

LEADS DEVELOPMENT MODEL

Sustainable Livelihood Promotion Initiative

MODEL : Solar Irrigation Model

Background

Jharkhand falls under Agro-Climatic Zone VII and receives an average annual rainfall of 1,100–1,300 mm. Agriculture is the main source of livelihood for most rural households. However, only a small portion of cultivable land has access to assured irrigation. As a result, farming depends largely on monsoon rainfall, limiting cultivation to a single crop in many areas. During the Rabi and summer seasons, farmers often leave their land uncultivated due to the lack of irrigation. This leads to low agricultural productivity, reduced household income, and seasonal migration in search of employment.

With more than 300 sunny days each year, Jharkhand has excellent potential for solar-powered irrigation. Solar irrigation provides farmers with a reliable, affordable, and clean source of water, enabling them to cultivate crops throughout the year. It also reduces dependence on diesel pumps and unreliable electricity while promoting sustainable farming practices. Recognising this opportunity, LEADS has been promoting Solar-Based Irrigation Models through convergence with government schemes, CSR initiatives, and development partners. The model helps small and marginal farmers improve agricultural productivity, strengthen climate resilience, increase household income, and reduce seasonal migration.



Concept

The Solar-Based Irrigation Model is a sustainable livelihood intervention that provides small and marginal farmers with reliable, affordable, and clean irrigation through solar-powered pumping systems. The model encourages the efficient use of surface water sources such as rivers, streams, ponds, check dams, irrigation wells, and water harvesting structures like Dobhas.

This reduces dependence on groundwater, diesel pumps, and unreliable electricity.



To meet different irrigation needs, LEADS has developed three types of solar irrigation systems:

- 1 HP Portable Solar Irrigation System – Suitable for small vegetable growers and marginal farmers.
- 2 HP and 3 HP Solar Irrigation Systems – Designed for medium-sized farms.
- 5 HP Solar Irrigation System – Suitable for larger farms and community irrigation.

Through convergence with government schemes, CSR initiatives, and development partners, the model promotes equitable access to irrigation, community participation, sustainable agriculture, and improved rural livelihoods.

Steps of Implementation

Step 1: Beneficiary Selection: Small and marginal farmers or farmer groups are selected based on landholding size, availability of surface water sources, irrigation needs, and willingness to adopt solar irrigation.

Step 2: Site Assessment and Technical Survey: A technical survey is conducted to identify suitable surface water sources such as rivers, streams, ponds, check dams, irrigation wells, and Dobhas. Based on the water availability and irrigation requirement, the appropriate pump capacity (1 HP, 2/3 HP, or 5 HP) is selected.

Step 3: System Installation: Solar panels, pumps, controllers, mounting structures, delivery pipelines, and other accessories are installed according to technical standards. The system is connected to the selected water source to supply water to farmers' fields.

Step 4: Water Distribution System: HDPE/PVC pipelines are laid to convey water efficiently from the source to farmers' fields. Water-saving irrigation practices are promoted wherever feasible to maximise water-use efficiency.

Step 5: Capacity Building: Farmers are trained on system operation, routine maintenance, efficient water management, and crop planning for sustainable utilisation of the irrigation system.

Step 6: Community Management: For community irrigation systems, Water User Groups are formed to manage water distribution, operation, maintenance, and equitable sharing of irrigation facilities. The members are encouraged to make a small regular contribution to a common maintenance fund, which is managed by the group and utilised for future repair, maintenance, and replacement of system components, ensuring long-term sustainability of the irrigation asset.

Step 7: Crop Planning: Farmers are encouraged to cultivate vegetables, cereals, pulses, oilseeds, and horticultural crops throughout the year, increasing cropping intensity and farm income.

Step 8: Monitoring and Sustainability: Regular monitoring, preventive maintenance, and community ownership ensure the long-term functionality and sustainability of the solar irrigation systems.



Outcome for Sustainability

1. More than 5,000 farmers have access to assured irrigation, enabling them to cultivate two to three crops annually and significantly improve agricultural productivity.
2. More than 7,500 acres of agricultural land have been brought under assured irrigation through the LEADS Solar-Based Irrigation Model and convergence with government schemes.
3. Dependence on diesel pumps and unreliable electricity has reduced significantly, lowering irrigation costs and reducing carbon emissions.
4. Efficient use of surface water sources promotes sustainable water management and strengthens climate-resilient agriculture.
5. Farmers have diversified into vegetables, horticulture, and other high-value crops, resulting in higher household income and improved nutritional security.
6. Community-managed irrigation systems, supported by Water User Groups and a common maintenance fund, ensure timely repairs and long-term sustainability of the irrigation assets.

7. Increased farm productivity and year-round livelihood opportunities have reduced seasonal migration and improved the socio-economic condition of rural households.

LEADS Experience

LEADS has successfully promoted the Solar-Based Irrigation Model across Jharkhand with support from government departments, CSR partners, and development agencies. So far, the organisation has established 30 Solar-Based Irrigation Models in different districts, demonstrating the effectiveness of solar-powered surface water irrigation in improving agricultural productivity for small and marginal farmers.

In addition, through convergence with PM-KUSUM and Mukhyamantri Kishan Samridhi Yojana, LEADS has supported the installation of more than 450 solar irrigation pumps, enabling farmers to adopt sustainable agricultural practices, increase crop productivity, and strengthen rural livelihoods.



Concluding Remarks

The Solar-Based Irrigation Model can be replicated in any area with adequate surface water and good solar potential. By combining renewable energy with government schemes and community participation, the model provides reliable irrigation, promotes sustainable agriculture, improves farmers' income, and creates long-term livelihood opportunities. It also strengthens climate resilience and reduces seasonal migration, making it an effective and sustainable model for rural development.





