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Constraints in adoption of solar pumps by the farmers in Jodhpur district of Rajasthan

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Abstract

A solar pumping is a pump running on electricity generated by solar photovoltaic panels available from collected sunlight as opposed to grid electricity or diesel run water pumps. However, the use is constrained by the spare parts are not available in market and high cost of the solar pumps components. The research study was conducted in Jodhpur district of Rajasthan. There are total sevens tehsils in Jodhpur district of Rajasthan, out of which, two tehsils namely Osian and Balesar were selected on the basis of maximum number of installed of solar pumps. Ten villages from each selected tehsils were selected on the basis of maximum number of solar pumps beneficiaries. One hundred twenty five (125) respondents were selected from twenty selected villages these were having maximum number of solar pumps selected for study. In the research investigated the constraints encountered by the respondents were categorized into six categories namely technical, operational & maintenance, financial, extension, farm level and environmental constraints. The study clearly showed that among all the studied constraints, technical constraints were up to greatest extent 69.76 MPS and ranked first followed by extension constraints 65.87 MPS ranked second however, the extent of financial constraints 60.10 MPS, operation and maintenance constraints 51.80 MPS, farm level constraints 40.67 MPS and environmental constraints 30.66 MPS were ranked third, fourth, fifth and six respectively.

Keywords: Solar pumps, power generation, solar panels, technical and operational constraints

Introduction

Solar energy is the origin for all forms of energies which can be used either through the thermal route *i.e.* using heat for cooking, drying, heating by generating electricity or through the photovoltaic route *i.e.* converting solar energy into electricity there can be specially used for lighting, pumping, cooling, electrical equipments and devices. Solar pumping robust fusion in rural development, available technology and ecological conservation available technology for increasing living standards, farmers income and improving the living conditions of women by reducing labour intensity and reducing poverty.

The Jawaharlal Nehru National Solar Mission was launched on the 11th January, 2010 by the Prime Minister Govt of India. The Mission was set the ambitious target of deploying 20,000 MW of grid connected solar power by 2022 aimed at reducing the cost of solar power generation in the country through long term policy, large scale expansion goals and domestic production of critical raw materials, components and products, as a result to achieve grid tariff parity by 2022 (Source: Encyclopedia).

According to Ministry of New and Renewable Energy (MNPE) Rajasthan has potential of 142 GW of electricity from solar energy. Solar plant of 4,637 MW has been commissioned in state up to December 2019. Pradhan Mantri Kisan Urja Suraksha evam Utthan Mahabhiyan (PM-KUSUM) Yojana was launch by the Government of India to increase the income of farmers and provide sources of irrigation for agricultural sector. Any farmers, group of farmers, panchayats and cooperatives can apply under KUSUM Yojana to get benefits of solar pumps. Govt provides 60 percent subsidy to farmers and 30 percent of total cost by govt as loan and remaining 10% contributes by the beneficiary.

Methodology

The study was conducted in Jodhpur district of Rajasthan. There are total seven tehsils in Jodhpur district of Rajasthan, out of which, two tehsils namely Osian and Balesar were selected on the basis of maximum number of installed of solar pump. Ten villages from each selected tehsils were selected on the basis of maximum number of solar pumps beneficiaries. 125 benificieies were selected from twenty selected village by these were having maximum number of solar pumps were selected for research study (Sources: 2011-19 Department of Agriculture and horticulture, Paota, Jodhpur, Rajasthan). Data and information were collected by investigator through personal interview technique with the help of interview schedule. Thereafter, data were

tabulated and various statistical measures *viz.* per cent, mean, mean per cent scores, standard deviation, ranking and correlation were used to arrive at specific inference.

Results

Constraint in adoption of solar pumps by the farmers

Agriculture is undergoing rapid scientific advancement during these days. There is no technical and operational know-how in these days but the most complex and significant problems are dissemination of new farm technologies and its utilization by the farmers. There is a tremendous gap between existing knowledge, knowledge utilization and production. Adoption of technology depends upon various factors which may either accelerate the level of adoption. Hence, an attempt was made to identify and analyze the constraints perceived by the respondents and investigated were considered as major impediments that restrict the farmers to adoption of solar pumps in their field. The results are presented in subsequent tables.

Table 1: Overall constraints perceived by the respondents in adoption of solar pumps n=125

S. No.	Aspect	MPS	Rank
1	Technical constraints	69.76	I
2	Financial constraints	59.70	III
3	Extension constraints	65.87	II
4	Farm level constraints	40.67	V
5	Operation and Maintenance constraints	51.80	IV
6	Environmental constraints	30.66	VI

MPS= Mean percent score

The data presented in table 1 reveal that among all the studied constraints, Technical constraints were up to greatest extent 69.76 MPS and ranked first followed by extension constraints 65.87 MPS ranked second however, the extent of financial constraints 60.10 MPS, Operation and Maintenance constraints 51.80 MPS, farm level constraints 40.67 MPS and environmental constraints 30.66 MPS were ranked third, fourth, fifth and six respectively.

Table 2: Technical constraint perceived by the respondents n=125

S. No	Technical constraint	MPS	Rank
1.	Spare parts are not available in market.	97.60	I
2.	Difficulty in getting equipment repaired.	95.20	II
3.	Non availability of quality spare parts	40.80	V
4.	Lack of codes and standards to guarantee quality SPV Panels and equipment	60.80	III
5.	Does solar pump work on regular way	54.40	IV

MPS=Mean percent score

Discussion

It is concluded that that main technical constraints for respondents in adoption of solar pumps "Spare parts are not available in market" and "Difficulty in getting equipment repaired has been regarded as the important technical constraint in adoption of solar pumps. The above constraint perceived by the respondents might be attributed due to the fact that contact between extension worker and farm families was not in workable position and inadequate to cater the needs of farming community, in context to transfer of solar pumps.

There finding are in accordance with the finding of research conducted by Khan and Latif (2010) [6], Upadhyay and Chowdhury (2014) [11] and Kabir *et al* (2017) [7].

Table 3: Financial constraints perceived by the respondents n=125

S. No.	Aspect	MPS	Rank
1	Inadequate subsidy	28.00	VII
2	High initial investment	49.60	V
3	High interest rates and short term loans	72.00	IV
4	Lack of money to buy a solar system	91.20	II
5	Lack of credit facilities	40.80	VI
6	Costly equipment (if subsidy is not provided)	88.80	III
7	High cost of solar pumps equipments	96.80	I
8	High maintenance costs	10.40	VIII

MPS= Mean percent score

Discussion

The constraints like costly equipment (if subsidy is not provided) of solar pumps equipment, high interest rates and short term loans and high initial investment this might be due to the facts that most of the respondents were unaware about government policies, subsidy or programmes to install the solar pump sets on subsided rates. High interest rates and short term loans are more expensive, this might be due to the facts that respondents having small land holding and small farmers are not able to afford to purchase solar pump without subsidy.

These findings are in accordance with the findings of research conducted by Chandran and Surendran (2016) [4] and Singh *et al*. (2017) [10].

Table 4: Extension constraints perceived by the respondents

S. No.	Aspect	MPS	Rank
1	Lack of extension exposure	63.20	VI
2	Lack of demonstration by KVK/Agriculture/Horticulture Department	20.80	VIII
3	Lack of administrative assistance	97.60	I
4	Lack of attention of Mass Media	20.00	IX
5	Lack of knowledge of extension agencies	72.80	IV
6	Lack of motivational programmes for adoption of solar	71.20	V
7	No follow up services by supplier (solar)	96.80	II
8	Lack of information regarding the profitability of solar pumps	96.00	III
9	Lack of feedback programme	52.80	VII

MPS= Mean percent score

Discussion

The constraints "lack of administrative assistance" due to facts that no specific government personnel were there provides technical guidance to the respondents has been first ranked. The respondents were not in possession of correct scientific knowledge due to fewer contacts with extension workers, extension experts, lack of training, programmes and less exposure to farm information.

These findings are in accordance with the findings of research conducted by Ghintala and Singh (2013) [5].

Table 5: Farm level constraints perceived by the respondents n=125

S. No.	Aspect	MPS	Rank
1	Fragmentation of holding	32.00	III
2	Lack of awareness	77.60	II
3	Saline groundwater	25.60	IV
4	Low off farm income	91.20	I
5	Small land holding	13.60	V
6	Fear of theft and vandalization	4.00	VI

MPS= Mean percent score

Discussion

Most of the respondents reported that "Low off farm income" and "lack of awareness" is the most perceived farm level constraints that are why average respondents could not afford to adopt it. This might be due to the reason that respondents were not very much aware about cost benefit ratio of installation of solar pumps at their farm level.

These findings are in accordance with the findings of research conducted by Chandel *et al*. (2015) [3].

Table 6: Operation and Maintenance constraints perceived by the respondents n=125

S. No.	Aspect	MPS	Rank
1	Requires specific skill in operation and maintenance	98.40	I
2	Delay from installations	31.20	III
3	Lack of skilled personnel or training schemes	69.60	II
4	Breakdown of solar energy use system	8.00	IV

MPS= Mean percent score

Discussion

The constraints requires specific skill in operation and maintenance and lack of skilled personnel or training schemes might have been ranked first and second because the majority of respondents under research study were not sound in technical know how about solar pump sets and had lack of understanding about operating, technical, maintenance and advancement of required specific skill in operation and maintenance.

These findings are in accordance with the findings of research conducted by Sehgal (2017) [9].

Table 7: Environmental constraints by the respondents in adoption of solar pumps n=125

S. No.	Aspect	MPS	Rank
1	It does not work in cloudy/ winter/ rainy days	83.20	I
2	Insufficient required day light in rainy days	2.40	III
3	Suitable place for establishment of solar pump are not available (weather/ climate condition)	6.40	II

MPS= Mean percent score

Discussion

For working out the environmental constraints faced by respondents in adoption of solar pumps, in all 3 aspects related to environmental constraint were considered. The Mean Percent Score (MPS) was calculated for each statement and rank was fixed accordingly.

There finding are in accordance with finding of research conducted by Kumar *et al.* (2017) [7].

Conclusion

Jodhpur has been acknowledged as having enough solar energy potentials to solve its energy problem and provide the solution to its rural electrification and agriculture problems. This paper had focused on the constraints namely technical, operational & maintenance, financial, extension, farm level and environmental constraints to the application of solar pumps as a means of providing power for irrigation in agriculture. Though solar pumps were costlier than generators in the beginning, but on the long run, spare parts are not available in market, difficulty in getting equipment repaired lack of administrative assistance, low off farm income and requires specific skill in operation and maintenance.

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