



Worth Their Salt

Building Skills and Improving Livelihoods of Women Salt Farmers in Gujarat through Clean Energy Solutions

The Little Rann of Kutch (LRK) in Gujarat, India's westernmost state, produces nearly 76 percent of the nation's salt. The Self-Employed Women's Association (SEWA) and the Natural Resources Defense Council (NRDC) partnered together with women "*agariyas*" or salt farmers to transition salt production away from expensive and polluting diesel and toward more efficient, solar and solar-hybrid water pumps. The project involved creating a robust *agariyas* training program to build the skills needed to operate the solar water pumps and developing the business case for scaling the use of solar pumps for salt farming.

Clean Livelihoods in Perspective

43,000 Families

Agariya Families in the LRK

94%

Annual income increase by switching from diesel to hybrid solar-diesel pumps

3,000+

Agariyas trained

115,000 metric tons

CO₂ emissions saved/year if 50% families use solar pumps & 50% use solar/diesel hybrid



FIGURE 1 Bhavnaben Koli, Salt Farmer and SEWA Member, Photo Credit: Madhura Joshi, NRDC

Earlier we stayed in a *kutchha* house and we didn't have money to repair it. But thanks to SEWA-NRDC, we have benefitted a lot from solar. It helped me send my three children to a private school. The elder son and daughter cleared high-school and are now enrolled in college (under-graduate courses). I feel that the solar (pumps) should spread to everyone in the country so that they can profit from the golden sun."

— Bhavnaben Koli, Kuda village, Dhanghadhra, Gujarat, a SEWA member of several years is a third-generation salt farmer, owner of three solar pumps



Key Findings



Annual Income Increases: By shifting to a hybrid system based on solar and diesel, purchased on loans, *agariyas* can increase their annual salt production and reduce, even eliminate, expenditure on diesel. Their annual net income can increase to ₹35,000 (~ \$538)⁹ per saltpan – 94 percent more than using diesel pumps; once the equipment loan is fully paid off, annual net income can increase to ₹80,000 (~ \$1,280).



Training Programs: SEWA's focus on developing the necessary skills for the solar pumps has played a critical role in expanding the use of clean energy for salt-farming. SEWA launched a three-part training program: 1) create a core group of “master trainers” to support the women *agariyas*, who can answer on-the-ground questions about technical installation, operation, and maintenance of the solar panels and pumps; 2) master trainers instruct groups of women *agariyas* and their families in the use and maintenance of solar panels and pumps, training over 3,000 *agariyas* to date; 3) women *agariyas* have access to subject-specific training modules throughout the year, in addition to informational posters, videos, and pamphlets.



Increasing Financing: A lack of access to affordable, widely available institutional credit is major barrier in scaling off-grid renewable energy applications amongst low-income households. But replicable innovative financial solutions helped women *agariyas* access credit and scale the project to more than 1,700 solar-powered pumps in the LRK by January 2019, and on track to reach over 15,000 pumps.



Economic Growth: Women *agariyas* use the additional income to pay for their children's education and pursue additional income-generating activities such as running small flour mills and raising cattle; this has ensured asset building and ownership, financial inclusion, and improved social recognition of women as bread winners.



Health and Pollution Benefits: Solar pumps also result in health benefits by reducing *agariyas*' exposure to harmful diesel pollution; SEWA-NRDC analysis show that reducing the diesel consumption for half of the 43,000 *agariya* families in the LRK through solar-diesel hybrid pumps and the other half through only solar-only pumps can avoid up to 115,000 metric tons of carbon dioxide (CO₂) emissions per year.



FIGURE 2 Agariya women and their families at work in the LRK. Intensive manual raking of the drying salt is needed to ensure smaller salt crystals. As the salt is formed and ready, the agariyas pile it up on the side of the pan to transport to the buyer.

Photo Credit Bottom Right: Wikimedia Commons; Rest: Bhaskar Deol and Neh, NRDC

The Little Rann of Kutch is a remote desert area of more than 3,000 square kilometers in Gujarat, India's westernmost state. Each year during the monsoon season (June through August) this area is submerged under seawater that floods in. Once the water recedes, *agariyas* move in to build squared-off sections out of the marshes, dig wells, pump out the brackish salt water (brine) from these wells, and harvest salt (Figure 2). Traditionally, each salt pan produces over 600 metric tons of salt annually.

SEWA in The Little Rann of Kutch


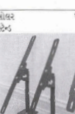
SEWA's engagement in the LRK started in 1992. SEWA organized the women *agariya* workers to educate them on nutrition and child care. Gradually, this engagement expanded into other areas such as savings groups or *bachat committees*, skills training and leadership enhancement sessions, and livelihood generation activities. Today, around 15,000 *agariya* women workers are members of SEWA.

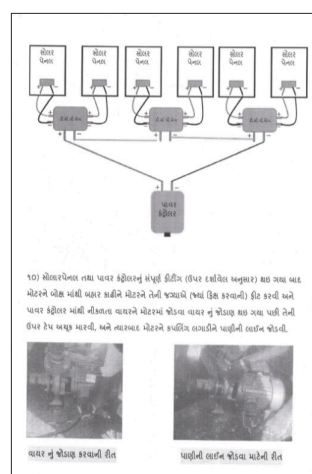


To reduce the costs of brine water extraction, SEWA's women *agariya* members mobilized to find alternatives. SEWA analyzed renewable energy technologies, including off-grid applications, and zeroed in on solar and solar-hybrid pumps as the most viable alternative to diesel-based salt production. What started as a technical test-case of 14 solar and solar-diesel hybrid pumps in 2013 has scaled to over 1,700 pumps by January 2019, with a goal to further expand to 15,000 pumps in the coming years.³

To shift to clean energy, SEWA focuses on developing the technical skills required for the installation, operation, and maintenance of the solar panels and pumps. The training program laid the groundwork for long-term success by building the skills needed for implementation, providing a route to future financing, as well as creating an organic information sharing and support network of SEWA's *agariya* women members that worked toward the success of the solar-pump project.

Technical Master Trainers. The first part of the program involved developing a core master trainer group, directly responsible for the functioning of the pumps. There are 10 master-trainers in total. Each master trainer covers 100 to 150 of SEWA's *agariya* families and is the first point of contact for any questions or issues these members may face with their pumps. The master trainers are responsible for ensuring the solar panels and pumps are installed and uninstalled correctly, and function well. Over 3,000 *agariyas* have been trained through these programs so far.

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Agariya Training Programs. In the second part of the training program, the master trainers pass their knowledge and expertise onto SEWA's women *agariya* members. These periodic training programs cover maintaining the solar panels and pumps and increasing



FIGURE 5 SEWA Training Meeting, Photo Credit: Nehmat Kaur, NRDC

the quantity and quantity of salt produced. One master trainer conducts multiple trainings in a year, training around 500 people. Each training session includes between 25 to 30 *agariyas*. SEWA's each woman *agariya* member and their families receive training three times a year (pre-, during-, and post-salt farming season) for about four years.

Training Modules and Posters. As a third element of the program, SEWA has developed different training modules intended for various levels of technical expertise. They have also developed several informational posters, videos, and pamphlets which are shared periodically throughout the year. In addition, SEWA also offers special training in members' areas of interest such as language lessons and organic farming.

Regular technical and financial training modules are also coupled with leadership and soft-skills sessions during SEWA's *bachat* committee (savings-group)

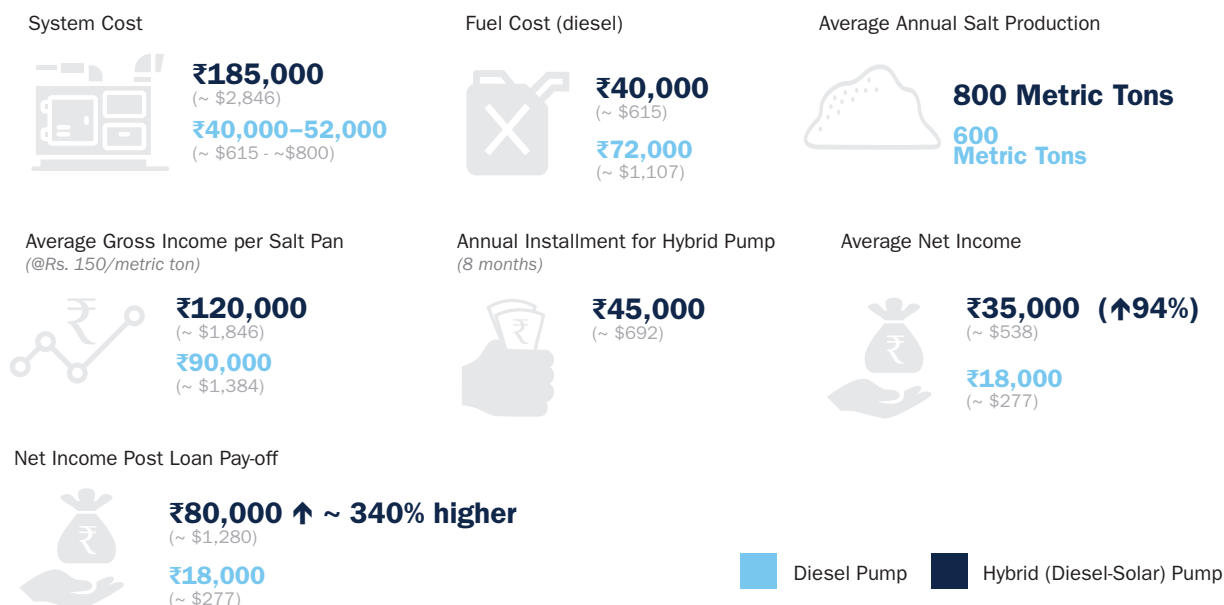
sessions. In *bachat* committee sessions, women are encouraged to speak up and speak out. In addition, the village team leaders encourage their group to think about ways to collectively work towards enhancing their livelihoods and exploring new financial opportunities. The desire of SEWA's *agariya* members to explore solutions which helped reduce diesel expenses, increase production, and improve income was first articulated in *bachat* committee discussions.

These village groups support women *agariyas* in fulfilling their ambitions and addressing their problems. Through its strong grassroots mobilization, systematic engagement, and periodic and continuous training SEWA has helped improve the financial literacy and awareness of its members.

Securing Financing to Shift to Clean Energy

SEWA and NRDC partnered in 2014 to build a compelling business case to bring solar energy to the salt flats in consultation with the *agariyas*. The first set of 200 solar pumps were provided to the pilot by Sun Edison at zero-cost vendor financing. SEWA loaned the pumps to its members on five-year, zero-interest installment plans. To avoid burdening the farmers, the installments were seasonal, i.e. payable during the salt-production season. These loans were affordable because of the money the salt-farmers saved on diesel, which effectively meant that the pumps paid for themselves by the end of the five-year period. The old diesel pumps were expensive to run – in addition to fuel costs, the pumps would require frequent repairs and trips to bring diesel from afar resulting in several breaks in the salt farming process. The use of more efficient hybrid

Comparison of Estimated Impact on Net Income



Figures based on reported expenditure and income figures by salt farmers, and NRDC calculations Source: SEWA-NRDC calculations 2016.



FIGURE 6 Solar Panels Used for a Water-Pump, Photo Credit: Anjali Jaiswal, NRDC

pumps led to an increase in the salt-out per pan – from around 600 metric tons per pan to 800 metric tons.

SEWA-NRDC analysis showed that the payback period for *agariyas* switching to hybrid solar-diesel pumps can be as low as 38 months, assuming a 12 percent interest rate. By using a solar-diesel hybrid system purchased with loans, *agariyas* can increase their annual net income to ₹35,000 (~\$538) per saltpan, which is 94 percent more than using a diesel pump. Once the equipment loan is fully paid off, annual income can increase to ₹80,000 (~\$1,230).

NRDC and SEWA also worked with MNRE to include solar water pumps in MNRE's capital subsidy scheme intended for agriculture irrigation pumps.⁴ This further lowered the costs for the salt farmers. In order to receive subsidies and qualify for loans to purchase of solar pumps, SEWA's financial literacy program helped *agariya* women understand the basic eligibility criteria for financial access and assisted them in organizing "Know Your Customer" documents.

The successful implementation and payback of loans allowed the project to expand. The International Finance Corporation (IFC) helped create a blended financing architecture⁵ that made credit affordable for buying solar pumps. This in turn allowed commercial banks such as Yes Bank and the Bank of Baroda (BoB) to expand their lending to *agariyas*. In 2017, SEWA and BoB signed a Memorandum of Understanding where BoB will extend loans for 15,000 more solar pumps. In addition, the Government of Gujarat announced 80 percent subsidies on solar water pumps for salt farming in 2017.⁶ The solar pump project offers innovative real-world financing models to take similar programs to scale.⁷

Using Skills to Improve Lives: Economic and Health Benefits

Increased income through the pilot program helped *agariya* women support their children's education and pursue additional income-generating activities such as running small flour mills and raising cattle. This has ensured asset building and ownership, financial inclusion, and improved social recognition of women as bread winners and decision-makers. The various financial, technical and personal skill enhancement trainings, the success of the solar project, and the gradual improvements in their living conditions has also



FIGURE 7 Flour-Mill; Photo Credit: Madhura Joshi, NRDC

helped them gain confidence in their entrepreneurial abilities. It has led to a greater sense of pride in their sustainable traditional skills and clean energy choice.

The use of solar and solar-diesel pumps has also resulted in health benefits by reducing exposure of *agariyas* to harmful diesel pollution. Additionally, transitioning away from diesel-only pumps has demonstrably positive environmental impacts. NRDC-SEWA estimates that reducing diesel consumption for half of 43,000 *agariya* families in the LRK through solar-diesel hybrid pumps and the other half through solar-only pumps can avoid up to 115,000 metric tons of carbon dioxide (CO₂) emissions per year.

The project offers lessons for the expansion of other off-grid projects. For instance, in 2017 around 8 million irrigation pumps powered by diesel, and another

12 million pumps powered by heavily subsidized grid electricity, were in use.⁸ The solar intervention in the LRK demonstrated that diesel pumps can be economically replaced by solar-powered versions with the help of targeted financial solutions.

Several beneficial outcomes have made this project a success: clean energy access for productive use, economic benefits for the household, positive social impacts, beneficial health impacts, and environmental gains through avoided CO₂ emissions. But these benefits reveal only part of what the solar initiative in the LRK has achieved. SEWA's extensive focus on skill development, which helped create the requisite support eco-system, is the other equally important part of the success story.

“If we were using diesel instead of solar, we would have to spend a lot of money which was literally being burnt to smoke. Instead, we prefer making better use of the money by paying installments for owning the solar pumps – no smoke, more savings, better health, and better life.”

- Gauriben Saapra, Enjar village, Dhanghadhra, Gujarat, uses solar-only pumps for salt production. She has four solar pumps operating on her two salt pans.



FIGURE 8 Gauriben Saapra, Salt Farmer and SEWA Member, Photo Credit: Madhura Joshi, NRDC

Endnotes

- 1 Sustainable Energy for All (SE4ALL). 2015. *Solar Pumps Help Indian Women Salt Workers Escape from Poverty*, January 29. Available at: https://www.se-forall.org/2015_01_29_solar-pumps-help-indian-women-salt-workers-escape-poverty
- 2 The *agariyas* are classified as an economically and socially backward tribe. Government of Gujarat. 2015. *Human Development Report – Surendranagar*. Available at: http://www.in.undp.org/content/dam/india/docs/human-development/District%20HDRs/7.%20Surendranagar_DHDR_September%202015.pdf
- 3 See the companion factsheet SEWA and NRDC, *Worth Their Salt: Improving Livelihoods of Women Salt-Farmers Through Clean Energy in the Salt Pans of Gujarat*, September 2018, for more details.
- 4 MNRE subsidy schemes routed through solar were discontinued in 2017. NABARD. n.d. *Solar Schemes* available at: <https://www.nabard.org/content1.aspx?id=596&catid=23&mid=>
- 5 Blended Finance is defined by Organization for Economic Co-operation and Development (OECD) as the strategic use of development finance (such as grants, donor funds, and government subsidies) for the mobilization of additional finance towards sustainable development in developing countries. These blended structures can have a substantial impact by shifting the investment risk-return profile for private investors by using flexible capital and favorable terms. OECD. 2018. *Blended Finance Principles for Unlocking Commercial Finance for the Sustainable Development Goals*. Available at: <https://www.oecd.org/dac/financing-sustainable-development/development-finance-topics/OECD-Blended-Finance-Principles.pdf>
- 6 Parikh, Niyati. 2018. Women show solar power is worth its salt. *Times of India*, March 9. Available at: <https://timesofindia.indiatimes.com/city/ahmedabad/women-show-solar-power-is-worth-its-salt/articleshow/63224681.cms>
- 7 See companion factsheet SEWA and NRDC, *Worth Their Salt: Improving Livelihoods of Women Salt-Farmers Through Clean Energy in the Salt Pans of Gujarat*, September 2018, for more details.
- 8 Bloomberg New Energy Finance (BNEF). 2017. *Accelerating India's Clean Energy Transition*. Available at: https://data.bloomberglp.com/bnef/sites/14/2017/11/BNEF_Accelerating-Indias-Clean-Energy-Transition_Nov-2017.pdf
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HIGHLIGHTED REPORTS



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https://www.nrdc.org/sites/default/files/worth-their-salt-improving-livelihoods-of-women-salt-farmers-through-clean-energy-in-the-salt-pans-of-gujarat_2018-09-10.pdf



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HIGHLIGHTED BLOGS

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Accelerating Clean Energy for All in India, Sameer Kwatra, August 2017
<https://www.nrdc.org/experts/sameer-kwatra/accelerating-clean-energy-all-india>

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<https://www.nrdc.org/experts/anjali-jaiswal/will-indias-first-renewable-energy-financing-summit-deliver-solutions-improve>

Self Employed Women's Association (SEWA) is a member-based organization of poor, self-employed women workers in India. SEWA is spread across 14 states of India with deep penetration at grassroots level in villages. SEWA also works in Afghanistan, Nepal, Sri Lanka, and Myanmar. SEWA has membership reach of 1.7 million globally. SEWA organizes the women into self-help groups and cooperatives based on their respective trades and then channelizes information, awareness, health interventions, trainings for skill development, financial support (e.g. savings, insurance, credit, and pension), and market linkages to enable members to become self-sustainable in their trades, including salt production. SEWA's twin goals are "Full Employment" and "Self-Reliance." "Full employment" includes work security, income security, food security and social security (at least healthcare, childcare, nutrition, shelter) whereas "self-reliance" means making members autonomous economically and in decision-making. For more information, visit www.sewa.org.

Natural Resources Defense Council (NRDC) is an international non-profit environmental organization with more than 1.4 million members and online activists. Since 1970, our lawyers, scientists, and other environmental specialists have worked to protect the world's natural resources, public health, and the environment. NRDC's India Initiative on Climate Change and Clean Energy, launched in 2009, works with partners in India to help build a low-carbon, sustainable economy. For more information, visit www.nrdc.org.



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