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Solar Irrigation pumps have been in India for over two decades. With rising prices of diesel and the vagaries agricultural power supply situation many farmers in Rajasthan have been considering solar energy as an alternative. Government of Rajasthan brought a new momentum in popularizing solar irrigation pumps by introducing 3 HP DC submersible pumps in an 86 percent subsidy driven scheme launched in 2011-12. The techno-economic performance of solar pumps has been uniformly positive; farmers we met could quantify financial benefits reaped, with most recovering their share of capital cost within a year. The administrative design of the subsidy scheme however leaves scope for improvement. This Highlight is a result of field visit to Rajasthan and interaction with administrators, Solar Photovoltaic (SPV) firms, dealers, politicians and farmers during the month of October-November 2012. Solar pumps are seen as a potentially powerful solution to government's inability to provide agricultural power connections. Solar pump's potential impact on excessive ground water extraction is not seen as a major concern by the policy makers. Interestingly farmers are seeing solar pumps as both a pumping and an energy solution.

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HIGHLIGHT

Solar Irrigation Pumps

The Rajasthan Experience

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Solar Irrigation Pumps
the rajasthan experience[1]

Highlight based on field work undertaken by the author during October-November 2012[2]

Introduction

ASolar Irrigation pumps have been in India for over two decades. According to Government of India's Ministry of Non-Renweable Energy (MNRE), over the years, about 7000 pumps have been installed. The Solar Photovoltaic (SPV) array converts solar energy directly into electricity as Direct Current (DC). Direct Current based surface pumps were the first to be tried with solar power. Punjab, where surface irrigation is extensively available, was one of the first states to attempt solar irrigation pumps.

With rising prices of diesel and unsatisfactory electricity situation, many farmers in Rajasthan have been considering solar energy as an alternative. One farmer in Sri Ganganagar (North Rajasthan) is said to have bought a second hand solar irrigation pump from adjoining Punjab. Many a farmer-politicians coming from North Rajasthan have been demanding the use of solar energy to address farmers' energy problems for quite a few years.

North Rajasthan (Sri Ganganagar, Hanumangrah and Bikaner Districts) which shares borders with Punjab has a high Sikh Population, large farm holdings and canal irrigation. There is a well established system for distribution of canal water to farmers from pre-Independence days. Typically farmers receive canal water once every two or three weeks; but once a year, there is no water for almost 30-40 days or so, when the canals are closed for cleaning and maintenance. Over the last ten years or so, there has been a steady decline in canal water supply, with farmers experiencing growing water stress for irrigation.

In response to this stress, the Government of Rajasthan started encouraging creation of farm ponds locally called *diggy* in canal irrigated districts of Rajasthan. There has been a substantial subsidy offered for creating *diggies.* While a few farmers have built *diggies* at a height allowing them to irrigate their fields with the force of gravity, the majority of the farmers have *diggies* at surface level, requiring them to use low-lift diesel or/and electric pumps for irrigation. Additionally, farmers have also dug borewells to supplement water for irrigation. Farmers here grow extensive *Kinoo* (orange) orchards, other fruits, flowers and cotton. Farmers use both diesel and electric pumps. There is a waiting list of two to three years for getting electric connection for agriculture.

Many farmers here are into high value agriculture, export their produce and are known to have good income. During 2008-09, Government of Rajasthan (GoR) installed 14 Solar Pumps in government farms and followed it with 50 solar pumps in farmers' fields in 2010-11. However inspite of the ground level interest, the government failed to design a scheme which had higher and long term stakes of the farmers in acquiring, using and maintaining solar pumps.

Rajasthan's subsidy scheme to promote solar pumps

Government of Rajasthan brought a new momentum in the space of solar irrigation pumps by introducing 3 HP DC submersible pumps in an 86 percent subsidy scheme launched in 2011-12. There was also a 2 HP DC submersible pump option, but there have been few takers for it. The initial estimates of costs at the Rajasthan level were Rs.6.16 lakh[3] for 3 HP pump and almost Rs.18-20 lakh for a 10 HP pump.

This was launched in 2011-12 in 16 select districts with an overall target of 1600 pumps, with a total project cost of Rs.96 crore[4]. The most popular solar pump cost Rs 5.70 lakh. The State government leveraged central financial assistance coming from MNRE and Agriculture Ministry for the same. The state government provides 56 percent

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[1]This IWMI-Tata Highlight is based on research carried out under the IWMI-Tata Program (ITP). It is not externally peer-reviewed and the views expressed are of the author alone and not of ITP or its funding partners - IWMI, Colombo and Sir Ratan Tata Trust (SRTT), Mumbai.

[2]This paper is available on request from p.reghu@cgiar.org

[3]One lakh = 0.1 million

[4]One crore = 10 million

subsidy under Rashtriya Krishi Vikas Yojana (RKVY) and the New and Renewable Energy Ministry of Government of India provides the balance 30 percent under Jawaharlal Nehru National Solar Mission (JNNSM). RKVY is a centrally sponsored scheme in which a State Level Sanctioning Committee (SLSC) takes expenditure decisions.

The districts were selected based on the availability of farm ponds, orchards, practice of hi-tech horticulture and drip irrigation. Districts had a pre-determined quota as follows- Alwar (60), Bhilwada (30), Bikaner (270), Chittorgarh (30), Dholpur (35), Ganganagar (425), Hanumangarh (250), Jaipur (90), Jaisalmer (40), Jhalawad (120), Jodhpur (40), Jhunjhunu (40) Kota (40), Nagore (40), Sawai Madhopur (40), Sikar (50. The project was implemented through the Horticulture Society under the Agriculture department of Government of Rajasthan. Interestingly 70 to 90 percent subsidy for newer equipments of horticulture is the norm in this department. Districts like Hanumangarh and Sri Ganganagar where demand was significantly higher than the allotted quota managed to draw the unused quota left over from districts which had less demand. These districts were able to supply pumps to all those who had applied, were eligible and had paid their share of the capital cost. In Sri Ganganagar, 625 solar pumps were installed although their original quota was 425. In Hanumangarh in 2010-11, all 287 who had applied and were found eligible were given subsidized solar pumps. Here, 270 pumps have been installed and 17 are still pending. These 17 had paid their share money after 31st March 2012. Table 1 provides an indication of the cost and subsidy for different solar pump alternatives

Table 1 Base rate and subsidy for the project of SPV solar pump set in Rajastan 2011-12

Item	Details	Base Rate		JLNNM Subsidy (30 %)		RKVY Subsidy (56 %)		Total Subsidy (86 %)		Farmers Share (14 %)	
		2200 wp	3000 wp	2200 wp	3000 wp	2200 wp	3000 wp	2200 wp	3000 wp	2200 wp	3000 wp
With Manual Tracker	Surface Pump 20 m head	376500	537000	112950	161100	210840	300720	323790	461820	52710	75180
	Submersible pump 20 m head	389900	560300	116970	168090	218344	313768	335314	481858	54586	78442
	Submersible pump 50 m head	395800	562300	118740	168690	221648	314888	340388	483578	55412	78722
With Auto Tracker	Surface pump 20 m head	414500	570000	124350	171000	232120	319200	356470	490200	58030	79800
	Submersible pump 20 / 50 m hread	418000	570000	125400	171000	234080	319200	359480	490200	58520	79800

During financial year 2012-13, the government's plan is to give 3000 solar pumps to meet the high and growing demand for them. 11 SPV companies have been shortlisted; their solar pump assemblies (SPV module and pump) are being tested in MNRE- Gurgaon,

Process of subsidy administration

In 2011-12, four firms were empanelled for providing solar pumps through a process of open tender. All firms had to supply at the lowest selected rates. All the pumps coming under the 2011-12 scheme were installed between April 2012 and September 2012. The monsoon was good in Rajasthan this year. During our fieldwork in October and November, the pumps were in operation but had yet to be used in the critical rabi season.

The solar pump subsidy was only available to farmers who had farm ponds (*diggi*), did horticulture in at least 0.5 hectare (ha) land and used drip irrigation. The farmer also had to own a minimum of 0.5 ha of land. Further the farmers who owned up to 2 ha of land could apply for 2200 Wp pump and those who had more than 2 ha of land could apply for 3000 Wp pump.

[5]Wp (Watt-peak)) is a measure of the nominal power of a PV solar energy device under laboratory conditions.

Farmers have to apply to the Horticulture department along with a demand draft for Rs.10000, land ownership record, a tri-partite agreement among the farmer, preferred empanelled supplier and the horticulture department, a quotation from the selected empanelled firm, and a technical drawing of the structure. Once all the applications are collected at Tehsil level, these are verified for compliance with the eligibility criteria. If the applications are more than the quota, a lottery is conducted in the presence of District Collector. A seniority/waiting list is created. If a farmer's name features in the lottery list, he/she has to deposit his 14 percent share minus Rs.10000 with the select firm. Based on the confirmation of the receipt of farmer's share work orders are issued by the Horticulture Department of the state government.

Administrative design issues

A major constraint in the administration of the scheme is the limited capacity of district level Horticulture Societies. Most of these have only a handful of field staff, they are required to do hundreds of field verifications of eligibility first and later, monitor the installations on numerous farmers' fields. Empanelled firms and their dealers have played a very significant role in mobilizing farmers demand, completing their files and getting the final physical verifications done. Farmers mostly have had to go with the firms which helped them in their paper work.

This implies in order to capture significant shares in this subsidy-driven solar pump market, supplier firms not only have to be good in the technology and its promotion but also be adept at getting the government procedure completed expeditiously. The dealers and engineers of the empanelled firms have had to spend 3- 4 months in completing files of applicant farmers. Indeed, getting these completed is a large part of the promotional work. Firms with existing dealer network and prior experience of dealing with horticulture society and its subsidy schemes have had a distinct advantage over other firms.

The logistical challenge of delivering solar pumps

The supplier has to deliver all components (solar panel, SPV pump, GI support structure and other accessories) to the farmer's plot within 45 days of his depositing the money and he has to finish the installation within the next 20 days. Against this requirement, many firms have taken up to six months to deliver after the work orders were issued to install pumps.

Payment to the SPV firm is made in three stages

(a) 14 percent of the order value at the time of placing order as farmers share

(b) 36 percent on the arrival material at prescribed site at farmer's field.

(c) Balance 50 percent, after successful completion of the work and verification by the committee nominated by the Horticulture Society comprising members of Rajasthan Renewable Energy Corporation (RREC).

There are no local testing facilities. The verifying team can at best verify if the pump is running. It has no means to ascertain the quality of installed SPV panels. There is no way to say if the SPV panels will be functioning well beyond the guarantee period.

The perverse dynamic of subsidy

Because of centrality of subsidy in the promotion of solar pump in Rajasthan, the conversational environment around the solar pumps is rife with stories of real or imaginary corruption and side payments being claimed by all and sundry involved in the process of accepting applications, verification, approval and so forth. It is widely believed that these side payments (or 'costs of doing business") are leading to gold-plating of SPV costs by suppliers. A case has already been filed in the Rajasthan High Court on the issue of "high cost" of solar pumps provided through empaneled firms. The petitioner is arguing that the subsidy be passed on directly to farmers who in turn choose the firm they want to work with.

Another query often raised is targeting of the subsidy. The Scheme does not aim to target small and marginal farmers. Since the practice of hi-tech agriculture was a precondition, it seems to have benefitted large and relatively richer farmers. Large farmers in North Rajasthan often stay in towns and are often engaged in government jobs, or enjoy positions of political power and influence or are established dealers of agricultural inputs. They hire agricultural labour to carry out farm operations. Many of them are beneficiaries of multiple types of subsidies of Horticulture department. Almost all the dealers, politicians and horticulture staff that I interacted with in course of my field work had acquired a subsidised solar pump.

There are apprehensions of suppliers gold-plating the SPV costs. For most suppliers, the MNRE benchmark cost of SPV systems without battery back-up support of Rs.190/-

[6]Accessed from http://www.mnre.gov.in/file-manager/offgrid-solar-schemes/aa-jnnsm-2012-13.pdf on 20th Nov 2012

per Wp became the base price point to match. This amounted to Rs.5.70 lakh for a 3000 Wp (Approx 3 HP) solar pump[6]. The current subsidy regime is therefore discouraging innovations to reduce cost of solar pumps. MNRE has maintained the 2011-12 benchmark support for SPV pumps rate for the year 2012-13 also. This year, the costs are likely to come down because of increasing use of AC submersible pumps in place of imported DC submersible pumps. However the benefit of falling prices of SPV modules is not likely to be passed on to the farmers.

For *diggies* a surface pump would also have sufficed. The inclusion of submersible pumps makes it possible to shift the solar pump in borewells also. Currently the submersible pump in made to float in the *diggi*. It is said that the use of imported DC submersible pump by one empanelled firm set the benchmark for the other empanelled companies and farmers demanded DC submersible pumps from other firms also. The imported pump costs close to Rs 1.75 lakh.

Performance of solar pumps

Solar pumps have been in operation in Rajasthan for anywhere between 1 month-6 months. If used, people are uniformly happy with the performance of the pumps. During October- November 2012, my impression is that solar pumps could run from 8 AM to 6 PM. Many farmers have begun to use it with drip irrigation for their orchards and for vegetables. It is easy to use, can be switched off and on easily. It requires dusting of the panels once a month. There is practically no other maintenance required. People I met talked of savings of the order of Rs.1000 a day on diesel and asserted they had already saved Rs.20000-30000 in cash since they began using the solar pumps (Table 2). People do talk of odd troubles in the running of the pump such as a non-functional auto tracker, stand not able to take heavy winds and a non-functioning motor. Those who have encountered problems are not happy with the after sales service; but these were few and far between.

Farmers also value not having to wake up in the night for running electricity pumps. Electricity is usually available to farmers for 5-6 hours in the night. Both sprinkler and drip work best with low power solar pumps. With diesel/electricity run pumps farmers try to get larger output of water in a short time to save on diesel and electricity cost. Farmers even use tractor engines for quick flood irrigation.

At the user's end, an electricity connection is cheaper than solar pumps or diesel pumps because of the existing subsidies on agricultural power supply. However in cases where farms are scattered and away from settlements, the electricity provider has to create special infrastructure to reach the farm for providing the electricity connection. For this, farmers have to contribute to capital costs, which sometime may go into several lakh rupees.

A 3 HP solar pump can irrigate anywhere between 1 to 2.5 ha of land from a diggy. Farmers who practice high value horticulture, such as *kinnow* orchards for export purposes, floriculture or vegetables, make anywhere between Rs 3-5 lakh from 1 ha of land. A farmer who has purchased a non-subsidy solar pump from a local solar integrator at Rs 1.4 lakh for a 3 HP solar pump told me he saved Rs.60,000 in electricity charges during the 10-12 months it would have taken him to get subsidized solar pump installed. He has disconnected his electricity connection. Farmers recover their contribution of approximately Rs.80000 within a year, in case they were using diesel pumps and in two years if they were using commercial electricity connection. A government document claims that an investment of Rs.700 crore can save the installation costs of 70000 new agriculture electricity connections to farmers.

Table 2 Illustrative Cases of farmers' Savings

	Electric Connection	Electric Connection	Diesel Pump
Type	Commercial	Agriculture	
Rate (Rs.)	At 6.30 per unit	At 1.4 per unit	At 45/liter, 1.5 litre per hour
Horse Power	5 HP	5 HP	5 HP
Capital Cost (Rs.)	25000	25000	15000
One time cost for 5 HP connection @ 2500 per HP (Rs.)	12500	12500	
Running Cost, 6 hrs 225 days in a year (Rs.)	31894	7088	91125

Use of solar pump for filling up the farm pond (*Diggi*) from a tubewell to increase the water available for irrigation and mixing saline tubewell water with fresh canal water was also observed in some cases. Some farmers have shifted the DC submersible pump which came with the Solar Pumping Module from the *Diggi* to the tubewell.

Solar pump is used to pump water from a diggi for flood irrigation of fields with crops like mustard. The drip system, mandated by the scheme to be compulsory with solar pump, is often dismantled; often the solar pumps is used to irrigate a different field which does not have drip system is irrigated through water channels dug within the farm.

In Rajasthan, at least solar pumps are unlikely to be shared with another farmer. In Jaipur, where water shortage is more acutely felt compared to North Rajasthan, one farmer had invested in an underground pipeline to his second field which was located across the road to make fuller use of solar pump. If a farmer finds the solar pump useful, he applies for another. Farm titles are still held in the names of grandfather of father and such joint families often apply for 2-3 solar pumps under the subsidy scheme.

Picture 1- A 3000 wp Solar Pump Array

Picture 2- A 2200 wp Solar Pump Array

The farmers interviewed contributed a maximum of Rs.80000 towards their solar pump. However in reality almost all companies offered a cash back to the farmer ranging between Rs.8000 and 20,000.

Theft and vandalism are a major concern. One farmer invested Rs.77000 for mounting the panels, the pump and the controls on a modified trolley which he takes home pulled by his tractor every night. Some farmers have put wired fence around the solar pump. One farmer has put wired fence and a box with a lock around the control panel. His fields are in the village and he found that children often played with his panels.

Enforcing drip irrigation as a pre-condition for solar subsidy

Unsustainable groundwater extraction is a concern that is shared by officials in the horticulture department and a few farmers, but it has not been reflected in the design of the 2012-13 scheme, where higher HP pumps are proposed to be installed. Politicians in North Rajasthan are also demanding 5 HP- 7 HP solar pumps. During 2012-13, Rajasthan is planning to provide higher HP solar pumps for tube well based irrigation also; this may aggravate its ground water problem (Shah and Kishore 2012). The Rajasthan government is very enthusiastic about subsidising solar pumps as a solution to its inability to meet electricity demand and is ignoring the risk of excessive groundwater extraction that may occur as farmers have free energy in their hands. While drip irrigation is a necessary condition to get a subsidised solar pump, there is no mechanism to ensure that the farmers will not use solar pumps for flood irrigation. Moreover, adoption of drip and sprinkler is no guarantee of groundwater conservation if zero cost solar energy encourages farmers to expand their irrigated land since land is not a major constraint in Rajasthan.

[7]Water Pumping Project, 2011-12, Government of Rajasthan

Non-subsidy market for solar pumps

One small Bikaner-based solar integrator, has challenged the credibility and veracity of the costs that the solar pump companies have put forward. This unregistered supplier offers a 3 HP Solar AC submersible pump for Rs 1.4 lakh. He uses batteries to store and supplement the power generated by SPV panels. His assembly includes: 8 solar panels of 220 w- 48 Volts, 4 batteries of 80 AH and 12 Volts and DC monoblock pump- 3 HP, 48 Volts and 3000 RPM. He is able to source SPV panels at a rate of Rs 38- Rs 40 per w. This is inclusive of 5 percent Central Sales Tax (CST), 3 percent insurance and 8-10 percent transportation cost.

This integrator has been trading in solar panels, batteries and invertor for the past 7-8 years. He sources panels from manufacturers/importers from Gujarat. A few months before the solar pump scheme was launched, he began making solar pump assemblies at at the behest of a large farmer who was exploring wind and solar alternative to cut his rising diesel and electricity costs. The entrepreneur has by now installed about 20 non-subsidy solar pumps and has orders to do about 10 pumps this year. He is installing a 10 HP solar pump and home lighting system with a storage of 15 KW power in the outskirts of Bikaner city at a cost of Rs.6 lakh.

Conclusion: pumping solution or energy solution?

While I did not come across any other solar integrator for solar pumps, there are many integrators available for putting together solar panels, inverters and batteries for home lighting and running house hold electric appliances. Farmers who live on the farms have invested additional Rs.20000-22000 thousand on an inverter and battery to use the solar pump – panels to meet their household energy needs. Such integrators are available even at the block level. One farmer removed two panels from a 14 panel assembly and installed them at his house, a kilometre away from the field, for home lighting and running of household appliances such as TV, Cooler and Fridge saving him a monthly electricity bill of Rs.1000. In addition, he irrigates his date orchard and pomegranate orchard through the solar pump-drip system.

Farmers are mostly looking at the SPV as an energy solution which can be a replacement of electricity. They want to use water coolers, air conditioners and other small equipments with the solar power available to them through the subsidised solar panels. If coupled with batteries SPV can be seen as a store house of 5-10 KWH units of electricity. With practically no running costs (except for replacement of batteries), it offers previously unforeseen choices for running a variety of electric equipments.

All in all, field visits in Rajasthan during October-November 2012 suggested that solar irrigation pumps have a bright future. Although numbers in use are small now, they are likely to quickly grow. Government of Rajasthan's aggressive policy of subsidizing solar pumps is helping to increase the numbers but there is some evidence that the current subsidy is discouraging cost reduction. Farmers are viewing solar pumps as an all-purpose solution to their energy needs.

References

Shah, T. and Kishore, A. 2012. Solar-powered Pump Irrigation and India's Groundwater Economy: A Preliminary Discussion of opportunities and Threats. Anand, India: IWMI-Tata Highlight # 26.

About the IWMI-Tata Program and Water Policy Highlights

The IWMI-Tata Water Policy Program (ITP) was launched in 2000 as a co-equal partnership between the International Water Management Institute (IWMI), Colombo and Sir Ratan Tata Trust (SRTT), Mumbai. The program presents new perspectives and practical solutions derived from the wealth of research done in India on water resource management. Its objective is to help policy makers at the central, state and local levels address their water challenges – in areas such as sustainable groundwater management, water scarcity, and rural poverty – by translating research findings into practical policy recommendations. Through this program, IWMI collaborates with a range of partners across India to identify, analyze and document relevant water-management approaches and current practices. These practices are assessed and synthesized for maximum policy impact in the series on Water Policy Highlights and IWMI-Tata Comments.

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