Solar-based irrigation helps farmers

Mahadev Sahni, a farmer in East Champaran district, has never been so vocal while telling fellow farmers from his village about solar pumps. Mahadev is a clean energy entrepreneur who uses solar pumps for irrigating his field. His proud possession of the solar pump is enabling him and other farmers in his vicinity who use the solar pump to irrigate their fields.

Use of solar pumps for irrigation holds huge potential in a country with abundant solar energy. Generating as much of that energy as possible from renewable sources is considered crucial to limiting catastrophic global temperature increases. (Source: *The Guardian*, May 10, 2017) India is the world's third-largest carbon polluter, with emissions forecast to at least double as it seeks to develop its economy and lift hundreds of millions of citizens out of poverty.

Water is critical to agriculture, and irrigation is a major input cost in agriculture, amounting to about 70 percent of the total cost. Given this scenario, the use of solar-powered pumps along with water-use efficiency measures in farming, such as minimal tillage, bed-making practices, direct seeded sowing of rice, and judicious use of farm inputs, can decrease the input cost by 25 percent. Using solar pumps alone, the inputs cost can decrease by 60 percent. For a small and marginal farmer, this is considerable and can be a game changer in making small and marginal farming more remunerative. Solar pumps are an attractive alternative technology for irrigation, which serves as a cost-effective mode of irrigation with low maintenance requirements.

Providing water for irrigation at a cost

North West Alluvial plains of Bihar, including the district of East Champaran, is an area that lacks affordable access to assistive irrigation, which further leads to crop loss and low yields. In the absence of cost-effective alternatives, small and marginal farmers are forced to practice less irrigation per hectare.

Use of diesel-based irrigation pumps to operate wells and tube wells across India results in the emission of an estimated 3.29 million metric tons of carbon. Bihar, with 48 percent of India's diesel pumps, is the primary contributor to India's carbon emissions from diesel pumps.

The need for clean energy clusters

Bihar is blessed with abundant groundwater resources for irrigation. This is mostly accessed using diesel-based pumps. According to Agricultural Census (2010–11), Bihar has 30.52 lakh hectares of net irrigated area, of which 66 percent is irrigated by wells and tube wells. The number of shallow tube wells has increased significantly in the last two decades. Their number in 2009 was [i]estimated to be 25,267, most (46 percent) of which were owned by marginal

farmers. Ninety percent of these wells and tube wells use diesel pumps as lifting devices.

The majority of marginal and smallholder farmers do not own pumps; they buy water for irrigation from diesel pump-owning farmers. The diesel pump owners use the diesel price rise to raise the price of water. Thus, the multifold increase in the price of diesel, compared to the base price for cereal crops, is a major concern. With the promotion of solar-powered pumps, one farmer in each cluster owns a pump and functions as a clean energy entrepreneur, providing water for irrigation to other farmers in the cluster at affordable prices.

Sehgal Foundation has formed a solar pump group of fifteen farm families whose fields are irrigated by one solar pump costing Rs 3 lakh. To buy this pump, one farmer contributes Rs 30,000. Sehgal Foundation provides a grant to the farmer in the form of a fixed deposit on his/her name in the bank. The government subsidy available through effective partnership with banks and government agencies covers one part of the cost of the pump. Those members of the solar pump group who have not contributed to the capital cost buy water at the rate of Rs 40 an hour, whereas the market rate of water from the diesel pump is Rs 150 an hour. But the rate of the solar pump is fixed, and the money collected is used for the maintenance of the system. Fourteen pumps installed in the area under the partnership project *Samagra Krishi* (holistic agriculture) benefit 148 farmers (one pump for each 10–11 farmers).

Seeing the success for their own eyes, farmers have come forward to adopt the technologies on their own and also earn by sharing the technology with other farmers. Mahadev is one such pioneer who feels empowered to be able to access the government subsidy available for solar pumps to help himself as well as others.

Farmers have attached batteries to the solar pump for making use of the energy resource by lighting their homes in the evenings. This has increased the economic returns and enabled better education for their children as they are able to study after dark.

Mahadev recalls, "At first when the concept of solar-powered pumps was introduced to us in the farmer meetings, we were skeptical. But now as a user, I can share that irrigation has become easier and is economically and environmentally sustainable. Although it was a felt need by all farmers, the high initial cost of technology was the reason for the slow adoption of this new technology initially in our area. The cluster-based approach is a huge benefit, and the partnership model between Sehgal Foundation, banks, NABARD, and the solar pump supplier really worked for us."

For further information, email: communications@smsfoundation.org

[i] http://www.indiawaterportal.org/articles/solar-water-pumps-efficient-irrigation