

Evidences

Study #2792

Projects:

- P588

Part I: Public communications

Type: OICR: Outcome Impact Case Report

Status: On Going

Year: 2018

Tagged as: New Outcome/Impact Case

Title: A revolution in solar-powered Irrigation: Solar Power as Remunerative Crop (SPaRC) model is being scaled out nationwide in India (WLE-IWMI)

Short outcome/impact statement:

A cooperative business model developed by the CGIAR Research Program on Water, Land and Ecosystems (WLE) and partners is now formally confirmed as one of four components of a total USD 16.4 billion Indian Government farm energy program (KUSUM). Gujarat state has begun scaling out the concept; six other states have begun piloting it under KUSUM. In the model, cooperatives manage a small solar-powered grid for irrigation pumps that sell surplus power to the electric utility.

Outcome story for communications use:

Massive Indian investment scales out solar irrigation: co-op business model reduces emission and boosts incomes

Indian governments are tackling climate change and poverty threats through a major expansion of solar irrigation. And a key component of the roll-out is a CGIAR Research Program on Water, Land and Ecosystems (WLE) business model that protects groundwater and bolsters income of smallholder farmers.

In 2018, the Government of India formally confirmed a previously announced plan for a national mega scheme to expand solar energy through a total investment of USD 16.4 billion, of which the central government will provide a 30% capital subsidy. The 10-year scheme aims to convert 7.5 million currently subsidized electric irrigation pumps to solar.

The scheme, KUSUM (Farmer Energy Security and Development Mission, 3), promotes the Solar Power as Remunerative Crop (SpaRC) business model, in which farmers form co-ops to sell surplus power back to utilities. The sell-back option provides incentive to use energy and groundwater judiciously.

This model was first developed in 2016-17 by WLE, the CGIAR Research Program on Climate Change, Agriculture and Food Security (CCAFS) and the IWMI-Tata Program (ITP). In its 2017 annual report, CCAFS announced preliminary plans for this program. The KUSUM announcement followed further consultations between ITP and the Indian Minister of Finance.

The state of Gujarat is already rolling out the model. Gujarat has announced its own pilot investment of USD 120 million. The Government of Gujarat estimates sale of surplus power will double the income of participating farmers. At least seven Indian states are also now piloting the model.

Based on India's experience to date, further roll out is expected to 1) introduce clean energy for irrigation and lower emissions; 2) build smallholder resilience by increasing productivity, food security and incomes; and 3) improve the financial sustainability of utilities.

In the past, irrigation expansion in India has brought about several challenges that switching to solar-powered pumps can mitigate. Notably, subsidies for fuel and electricity have led to over pumping and groundwater depletion. Providing subsidized electricity to farmers has even bankrupted some electric utilities.

On the other hand, when the SpaRC model was first piloted, the results were impressive: Farmers' incomes doubled, mostly from the sale of excess power, but also due to reduced pumping costs.

The model is now attracting attention from outside of India: With the support of WLE and the Swiss Development Cooperation (SDC), IWMI has initiated a long-term regional partnership to promote solar irrigation in India, Pakistan, Nepal and Bangladesh. WLE will also disseminate SPaRC lessons to countries in sub-Saharan Africa and Latin America.

Photo 1:

<https://www.flickr.com/photos/iwmi/16003412812/in/photolist-q6MTQF-q6EQBu-qoe9t8-preZib-q6MRtr-qoedcv-qo4a1r-qkXcow-qkX34Q-q6MUD4-prf3Cs-qoaF5y-R5EJfh-FDnC1P-FDjgvB-cRputs> 24 year old Mohan Das works on a sprinkling system energized through a submerged solar pump at a private farm in Klashar, Jagdhri Block, Yamunanagar District, Karnal State, Haryana Country, India. Prashanth Vishwanathan/IWMI (no consent on file)

Photo 2: <https://www.flickr.com/photos/iwmi/15816722698/> Gurinder Singh's 80 acre farm in Jagadhri Block, Yamunanagar District, Karnal State, Haryana Country, India is irrigated using a solar water pump. Prashanth Vishwanathan/IWMI (no consent necessary)

Photo 3: <https://www.flickr.com/photos/iwmi/16002140981/> Solar panels are seen adjacent to a water source used for irrigation on a private farm in Klashar. Prashanth Vishwanathan/IWMI (no consent necessary)

For related links please see "Communications Materials" in the field below. For a version of this story with embedded links, please contact WLE: a.hunt@cgiar.org

Links to any communications materials relating to this outcome:

- <https://wle.cgiar.org/thrive/2018/04/23/here-comes-sun-solar-technology-agriculture>
- <http://tinyurl.com/y5p6jj3c>
- <https://drive.google.com/open?id=11gU63CZAUgach2yJVWqy2SkRyrjgkBsg>
- <http://tinyurl.com/yymgcsqg>
- <https://kusum.online/home/>
- <https://krishijagran.com/news/farmers-new-crop-electricity-surya-shakti-kisan-yojana/>
- <https://drive.google.com/open?id=1vdj9DU6TW0YcG8Exhmu6hGZCgeRoo6s>

Part II: CGIAR system level reporting

Link to Common Results Reporting Indicator of Policies : Yes

Policies contribution:

- 230 - Indian and Gujarat state governments rolling out national solar irrigation investment program based on results of WLE and CCAFS-supported pilot study. Farmers will be able to sell surplus power to electric utility

Level of maturity of change reported: Level 1

Links to the Strategic Results Framework:

Sub-IDs:

- Reduced smallholders production risk

Is this OICR linked to some SRF 2022/2030 target?: Yes

SRF 2022/2030 targets:

- # of people, of which 50% are women, assisted to exit poverty

Comment: <Not Defined>

Geographic scope:

- National

Country(ies):

- India

Comments: <Not Defined>

Key Contributors:

Contributing CRPs/Platforms:

- WLE - Water, Land and Ecosystems
- CCAFS - Climate Change, Agriculture and Food Security

Contributing Flagships:

- F2: Land and Water Solutions for Sustainable Intensification (LWS)

Contributing Regional programs: <Not Defined>

Contributing external partners:

- MGVCL - Madhya Gujarat Vij Company, Ltd.
- SDC - Swiss Development Cooperation
- GERMI - Gujarat Energy Research and Management Institute
- Government of Gujarat (India)
- Government of India
- SRTT - Sir Ratan Tata Trust & Allied Trusts
- NDDB - National Dairy Development Board

CGIAR innovation(s) or findings that have resulted in this outcome or impact:

This outcome has emerged from a pilot experiment that combines solar energized irrigation pumps and the opportunity to sell surplus power to the electricity utility at a fair market price. All the participating farmers had previously used diesel pumps. The pilot initially involved six farmers; three more joined within a few months; as of December 2018, it has been operating for over 30 months. Results have included a 50% increase in net farm income, half of which is from the sale of electricity; three times the previous area is irrigated through sales to other farmers, and the electricity utility has saved some In Rs 340,000 (USD 4,900) that otherwise would have been the farm power subsidy (2).

Innovations: <Not Defined>

Elaboration of Outcome/Impact Statement:

In 2015, the IWMI-Tata Program (ITP), WLE and the CGIAR Research Program on Climate Change, Agriculture and Food Security (CCAFS) collaborated on research to organize farmers using diesel pumps in Dhundi village (Gujarat, India) into the world's first solar irrigation cooperative – Dhundi Solar Energy Producers' Cooperative Society (6). Nine farmers acquired solar irrigation pumps. They were connected through a micro-grid and offered an option to sell surplus solar power to the electricity utility under a 25-year agreement. The assumption was that the model would [a] introduce clean energy; [b] build climate resilience by offering farmers an additional source of income; [c] improve the utility's financial sustainability; and [d] incentivize farmers to use energy and groundwater judiciously (2-4).

As the pilot became operational and started delivering results (7), it received a lot of media and policy attention. ITP started receiving requests to replicate the cooperative in other locations. The National Dairy Development Board (NDDB) extended the pilot to a nearby village and included it in its "model village" design.

Assisted by ITP, the Government of Gujarat drafted and launched a USD 120 million program to implement the model (8). a new solar policy to scale the model across the state. Farmers will continue to be guaranteed 12 hours of grid electricity and receive substantial subsidies to purchase solar pumps. For 25 years, they will be able to sell surplus power to the grid to pay off their pump loans and subsequently continue selling power at a profitable rate. The Gujarat Government estimates sale of surplus energy will double the income of small and marginal farmers covered under the scheme.

Nationally, the Solar Power as Remunerative Crop (SPaRC) model is now one of three components in the Government of India's KUSUM (Farmer Energy Security and Development Mission, <https://kusum.online/home/>) scheme, announced in Feb 2018. Total investment is estimated at USD 16.4 billion, of which the central government will invest a 30% capital subsidy. Some seven states are now testing the model.

In Dhundi, farmers using diesel pumps shifted to solar pumps. Under KUSUM, currently subsidized electric feeders will be solarized: farmers will lose the subsidies but be able to sell surplus electricity to the utility. The water price will be closer to the scarcity value of water, which should incentivize more efficient use of water.

ITP, WLE and Swiss Development Cooperation (SDC) are supporting the implementation of this model (5). Over 980 farmers have already been shifted from subsidized connections to grid-connected solar pumps in 2018. The Gujarat Government estimates sale of surplus energy will double the income of small and marginal farmers covered under the scheme.

References cited:

Publications

1. Shah, T. 2018. Kick-starting the Kisan Urja Suraksha evam Utthaan Mahabhiyan. *Economic and Political Weekly*, 53 (34), pp. 13-16.
<https://www.epw.in/journal/2018/34/commentary/kick-starting-kisan-urja-suraksha-evam.html>.
2. Shah, T.; Durga, N.; Rai, G.P.; Verma, S.; Rathod, R. 2017. Promoting Solar Power as a Remunerative Crop. *Economic and Political Weekly*, 52 (45), pp. 14-19.
<https://www.epw.in/journal/2017/45/commentary/promoting-solar-power-remunerative-crop.html>.
3. Shah, T.; Rajan, A.; Rai, G.P.; Verma, S.; Durga, N. 2018. Solar Pumps and South Asia's Energy-Groundwater Nexus: Exploring implications and reimagining its future. *Environmental Research Letters*. <https://doi.org/10.1088/1748-9326/aae53f>
4. Verma, S.; Durga, N.; Shah, T. 2019. Solar Irrigation Pumps and India's Energy-Irrigation Nexus. *Economic and Political Weekly*, 54 (2), pp. 62-65.
<https://www.epw.in/journal/2019/2/discussion/solar-irrigation-pumps-and-indias-energy.html>.
5. Verma, S.; Kashyap, D.; Shah, T.; Cretazz, M.; Sikka, A. 2018. SoLAR: Solar Irrigation for Agriculture Resilience: A new SDC-IWMI Regional Partnership. SDC-IWMI Discussion Paper. Available at <https://drive.google.com/open?id=1vdj9DU6TW0YcG8Exhxmu6hGZCgeRoo6s>
6. WLE. 2017. CGIAR Research Program on Water, Land and Ecosystems: Annual Report for 2016. IWMI. <https://cgispace.cgiar.org/handle/10568/89302>.
7. DSUUSM. 2018. Tri-Annual Progress Report, 2015-18. Dhundi Solar Energy Producers' Cooperative Society. Dhundi village, Thasra Taluka, Kheda District, Gujarat: Dhundi Saur Urja Utpadak Sahkari Mandali (DSUUSM). Available at <https://drive.google.com/open?id=11gU63CZAUgach2yJWqy2SkRyrjgkBsg>
8. Mondal, M. 2018. Farmers' New Crop: Electricity Surya Shakti Kisan Yojana. <https://krishijagran.com/news/farmers-new-crop-electricity-surya-shakti-kisan-yojana/>.

Brochure

9. Shah, T., Durga, N., Verma, S., Rai, G.P. and Rathod, R. (2018). The Promise of Dhundi Solar Pump Irrigators' Cooperative. Anand: IWMI-Tata Water Policy Program. Available at https://drive.google.com/open?id=1D0Mr293ZAqveOYnPfD_jYhBLk_xu6Eo3

Videos:

1. SPaRC'ing a Revolution
<https://www.youtube.com/watch?v=CKy7Yrhi2W0>
2. The Promise of Dhundi Solar Pump Irrigators' Cooperative
<https://www.youtube.com/watch?v=SneJ3plzz5I>
3. Solar Energy, a Cash Crop for Gujarat Farmers
<https://www.youtube.com/watch?v=1maUZs3SbcI>

Quantification: <Not Defined>

Gender, Youth, Capacity Development and Climate Change:

Gender relevance: 0 - Not Targeted

Youth relevance: 0 - Not Targeted

CapDev relevance: 0 - Not Targeted

Climate Change relevance: 2 - Principal

Describe main achievements with specific **Climate Change** relevance: The pilot study was initiated as a collaboration between WLE and CCAFS. The new government program involves high subsidies of solar power. In the long term this will contribute significantly to reducing Indian carbon emissions.

Other cross-cutting dimensions: <Not Defined>

Other cross-cutting dimensions description: As this solar irrigation model is scaled out, it will contribute to three CGIAR Global Challenges: living within planetary boundaries, sustaining food availability, and creating jobs and growth. Switching diesel to solar pumps will significantly decrease greenhouse emissions, as will switching from coal to solar power generation. Selling surplus power may incentivize farmers to pump less water, reducing pressure on aquifers. More food will be produced, and an entire new industry of selling and servicing solar photovoltaic irrigation pumps will create new jobs and help grow the economy.

Outcome Impact Case Report link: [Study #2792](#)

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