocate for a holistic nexus-responsive approach to maximize benefits and mitigate potential trade-offs.

Future efforts will support more effective targeting of solar irrigation programs, address barriers to inclusive financing of solar irrigation, mobilizing investment from different sources, and support development of uses of solar in agriculture beyond irrigation (e.g. Agri-voltaics).

We look forward to continued and close collaboration with SDC in advancing sustainable irrigation and energy solutions in response to climate change.

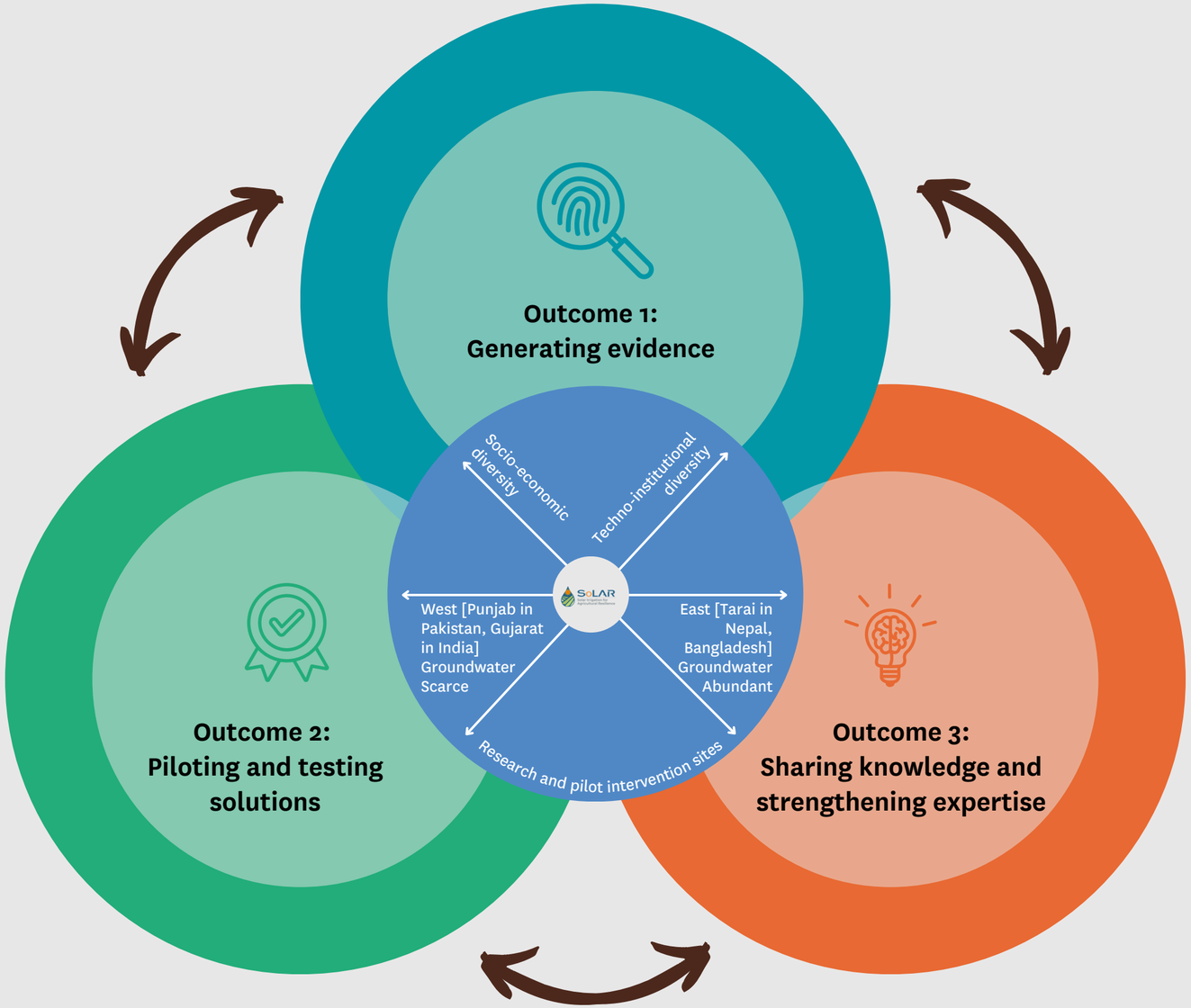
Project

SoLAR in South Asia aims to create climate-resilient, gender-equitable, and socially inclusive agrarian livelihoods in South Asia by supporting government efforts to promote SIPs. The program outcomes, co-designed with SDC, respond to government commitments to transition to clean energy pathways in agriculture through:

Generating improved empirical evidence to support the development of climate-resilient, gender-equitable, socially-inclusive, and groundwater-responsive solar irrigation policies

Validating innovative actions and approaches for promoting gender-equitable, socially-inclusive, and groundwater-responsive solar irrigation

Increasing national and global knowledge and capacity for developing gender-equitable, socially inclusive, and groundwater-responsive solar irrigation policies and practices



Outcome 1

- Evaluating existing SIP programs
- Assessing impacts on agriculture and energy use
- Assessing impacts on groundwater resources
- Assessing impacts on women and socially marginalized groups

Outcome 2

- Scale pilot in Bangladesh: testing various financial modalities for SIP ownership by farmers
- Scale pilot In Gujarat, India: Institutional modalities for grid connected SIPs
- Demonstration of pilots In Bangladesh, Nepal and Pakistan: testing techno-institutional modalities for grid connected SIPs East (Nepal Tarai, Bangladesh)

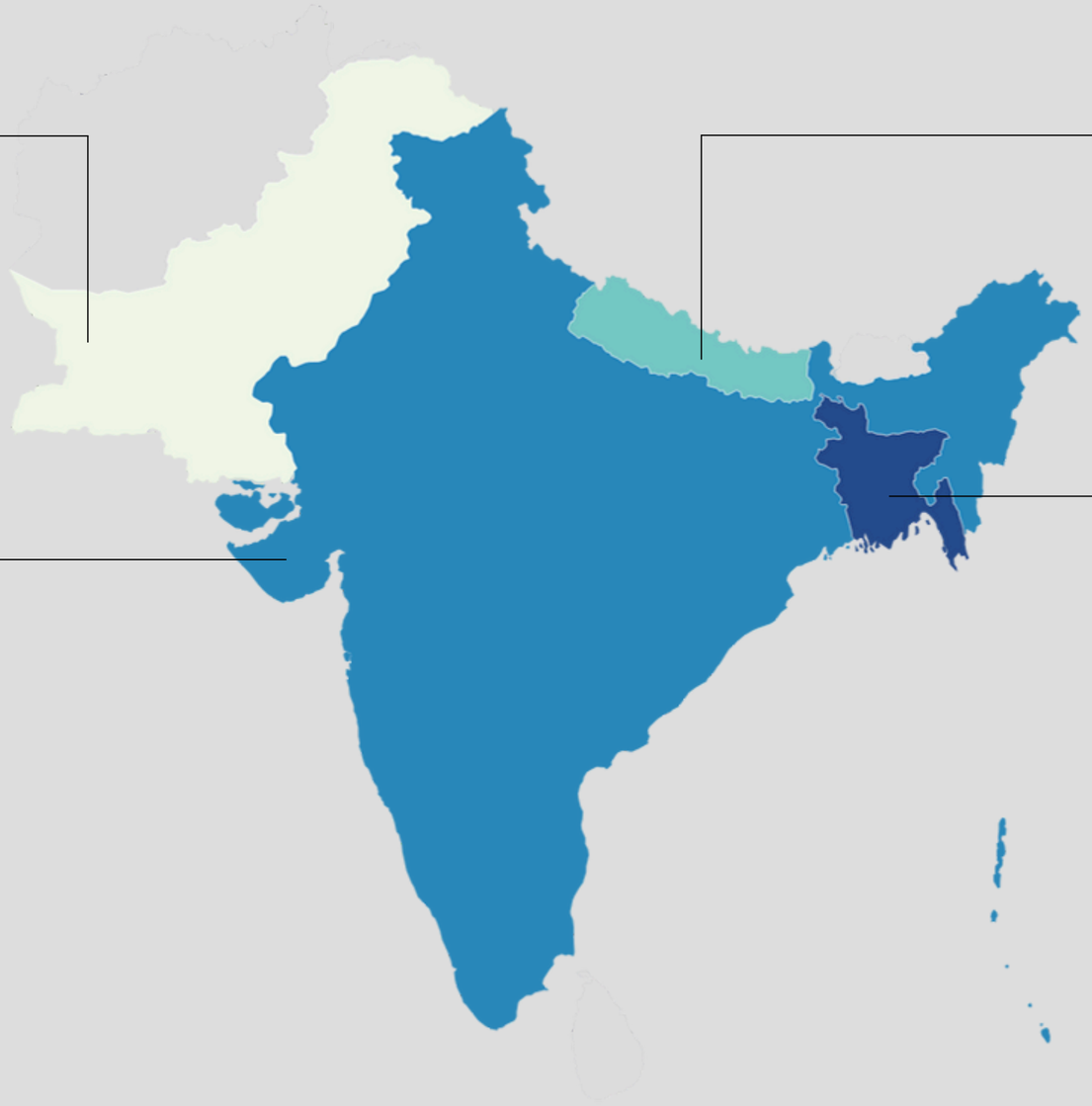
Outcome 3

- Training women and men solar technicians
- Training farmers In water efficient on farm techniques
- Communicating with national policy makers and other regional/global stakeholders
- De-mystifying linkages between water-energy and food for sector professionals

SoLAR
Solar Irrigation for Agricultural Resilience

PAKISTAN

- Research (GESI, Groundwater, Policy)
- Evaluation of Grid Integration
- Innovation Grantee
- Trainings and Capacity Building



NEPAL

- Research (Assessment and GESI case study of Government's solar irrigation program)
- Innovation Grantee
- Trainings and Capacity Building

INDIA

- Research (GESI, Groundwater, Policy)
- Evaluation (Grid-Connected and Off-grid SIPs)
- Innovation Grantee
- Trainings and Capacity Building

BANGLADESH

- Research (GESI, Groundwater, Policy)
- Pilot Implementation (Grid Integration)
- Trainings and Capacity Building

Activities

Bangladesh

Groundwater Sustainability

- The results show no significant difference in water use between solar and diesel irrigation (intensive margin), with 4.2 percentage point increase in dry season paddy area (extensive margin).
- Hydrological modeling suggests minimal regional groundwater impact under these assumptions.
- Results proved to be important technical support to IDCOL in their GCF proposal for SIPs in Bangladesh.

Grid Connected SIP

- Seven grid-integrated SIPs were piloted with IDCOL—the first of its kind in the country—to enhance the financial sustainability of SIPs.
- These pilots resulted in substantial energy exports to the national grid and savings in government subsidies.
- The lessons from these pilots have been instrumental in shaping the design of future investments, with the majority of upcoming SIP investments approved for grid integration.

Capacity Building

- In collaboration with IDCOL and DAE, training modules were developed on solar pump usage, crop scheduling, and water-efficient irrigation to promote sustainable practices among SIP farmers in Bangladesh. Four pilot training sessions were conducted, benefiting around 120 farmers.
- The Country Coordination and CPMC, comprising key implementing departments for SIPs such as IDCOL, BARC, BADC, DAE, BREB, BMDA, and SREDA, established a platform for regular stakeholder engagement and policy discussions.
- Exchange visits to India and Nepal facilitated knowledge transfer and learnings.

GESI-Responsive and Groundwater-Aware Financial Models

Study to identify barriers to SIP adoption among women and marginal farmers in remote regions of Bangladesh, including Char land, Chittagong Hill Tracts, and Sylhet.

India

Groundwater Sustainability

- The deployment of SIPs often raises concerns about groundwater sustainability.
- We have generated evidence on the effect of grid-connected SIPs on groundwater withdrawal.
- Our findings suggest that grid-connected SIPs do not lead to increased groundwater extraction due to the incentives provided to farmers under this model.

GESI

- Women-led community-based solar business models were piloted to build the entrepreneurial capacity of women farmers, enhance irrigation access, and improve agricultural productivity and income with SHGs in Madhya Pradesh.
- Two models were implemented with the objective: one following the "Earn First, Pay Later" approach and another requiring a 10% upfront cost.
- Community-based solar initiatives like CinI and KARMA created local jobs and strengthened rural economies.
- Specialized training was conducted for male and female enumerators to better incorporate GESI into data collection.

Evaluation and Results

Grid-Connected SIPs

- Adoption is hindered by risk aversion and capital constraints.
- Farmers earn an average of USD 200 annually from selling power—about 34% of their crop income.
- Strong cost recovery: 25–28% of investment recouped in two years.

Off-Grid SIPs

- Farmers shift toward high-value crops like wheat and Isabgol post adoption.
- Significant reduction in diesel consumption.

Capacity Building

- IWMI conducted a day-long training for farmers on the technical and financial aspects of the grid-connected SIP scheme.
- Farmers participating in the SKY scheme experienced a 23% increase in net energy evacuation and an average income boost of USD 160.

Nepal

Grid-Connected SIPs

- The first grid-connected solar irrigation pilot was established via a net-metering agreement between the NEA and the Sourya Urja Krishak Samuha (Farmer's User Group), allowing farmers to inject surplus electricity into the grid and reduce diesel based water market in the catchment area.
- Conducted a comprehensive needs assessment to develop tailored capacity- building training for farmers.

Capacity Building

- Conducted seven trainings spanning across the Terai region of Nepal. Trained 157 technicians, with balanced gender participation (41% female and 59% male), ensuring long-term sustainability and reliable maintenance of SIPs.
- A bilingual Training Manual on Solar Irrigation Pumps in English and Nepali, covering troubleshooting, operation, and maintenance, was handed over to AEPC and uploaded to their website as a knowledge product.
- Nepal hosted four national forums.

GESI

- Policy reforms with significant progress in supporting women and small-scale farmers through SIP subsidies.
- AEPC prioritized allocating 1 out of 3 subsidies to women farmers at the Local Government level and started Community SIP to accommodate smallholders and landless farmers (through lease agreement).

Pakistan

Groundwater Sustainability

- Groundwater research in Punjab revealed that both SIP and non-SIP farmers had similar cropping patterns, indicating no significant changes in water-intensive practices due to SIP adoption.
- Web-based modules on solar suitability mapping and solar irrigation pump sizing tool for Punjab have been developed. In response to government demand and to build synergies across projects, team is now extending the development of these tools for other provinces.

Grid-Connected SIPs

- Choice experiments in Pakistan informed grid-integration policies and sustainable groundwater use. These policies aim to improve farmer income and reduce reliance on diesel-powered pumps.
- An econometric analysis revealed that farmers growing staples and those selling groundwater-valued feed-in tariffs more.

Capacity Building

- Collaborated with the PARC to conduct four training sessions, improving the capacity of farmers and technicians.
- Training programs focused on sustainable water use, reducing operational costs of SIPs.
- Hosted 4 national forums and periodically organized CPMC meetings.

Groundwater-Aware Financial Models

- The program facilitated a World Bank-funded (USD 105K) review study on solarizing agriculture in Punjab, which developed a groundwater vulnerability index and proposed sustainable financial models.
- Advocated for feed-in tariffs to incentivize farmers to adopt grid-connected SIPs.
- Most SIPs were installed with self-finance, replacing diesel pumps for 64% of surveyed farmers due to high operational costs.

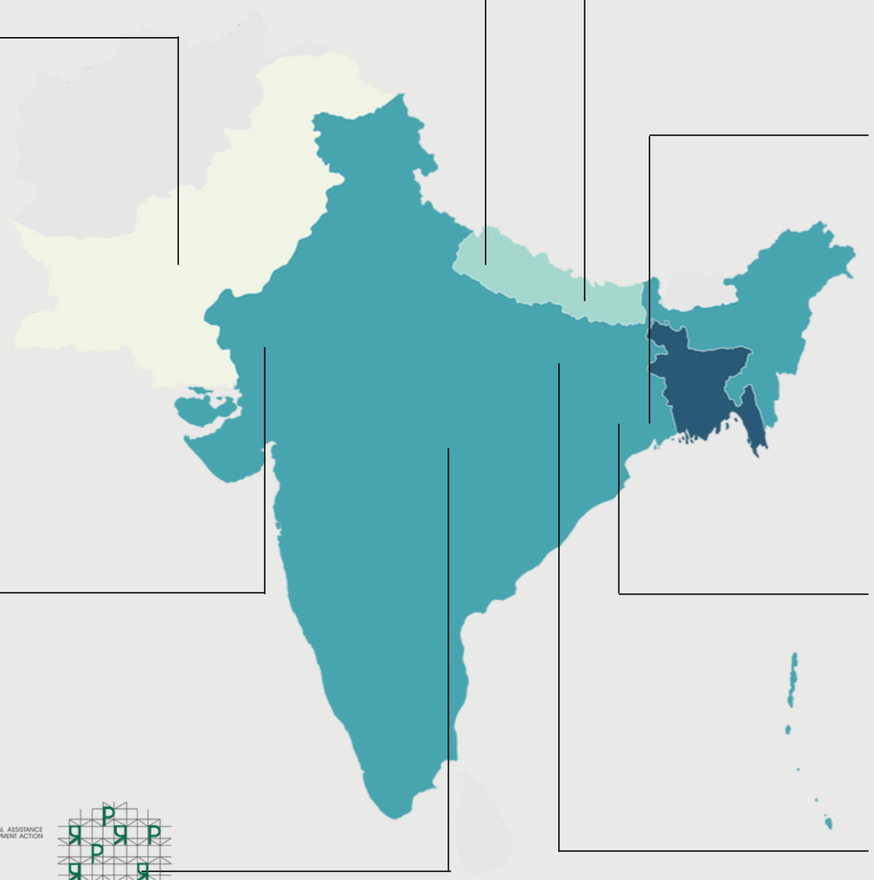
Knowledge Sharing

A series of national and regional forums were conducted in four countries to facilitate dialogue, knowledge exchange, and policy development on solar irrigation and sustainable agriculture.

These forums engaged over 1,000 stakeholders from government, academia, research institutes, and local communities to explore the transformative potential of solar energy in irrigation.

One regional and one global science-policy forums were organised apart from national forums engaging over 400 participants from around 20 countries.

Innovation Models



Pakistan Agricultural Research Council (PARC)

Urmul Seemant Samiti

Professional Assistance for Development Action (PRADAN)

MinErgy Initiatives

Gham Power Nepal Private Limited

Environment Conservation Society (Switch ON Foundation)

Kalinga Renewable Energy Manufacturers Pvt. Limited (KARMA)

Collectives for Integrated Livelihood Initiatives (CInI)

Iinnovation models showcased the financial scalability of SIPs in South Asia

Innovation Model Case Studies

MINI SOLAR PUMPS FOR WOMEN FARMERS - MSP4WF

Solutions

- Formed WUGs to promote shared use of pumps and conducted trainings.
- Innovative financing using equity, subsidies, and a First Loss Default Guarantee revolving fund to enable collateral-free loans.
- Installed 2–3 HP solar pumps based on irrigation needs for 20 women farmers.

Outcomes

- 20 operational pumps led to a 50% increase in women farmers' income
- Saves ~26.28 tons of CO_2 emissions annually by replacing diesel/electric pumps.
- WUGs enable farmers to sell water at 10–15% better price creating additional income

RESPONSIVE DRIP IRRIGATION FOR DUGWELL COMMUNITIES

Solutions

- Piloted optimized solar-powered drip irrigation in water-scarce regions.
- Installed push-button solar pumping systems for overhead water tanks.
- Developed a gender-friendly smart irrigation system.

Outcomes

- 67.69% water savings compared to flood irrigation.
- Improved water efficiency for vegetables (24.69%) and cotton (19%).
- Promoted continuous water availability, energy savings, and women empowerment.

OFF GRID BAZAAR: SCALING SOLAR IRRIGATION

Solutions

- Deployed 7 solar water pumps with sensors and remote monitoring.
- Developed Off Grid Bazaar, a digital Data-Driven farming–yield optimization platform.
- Easy farmer financing and Personalized Crop-specific recommendations.

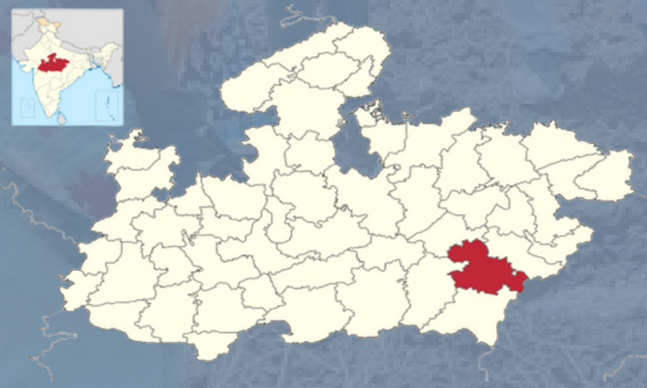
Outcomes

- Improved farmers' economic conditions and income levels.
- Smart sensors enhanced solar pump and crop performance.
- Reduced CO_2 emissions by replacing diesel and electric pumps.

These initiatives highlight the transformative potential of solar irrigation in enhancing agricultural resilience, sustainability, and gender equity in South Asia.

Community-Based Solar Lift Irrigation

A Women-Led SHG Model



Kevlari and Chimkatola
villages in Mandla district, Madhya Pradesh

Context: A pilot intervention targeted two tribal-dominated villages, where over 75% of farmers—economically poor and reliant on rainfed agriculture—lacked access to reliable irrigation, limiting crop diversification and productivity.

Intervention type: Community-based Solar Lift Irrigation

Business models piloted: 1) Earn First, Pay Later, 2) 10% Upfront Cost, with recovery through water sales.

Institutional structure: Water User Associations with women farmers were formed. 15 members in Kevlari and 13 members in Chimkatola.

Preliminary results: Each WUA saved over INR 10,000 (USD 115) from water sales. Farmers shifted cropping patterns toward more profitable crops like wheat and vegetables.

Behavioural Change: Initially hesitant to invest or take loans, the women farmers are now leading efforts to install a solar-powered mini-rice mill for off-season income. This marks a shift toward greater confidence in renewable energy and collective enterprise.

Achievements

Farmer Income

- In India (Rajasthan, Gujarat) 27% rise in farm income and USD 125/year saved on diesel costs as a result of SKY
- ~25% higher Boro profits in Bangladesh (USD BDT/acre) following introduction of SIPs

Water Saving

- In India-600 mm/year less water pumped by grid-SIP users. 14% energy use reduction reported by SKY farmers
- Lower groundwater abstraction in Pakistan due to SIP capacity limits

GHG Mitigation & Energy Efficiency

- ~2.8 tCO_2/year avoided per SIP (India)
- 61% (rice) & 44% (wheat) reduction in use of diesel for pumping (Nepal)

Capacity Building & Outreach

- Project outreach to around 36k people
- Around 5000 benefitted from pilot studies and GESI-focused awareness activities.
- More than 20 trainings conducted including ~3500 farmers, ~300 technicians (~30% women) and policymakers

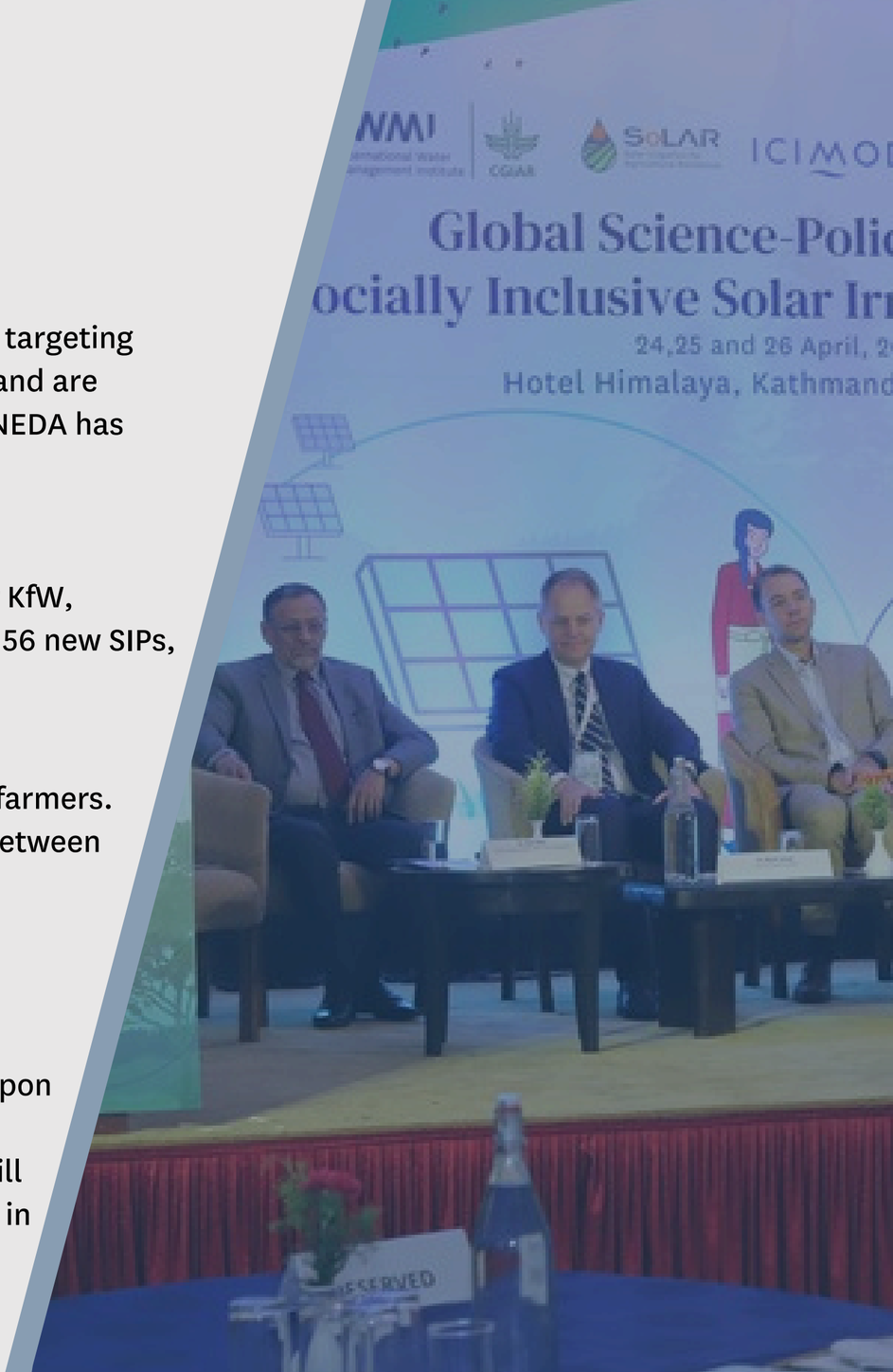
Driving Policy Change

In India, Studies on PM-KUSUM have identified key inequities and recommended improved targeting mechanisms for small and marginal farmers. These findings have been shared with MNRE and are expected to inform the design of PM-KUSUM 2.0 in 2027. Collaborations with ICAR and UPNEDA has resulted in formal commitments, MoUs, and the deployment of extension agents.

In Bangladesh, learnings from the pilot have been instrumental in IDCOL through its donor KfW, incorporating grid integration within the financing structure of SIPs. IDCOL have approved 56 new SIPs, of which 39 sites will be connected to the grid.

In Nepal, AEPC will revise its subsidy disbursement criteria in favour of women and small farmers. First grid-connected solar irrigation pilot was established via a net-metering agreement between the NEA and the Sourya Urja Krishak Samuha (Farmer's User Group).

In Pakistan, web-based modules for solar suitability mapping and a solar irrigation pump sizing tool have been developed, where they received recognition from the government. Upon government’s request, the developed tools are now being extended to three provinces including Balochistan, Khyber Pakhtunkhwa, and Sindh, under different projects, which will enhance government efforts in evidence-based planning and promotion of solar irrigation in Pakistan.



Pathways Towards Impact

Gender-Inclusive Solar Irrigation

Promoted gender-sensitive policies and financial models, ensuring equitable access to SIPs for women farmers and marginalized groups through micro-SIPs and training programs.

Innovative Financing Models

Introduced micro-financing, grant-based investments, and First Loan Default Guarantee to enhance SIP accessibility, reducing financial barriers for smallholder farmers.

Sustainable, Climate-Resilient Agriculture

Advocated for solar-powered irrigation to replace diesel systems, leading to lower CO_2 emissions, groundwater conservation, and high-value crop adoption through region-specific irrigation strategies.

Grid-Connected Solar Irrigation

Explored net metering and surplus electricity sales, enabling farmers to generate additional income while encouraging responsible groundwater use.

Capacity Building & Knowledge Sharing

Strengthened technical skills and system maintenance through GERMI training programs, field visits, and collaborative learning, ensuring the long-term sustainability of SIP adoption across regions.

Beyond Project Countries South-South Learning

The team was approached by the BTF to assist in implementing two solar lift irrigation systems in Bhutan, which was successfully completed with additional support from SDC.

Additionally, countries in East Africa have shown interest in applying lessons learned from South Asia's grid and off-grid learnings.

Advancing Climate-Resilient Agriculture through Solar-Powered Lift Irrigation in Bhutan

Approach:

- Conducted a feasibility study through site assessment and stakeholder discussions to ensure inclusivity & community buy-in.
- Capacity Building on solar system management and sustainable water practices.
- Supported system installation; documented insights to guide scale-up and policy planning.

Technical Assistance:

- Enhanced technical readiness for installing solar-powered lift irrigation in selected pilot areas.
- Strengthened collaboration and knowledge sharing among farmers, engineers, and government bodies.
- Built local capacity for sustainable irrigation management.
- Developed a scalable model for climate-resilient agriculture in Bhutan's high-altitude regions.

High-altitude warm-temperate regions are major rice-producing areas depending on timely irrigation. However, declining mountain spring discharge and unaffordable electricity costs have made conventional lift irrigation systems unsustainable for smallholder farmers. SDC-IWMI team supported BTF to provide technical assistance ain design and planning of two solar lift irrigation systems in Bhutan.

Bali Village, Chubu Gewog (Punakha District), Changsima Village, Hungrel.

Ethiopia

Solar energy offers pathways to climate-resilient productivity and value addition. Agriculture is central to Ethiopia's livelihoods yet constrained by unreliable energy access and post-harvest losses.

Activities

- Multi-stakeholder workshop in Addis Ababa engaging 30+ actors for system mapping and scaling dialogue.
- Comprehensive Innovation System Analysis completed, identifying policy, finance, and capacity gaps.
- Documented diverse business cases across SPIS, solar cooling, drying, mechanization, with barriers articulated.
- Piloted financing mechanisms (SEFFA PayGo, revolving funds) showing improved uptake with technical bundling.

Gaps and Potential

- Policy frameworks supportive but fragmented; need for a National Solar-in-Agriculture Strategy.
- Uptake requires knowledge, services, and trust-building, not just equipment supply.
- Affordability barriers persist; innovative finance (PAYGo, revolving funds) and de-risking needed.
- Technical capacity constraints and supply chain challenges limit scale.
- GESI barriers remain: women and youth face unequal access to training, finance, and markets.

Kenya

Kenya has the highest solar water pump uptake in Sub-Saharan Africa but low adoption of solar cooling, drying, and processing due to cost and awareness barriers.

Activities

- Multi-stakeholder workshop in Nairobi engaging 27+ actors for barriers andopportunities mapping.
- Diagnostic study identified affordability, technical capacity, and policy fragmentation askey constraints.
- Integrated with Kenya's National Irrigation Sector Investment Plan (NISIP), positioningsolar irrigation within FLID pathways.
- Joined Inter-Governmental Committee on PURE to foster cross-ministerial coordination.

Gaps and Potential

- Supportive policies exist, but operational integration of solar in agri-programs is limited.
- High upfront costs and lack of tailored finance limit smallholder uptake; PAYGo andlease-to-own models promising but underdeveloped.
- Quality and trust issues persist due to substandard products and limited techniciancapacity.
- Coordination gaps among private sector, local governments, and cooperatives weakenlast-mile service delivery.
- Need for blended finance, quality assurance frameworks, and systematic capacitybuilding to scale solar-powered agriculture sustainably.

Collaborations

INDIA

Gujarat Urja Vikas Nigam Ltd (GUVNL): Implemented grid-connected solar irrigation initiatives under the SKY scheme

Gujarat Energy Research and Management Institute (GERMI): Conducted research on institutional aspects of grid-connected solar pumps and energy efficiency modeling

Institute of Rural Management Anand (IRMA): Evaluated socio-economic impacts of solar irrigation; analyzed SKY's impact on water markets

Ashoka Trust for Research in Ecology and the Environment (ATREE): Assessed groundwater sustainability and ecological impact

Sardar Patel University (SPU): Studied the Suryashakti Kisan Yojana (SKY) impacts on rural water markets

Collectives for Integrated Livelihood Initiatives (CInI): Developed community-based solar irrigation business models

PAKISTAN

Ministry of National Food Security & Research: Provided policy recommendations for sustainable water-energy-agriculture integration

Federal Water Management Cell: Conducted groundwater studies and promoted optimized irrigation practices

Pakistan Agricultural Research Council (PARC): Piloted gender-friendly irrigation systems and advanced technologies

Khwaja Fareed University of Engineering and IT (KFUEIT): Supported simulation studies for solar pump efficiency

Buraq Integrated Solutions & Capital Technologies (CT): Instrumented groundwater monitoring systems at tubewell sites

Boston University: Conducted farmer preference studies on selling surplus electricity

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BANGLADESH

Infrastructure Development Company Limited (IDCOL): Piloted and evaluated SIPs with innovative financing models

NGO Forum for Public Health: Led awareness campaigns and farmer capacity building

Bureau of Socioeconomic Research and Training (BSERT): Analyzed the impacts of irrigation policies on smallholder farmers

GAZI Group: Managed SIP supply chains, ensuring quality standards

WAVE Foundation: Monitored equitable SIP access and provided training for marginalized groups

NEPAL

Alternative Energy Promotion Centre (AEPC): Partnered to facilitate Impact Assessment of Government's Subsidy program

Chhipaharmai Rural Municipality: Facilitated the implementation of demonstrated pilot for grid-connected solar irrigation

Nepal Electricity Authority (NEA): Supported the grid integration process for the demonstration pilot

GIZ POSTED Project: Knowledge sharing on solar irrigation and capacity building

Quasar Energy Consultants: Developed training materials and conducted Capacity building training for local technicians

Recommendations

INDIA

- Support scaling of PM-KUSUM in selected states through addressing barriers to uptake and promote alignment with rural livelihood missions
- Explore optimal subsidy levels and delivery systems for resource-constrained farmers.
- Develop more effective targeting of solar schemes through solar suitability mapping to link groundwater abstraction to socio-economic factors and cropping patterns.

PAKISTAN

- Develop explicit solarization policies to replace diesel pumps.
- Support self-financed SIP projects with tailored financial products like low-interest loans.
- Create knowledge hubs with universities for SIP training and capacity building.
- Conduct women-focused training on precision irrigation and SIP operation.
- Strengthen institutional frameworks and regulatory enforcement for SIP adoption.

BANGLADESH

- Strengthen policy coherence across water, energy, and agriculture sectors, aligning with NDCs.
- Promote grid integration for SIPs, enabling energy buy-back for financial sustainability.
- Expand farmer training in water management, crop diversification, and SIP maintenance.
- Highlight environmental and economic benefits through awareness campaigns.
- Support alternate uses for solar e.g. agri-voltaics that minimize land use and maximize multi-use benefits.

NEPAL

- Ensure inclusive access through targeted subsidies, simplified processes, and local government-led solar irrigation programs.
- Scale technology smartly by co-developing business models and improving net-metering for grid-connected solar irrigation.
- Build strong support systems with after-sales networks, digital monitoring, and decision support system.
- Fill knowledge gaps on groundwater sustainability and emissions to guide SIP expansion and access climate finance.

Publications

Solar irrigation in India: a situation analysis report https://doi.org/10.5337/2021.217

Solar irrigation in Bangladesh: a situation analysis report https://doi.org/10.5337/2021.216

Solar irrigation in Nepal: a situation analysis report https://doi.org/10.5337/2021.218

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