



Global Energy Alliance
for people and planet

The power of energy for better farming

In India, solar powered irrigation and innovative digital tools improve the lives of more than a million farmers and their communities



We have contributed to:



670,000
new solar connections



530,000
solar irrigation pumps installed



1 million
farmers reached



\$1.2 billion
financing unlocked



At a glance

- Project: Agri-solarization, Rajasthan
- Location: Rajasthan, India
- Duration: 2023-ongoing

Objective

To accelerate a government initiative to expand solar energy in Rajasthan, northwestern India, replacing diesel-powered irrigation, improving farmers’ lives and bringing reliable power to local communities.

Outcome and pathway to scale

Global Energy Alliance’s digital innovations and a farmer education program enabled the Government of Rajasthan to rapidly scale up its agri-solarization initiative, installing more than 530,000 new solar-powered irrigation pumps and reaching more than a million farmers with clean energy. Beyond farms, the program enabled more than 670,000 new solar connections in local communities, delivering more reliable power to 20 million people. The program’s success unlocked \$1.2 billion in existing subsidies, accelerated agri-solarization in two additional states and established a pipeline of seven more states, to reach more than 12 million farmers. The work is now set to expand internationally, beginning with Nigeria.

When Nirmal Das Swami looks across his farmland in Sawarda, a village in the north-western Indian state of Rajasthan, he sees more than just lines of crops. Rows of gleaming solar panels power the irrigation system, as well as those of his neighbors’ farms, businesses and the local school.

“The farmers in the area are now getting reliable access to electricity during the day,” he said. Previously, an irregular supply of electricity – often only available at night – forced them to rely on diesel generators or to work erratic hours to irrigate their fields.

Rajasthan is India’s largest state by area, but amongst the smallest by population. Home to 86 million mostly rural people, more than one in 10 residents are farmers, many working plots of five acres or less. The state is the largest producer of bajra (pearl millet) in India, alongside crops such as wheat, barley and oilseeds.

In a region that is prone to severe water shortages, insecure electricity supply often leads farmers to leave irrigators running overnight risking over-watering, or to rely on expensive diesel-powered water pumps for irrigation.

For more than a decade, the Indian government has pursued irrigation programs to improve the prospects of rural populations. In March 2019, the Ministry of New and Renewable Energy launched a program called PM-KUSUM (Pradhan Mantri Kisan Urja Suraksha evam Utthaan Mahabhiyan) to support farmers with access to timely irrigation through reliable clean electricity.

Working with three Rajasthan utilities, the program provides subsidies to farmers to incentivize the installation of grid-connected solar plants near rural substations.

The scheme is designed to benefit multiple stakeholders. Farmers and developers who install the plants receive a subsidy of 30 percent of the cost of installation and are also able to sell power back to the utility at a regulator-approved rate. Utilities then have access to cheaper, cleaner energy and nearby communities receive more consistent power.

The government’s program was ambitious in scope and design. But implementation proved a challenge. In some cases, farmers didn’t have enough information about — or even awareness of — the program. Many of their plots were also too small or fragmented to support the 5-10-acre sites needed to build solar plants. And while the government was proactive at getting the program under way, utilities didn’t have a way to track progress, making monitoring and evaluation a challenge.

Farming by sunlight: farmer Nirmal Das Swami surveys his solar arrays in Sawarda, Rajasthan. Photo: Global Energy Alliance





With solar power, overwatering or underwatering becomes a thing of the past.
Photo: Global Energy Alliance

The promise of solar irrigation

India is rapidly emerging as a global leader in climate and clean energy. The country aims to generate 60 percent of its homegrown electricity from renewables by 2035, and reach net-zero carbon emissions by 2070. As the [country's third largest consumer of energy](#), agriculture plays a critical role in achieving these ambitious goals.

Rajasthan is a key part of the effort. The state aims to install 17GW of renewable energy capacity — enough to power more than 3 million agricultural pumps — through initiatives that directly target irrigation.

“Rajasthan stands at the forefront of India’s renewable energy revolution,” said India’s Union Minister for New and Renewable Energy, Shri Pralhad Joshi, in late 2024.

The benefits of solar irrigation are many. With reliable day-time power supply, farmers can decide when to irrigate and the type of irrigation to use. Where previously they may have had to keep their pumps running overnight to take advantage of erratic supply, reliable power enables more controlled drip irrigation, sprinkler irrigation and other water-efficient methods.



Rajasthan stands at the forefront of India’s renewable energy revolution”

– Shri Pralhad Joshi, India’s Union Minister for New and Renewable Energy

Overwatering or underwatering becomes a thing of the past. Production costs fall, productivity rises and crop diversification becomes possible.

Increased productivity allows farmers to spend less time in the fields, especially at night when work can be both more difficult and more dangerous, particularly for women who make up half of India’s agricultural workforce. With more time on their hands, farmers can pursue other income-generating work, spend more time with families or simply rest.

How technology unlocked the solar irrigation scheme

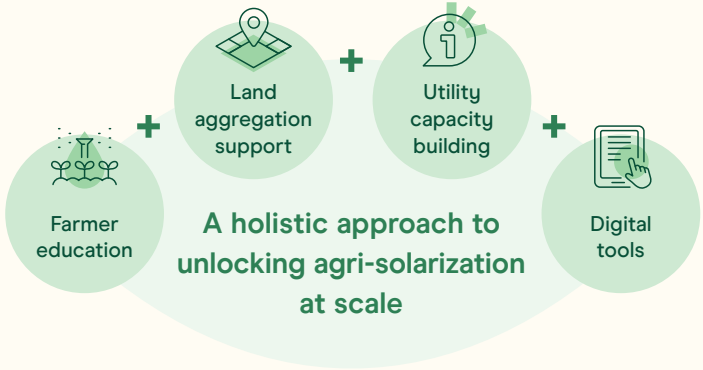
The government of Rajasthan approached Global Energy Alliance in 2023 for support with scaling the solar irrigation program and addressing implementation bottlenecks.

The first challenge was to help farmers understand and engage with the program. Global Energy Alliance staff embarked on an extensive education outreach, visiting farmers to explain the program and facilitating meetings with those who were already participating.

“Meeting farmers in their own communities was pivotal to getting this program off the ground,” said Global Energy Alliance’s managing director in India, Samit Mitra. “The personal outreach, and the opportunity to ask questions and problem solve – that was the difference between them engaging with the program and not.”

With many farmers working parcels of land smaller than five acres it was critical to help them understand how they could participate, and equip them to do so. A digital project management tool that Global Energy Alliance had built for its own use provided the crucial breakthrough.

Developers repurposed the tool to create a digital portal that allowed farmers to register their land via an app at a predetermined lease rate. Utilities then used the portal to verify land titles and bundle contiguous plots into larger parcels approved for development. Solar developers were then able to find suitable aggregated sites on the app and bid on them.



Next, Global Energy Alliance looked at how utilities could effectively monitor and track the projects. In partnership with the utility Jaipur Vidyut Vitran Nigam Limited (JVVNL), we developed a second, complementary digital tool designed specifically to help utilities track their project pipeline in real time. A contract monitoring system allowed officials to assess progress, address setbacks and improve service delivery across installations. Each project was tracked from tender to commissioning, aggregating data on capacity, timelines and other milestones.

Other easy-to-use tools, and a rigorous training program, helped utilities streamline and automate billing, metering and lease payments.

“The system gives us each and every step where the project is, even the time,” said Deepti Mathur, Superintendent Engineer with JVVNL. “It tells us whether we are meeting our deadlines and that helps us plan ahead accordingly. We would never be able to take these projects forward [without it].”



Global Energy Alliance visited more than 1,000 farmers across 50 communities to increase awareness of the agri-solarization program.
Photo: Global Energy Alliance

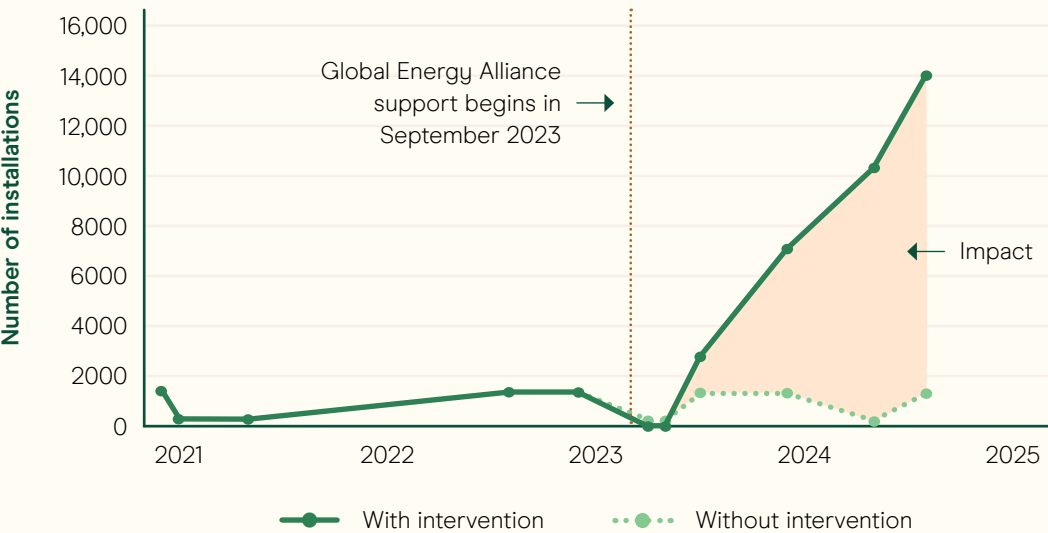


Our contribution, Rajasthan and beyond

Since Global Energy Alliance began working with its partners on PM-KUSUM in 2023, Rajasthan has added 2.67GW of solar capacity from more than 1,200 solar plants. At the end of 2025, an additional 2,500 solar plants were in the pipeline. To date, more than 530,000 solar-powered irrigation pumps have been installed, supporting more than a million farmers.

External analysis offers a striking snapshot of the impact of Global Energy Alliance’s work. Between September 2023 and February 2025, an additional 13,000 solar pump installations were enabled in Rajasthan thanks to land aggregation and the new tools.

A striking snapshot of impact



- Notes**
1. Estimated impact on acceleration of PM-KUSUM in Rajasthan (June 2021–Feb. 2025) as a result of Global Energy Alliance and partners using interrupted time series analysis. Predicted values (solid lines) are compared with counterfactual trends (dashed lines);
 2. Data source: Open government data platform India (2021), Press Information bureau and Parliamentary Question annexes (for 2023-2025)



Reliable energy is helping farmers improve productivity while building more resilient rural livelihoods.
Photo: Global Energy Alliance



Rajasthan solar by the numbers*



65% of people said electricity bills were lower



>50% of farmers experienced higher crop yields



80% said electric appliances saved them time on household chores

*Data gathered in an independent survey of 250 families (Source: Sambodhi)



All of our electricity-related problems have been resolved”

– Anna Yadav, teacher

Back in the Rajasthani village of Sawarda, life has transformed. Since gaining solar power, local businesses are booming, and not just for the farmers. Signs of reverse migration are visible; people who had moved away are returning to open new businesses. Shops are trading two to three hours longer per day.

In his welding shop, Saleem Khan is happy. Thanks to reliable power, he works whenever he wants to – not just when electricity dictates. Productivity has doubled. “Business is doing well,” he said.

Dependable lighting means children can study for longer uninterrupted hours in the evenings. Families rely less on dirty and unhealthy kerosene lamps.

“All our electricity-related problems have been resolved,” said Anna Yadav, a teacher in Sawarda. “Farming has improved, children no longer face challenges while studying.”



Local carpenter who recieves electricity from the solar plant in Rajasthan.
Photo: Global Energy Alliance



Thanks to the new digital tools and the pre-approved sites, developers have become more confident to invest. This has accelerated the PM-KUSUM program and has unlocked \$1.2 billion in investment, including \$270 million from central and state government sources, along with investments from farmers, banks and private developers financing solar irrigation pumps and solar installations.

The states of Maharashtra and Odisha have already adopted the digital tool and the utility in Bihar has submitted a proposal to work with Global Energy Alliance. Early discussions are underway with six more states, with the potential to reach more than 12 million farmers by 2030. A similar program is under consideration to support farmers in Nigeria.

Farmers report enormous benefits. Solar power has unleashed an average of **five additional hours of electricity** every day. Farmers can plan better, watering is more timely and growing cycles are longer, opening the door to higher returns and more resilient incomes. Many farmers are now diversifying beyond traditional staple crops to grow more profitable fruits and vegetables, such as watermelon, onion, okra and spinach.

Public and private partners

Government of India, Rajasthan Energy Department, Jaipur Vidyut Vitran Nigam Limited (JVVNL), Ajmer, Jodhpur Vidyut Vitran Nigam Limited, MAHAGENCO, TPCODL, TPWODL, TPSODL, TPNODL,

GRIDCO, OREDA, North Bihar Power Distribution Company Ltd (NBPDC), South Bihar Power Distribution Company Ltd (SBPDCL)

About Global Energy Alliance for People and Planet

Global Energy Alliance for People and Planet is a global nonprofit that builds public, private and philanthropic partnerships to accelerate clean energy and economic opportunity. Founded in 2021 by The Rockefeller Foundation, IKEA Foundation and Bezos Earth Fund, we build the technical, financial and institutional foundations that make clean energy investable and scalable across emerging economies.

Our work is anchored in two mutually reinforcing global pillars. **Grids of the Future** strengthens energy supply through AI-enabled, renewables-ready power grids. **Powering Opportunity** builds demand, helping people harness clean energy to power businesses, create jobs and drive economic growth. Through these pillars we work toward our vision: a world where everyone has clean electricity and the means to use it to improve their lives.



Solar-powered agriculture is strengthening rural communities in Sawarda, creating opportunities for women, farmers and local businesses to thrive together.

Photo: Global Energy Alliance

Published July 2026



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