CONSTRAINTS IN ADOPTION OF SOLAR WATER PUMP SETS IN THE SELECTED AREA OF CHHATTISGARH

Factors militating against adoption of solar water pump sets.....;.; : A survey

Abstract

In the agricultural sector, highest electricity use goes to irrigation operating pump sets. Solar pump sets is a renewable source of energy in replacement of existing diesel and electricity-based pump sets. Sour Sujala Yojna was launched by Prime Minister that to provide solar power irrigation pumps to farmers at a subsidized price. 56362 solar water pump sets were installed during 2016 to 2019 in Chhattisgarh state. In the study area sample farmers were facing major problem "solar pump is not working during cloudy days" and second "law farm income". Rank 3rd was "small land holding" and through the solar pump irrigation covered less area rank 4th. There is maintenance problem was less or negligible. For solving the problem battery charge system should be add in solar pump. Water tank fixed and stored water above 20 m height then after use. Solar pump is renewable source of energy. So it is not affect the nature. It is best source of irrigation for future saving of energy.

The above is not an abstract rather 'statement of problem. .The author should know that an abstract is a summary of the entire study.

Keywords: solar, pump. Constraints, garret ranking, farmer.

Introduction

Agriculture plays an important role in Indian economy. Nearly 70 percent of India's population depends either directly or indirectly on agriculture, while 44 percent of the 140 million sown hectares depend on irrigation, the remainder rely on the monsoon. Irrigation is essential for crop production. There's growing demand for water to irrigate the crops. In the agricultural sector, highest electricity use goes to irrigation operating pump sets. To meet the energy demand for irrigation, solar photovoltaic (PV) pumps were introduced under the National Solar Mission (NSM) off-grid power generation category with a power target and phases as shown in table 1 SOUR SUJALA YOJNA was launched by Prime Minister that provide solar power irrigation pumps to farmers at a subsidized price. Chhattisgarh is the first state to implement the scheme. 2hp, 3hp and 5hp solar pumps were installed under this scheme. In this scheme, 56362 solar water pump sets were installed during 2016 to 2019 in

Chhattisgarh state. In the Raipur districts 917 solar water pump sets are installed. CREDA (Chhattisgarh State Renewable Energy Development Agency) provides solar water pump sets at subsidized price to the farmers. The benefits received by the farmers, through the Sour Sujala Yojna, is provided by the agricultural department. (Delete the comma after 'Yojna').

This introduction is too shallow without references. So, the author should contact literature on this topic and do the needful and lift what is written as abstract and make it part of the last paragraph of introduction which states the problems and go on to add the objectives of the study.

Table 1. National solar mission targets

S.NO.	Application segment	Target for Phase – I (2010-13)	Target for Phase – II (2013-17)	Target for Phase - III (2017-22)
1	Grid connected solar power generation	1100MW	4000MW	100000MW
2	Off-grid solar applications (includes solar PV pump)	200MW	1000MW	2000MW
3	Solar thermal collectors	7 million sq. m.	15 million sq. m.	20 million sq. m.
4	Solar lighting systems	5 million	10 million	20 million

Source: Ministry of Renewable Energy Sources, Govt. of India.

Materials and Methodology

The author, should simply state the research design employed, sampled population and the sampling technique as well as the principle instrument used for data collection and then add how the data collected were analyzed. The implication is that, the methodology was not well written.

The methodological frame work presented under the following headings:

1 Sampling design

2 Collection of data

3 Analytical tools and techniques

4 Description of study area

1 Sampling Design

1.1 Selection of district

Chhattisgarh State consists of 33 districts. The Raipur district is selected randomly for the study.

1.2 Selection of blocks

The Raipur district has four blocks namely Arang, Tilda, Dharsiwa and Abhanpur. Arang block was selected purposively because highest number of solar pumps was installed.

1.3 Selection of villages

Selection of villages is in accordance with the corresponded villages of solar pump user farmer. Villages are kunda, badgaon, chandkhuri, godhi, tekari, parsada, chhatera and borid.

1.4 Selection of farmers

For the research work purpose 49 farmers are selected randomly from the eight village with solar pump sets were listed out.

2. Collection of data

In order to address the objectives of the study, primary as well as secondary data were collected for the study.

2.1 Primary Data

Primary data for the study will be collected from solar pump set user farmers. Information regarding the cost, benefits limitation, impact and various parameters of solar water pump sets usage will be collected from farmer.

2.2 Secondary Data

Secondary data relevant to the objectives of the study were collected from the CREDA (Chhattisgarh State Renewable Energy Development Agency) and Agriculture Department Raipur etc.

Materials and Method

3 Analysis tools and technique

To understand the constraints in adoption of solar water pump sets

Constraints in the use of solar water pump sets have been identified based on the literature reviews and farmer's opinion. These constraints were evaluated by 3 experts in the field and a final list of constraints was drawn up for pre-testing after proper addition and deletion
Garret ranking technique was used to find out the significant constraints that affect the respondents. According to this process, respondents were asked to assign the rank for all constraints and the result of such a rank was transformed to the score value by using following formula:

$$\text{Per cent position} = 100 * (Rij - 0.50) \div Nj$$

Where, Rij stands for rank given for the ith constraints (i= 1, 2……10) by the j th individual (j = 1, 2 …..48)
Nj stands for number of constraints ranked by jth individual.

When the percentage positions were found, by referring to the table given in Garret and Woodsworth (1969), the percentage position of each rank was transformed to scores. The scores for each constraint were then summed up over the number of sample farmers that ranked those constraints. In this way, for each of the constraints, total scores were reached, and mean scores were determined by dividing the total score by the number of respondents who gave ranks. Lastly, the overall ranking of the constraints was achieved by assigning rank to the decreasing order of the mean scores.

Table 2: Constraints in adoption of solar pump sets

Constraints no.	**Constraints**
F1	Small land holding
F2	Lack of knowledge about solar pump

F3	Delay in installation of solar pump
F4	Low farm income
F5	Lack of demonstration
F6	Inadequate subsidy
F7	Problem of starter
F8	High ground water
F9	Less area irrigate
F10	Not working during cluody days
F11	Compare to disel pump
F12	Maintenance

Results and Discussion

On the basis of the outcome of the pilot study, only problems like Small land holding, Lack of knowledge about solar pump, Lack of knowledge about solar pump, Low farm income, Lack of demonstration, Inadequate subsidy, Problem of starter, Problem of starter, High ground water, Less area irrigate, Not working during cloudy days, Compare to diesel pump and Maintenance have been used in the Final Interview Schedule. By way of giving these factors in the Final Interview Schedule, sample farmers have been called to assess each problem on its own significance. Each farmer is instructed to indicate the problem in adoption of solar pump by giving rank 1 to the main problem, rank 2 to the second main factor and so on. Based upon on the ranks assigned by the sample farmers, the order of facing problem during the installation of solar pump. To find the most significant problem the sample farmers in selecting as they were facing problem. Garrett's Ranking Technique was employed. It is calculated as percentage score and the scale value is obtained by employing Scale Conversion Table given by Henry Garrett.

The percentage score for each rank from 1 to 12 are calculated. The percentage score thus obtained for all the ten ranks are converted into scale values using Scale Conversion Table given by Henry Garrett. The scale values for first rank to twelfth rank **is** are 83, 73, 66, 62, 55, 52, 48, 44, 40, 34, 27 and 17 respectively. The score value (fx) is calculated for each factor by multiplying the number of respondents (f) with respective scale values (x). The total scores are found by adding the score values (fx) of each rank for every factor. The mean score is then calculated to know the order of preference given by the respondents for the factors. Based on the mean score, the overall ranks are assigned for each. The ranking analysis of the factors in adoption of solar water pump by the farmers through Garrett's

Ranking Technique is shown in Table 3and 5. The author should back the findings with other authors works cited as they relate to the findings either for or against

Table 3: The ranking analysis of the factors in adoption of solar water pump

Constraints no.	**formula** $(100*(Rij-0.50)\div Nj)$	**Calculation**	**Table value(x)**
F1	100*(1-0.5)/12	4.166667	83
F2	100*(2-0.5)/12	12.5	73
F3	100*(3-0.5)/12	20.83333	66
F4	100*(4-0.5)/12	29.16667	62
F5	100*(5-0.5)/12	37.5	55
F6	100*(6-0.5)/12	45.83333	52
F7	100*(7-0.5)/12	54.16667	48
F8	100*(8-0.5)/12	62.5	44
F9	100*(9-0.5)/12	70.83333	40
F10	100*(10-0.5)/12	79.16667	34
F11	100*(11-0.5)/12	87.5	27
F12	100*(12-0.5)/12	95.83333	17

Table 4. garrett ranking conversion table.

GARRETT RANKING CONVERSION TABLE

The conversion of orders of merits into units of amount of "socres"

Percent	Score	Percent	Score	Percent	Score
0.09	99	22.32	65	83.31	31
0.20	98	23.88	64	84.56	30
0.32	97	25.48	63	85.75	29
0.45	96	27.15	62	86.89	28
0.61	95	28.86	61	87.96	27
0.78	94	30.61	60	88.97	26
0.97	93	32.42	59	89.94	25
1.18	92	34.25	58	90.83	24
1.42	91	36.15	57	91.67	23
1.68	90	38.06	56	92.45	22
1.96	89	40.01	55	93.19	21
2.28	88	41.97	54	93.86	20
2.69	87	43.97	53	94.49	19
3.01	86	45.97	52	95.08	18
3.43	85	47.98	51	95.62	17
3.89	84	50.00	50	96.11	16
4.38	83	52.02	49	96.57	15
4.92	82	54.03	48	96.99	14
5.51	81	56.03	47	97.37	13
6.14	80	58.03	46	97.72	12
6.81	79	59.99	45	98.04	11
7.55	78	61.94	44	98.32	10
8.33	77	63.85	43	98.58	9
9.17	76	65.75	42	98.82	8
10.06	75	67.48	41	99.03	7
11.03	74	69.39	40	99.22	6
12.04	73	71.14	39	99.39	5
13.11	72	72.85	38	99.55	4
14.25	71	74.52	37	99.68	3
15.44	70	76.12	36	99.80	2
16.69	69	77.68	35	99.91	1
18.01	68	79.17	34	100.00	0
19.39	67	80.61	33		
20.93	66	81.99	32		

Table 5: The ranking analysis of the factors in adoption of solar water pump by the farmers through Garrett's Ranking Technique.

Constraints	F1 81	F2 73	F3 66	F4 62	F5 55	F6 52	F7 48	F8 44	F9 40	F10 34	F11 27	F12 17	total score	mean score	rank
Small land hoding	1215	657	198	310	165	260	192	44	80	34	27	17	3199	65.89796	III
Lack of knowledge about solar pump	810	219	198		110		192		40				1569	32.02041	X
delay in installation of solar pump	972	730	511	248		52	48	176		68	27		2832	57.79592	V
Low farm income	972	584	292	310	220	156	240	220	160	129	81	17	3381	69	II
Lack of demonstration	567	219	132	186	220		240		40	34	27		1665	33.97959	IX
Inadequate subsidy	648	511	330	248		104	144		120	34	27	17	2183	44.55102	VIII
problem of starter	810	438	396	310	165	104	48	44	120	102	54	17	2608	53.22449	VI
high ground water		876	528	186	330	208	240		120	34	27		2549	52.02041	VII
less area irrigate	1053	584	264	248	275	156	96	88	80	68	27		2939	59.97959	IV
not working during cluody days	1296	657	528	434	110	260	144	176	160	102	27	17	3911	79.81633	I
compare to disel pump				310	165	208	192	88	80		27		1070	21.83673	XI
Maintenance											27	17	44	0.897959	XII

Table 6. The ranking of constraints in adoption of swps in the study area

S.No.	Constraints	Mean value	Rank
1	Not working during cloudy days	79.81633	I
2	Low farm income	69	II
3	Small land holding	65.89796	III
4	less area irrigate	59.97959	IV
5	delay in installation of solar pump	57.79592	V
6	problem of starter	53.22449	VI
7	high ground water	52.02041	VII
8	Inadequate subsidy	44.55102	VIII
9	Lack of demonstration	33.97959	IX
10	Lack of knowledge about solar pump	32.02041	X
11	compare to diesel pump	21.83673	XI
12	Maintenance problem	0.89795	XII

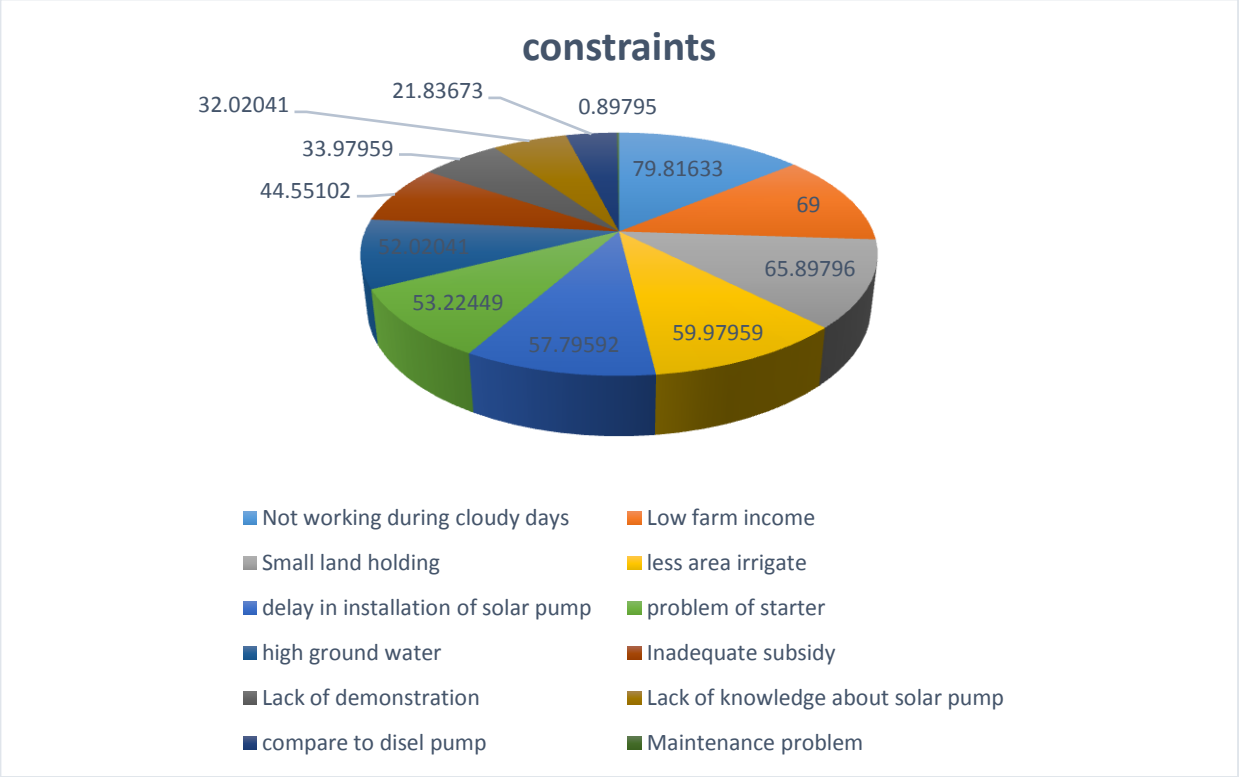

Fig 1. Constraints faced by the respondents

Table 6, R reveals shortcomings in the study area regarding the adoption of solar water pump sets. In the study area sample farmers were facing major problem "solar pump is not working during cloudy days" and second "law farm income". Rank 3rd was "small land holding" and through the solar pump irrigation covered less area rank 4th. Rank 5 th was "delay in installation of solar pump". "Problem of starter", "high ground water", "Inadequate subsidy", "Lack of demonstration", "Lack of knowledge about solar pump" and "compare to diesel pump" were assigned rank 6 th,7 th,8 th,9 th.10 th, and 11th respectively. There was maintenance problem was less or negligible.

Findings as earlier said should be buttressed by citing other authors' work as they relate the topic

Conclusion and suggestion:

In the study area many problems were identified militating against came in the adoption of solar pump such as Solar pump not working during cloudy days, law farm income, small land holding, through the solar pump irrigation covered less area, delay in installation of solar pump. Problem of starter, high ground water, inadequate subsidy, Lack of demonstration,

Lack of knowledge about solar pump and compare to diesel pump and maintenance problems. Above the problems **"Solar pump not working during cloudy days", "law farm income", "small land holding"** and **"through the solar pump irrigation covered less area"** were major constraints facing by the sample farmers. Based on what were the under mentioned suggestions made?

1) In the area of study, solar pumps with low pumping capacity backed by water harvesting techniques and micro-irrigation can enable farmers to change their crop pattern to higher-value, more remunerative crops.

2) During the cloudy days solar pump is not working. For overcome of this problem battery charging system should be add in solar pump. Traditional method of water harvesting should be adopt and store water in 20 m height and use during cloudy days.

3) Large farmers are not adopted solar pump because of less discharge capacity of solar pump. And solar ppump is costly, so the farmers can't installed solar pump without subsidy. But solar pump is renewable source of energy it overcome the electric and diesel problem. Solar pump is renewable source of energy. So it is not affect the nature. It is best source of irrigation for future saving of energy.

4) It is required to promote the use of solar pump by the government.

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The listed references were nowhere used in the work. The author should utilize the references in the body of the work