

Original Research Article

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## Solar Water Pump: An Analysis of Farmers Utilization in Coimbatore District, India

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### ABSTRACT

India is a country with hottest temperature and moderate humidity, where certain states are said to be experiencing the highest solar radiation in a year. According to the National Action Plan on climate change, if India were to convert 1 per cent of the 5,000 trillion kilowatt-hour of solar energy that it receives in a year into energy, the country would have enough solar resource to meet its energy crisis (GIZ, 2013). There is a huge untapped market potential for this sector, as is yet to be exploited by the private and public sector. The objectives of this study were to analyze the trend towards solar water pump, to analyze the farmers' profile and; finally to explore the retailers share in sale and marketing strategy followed in selling the solar water pumps. The study was conducted in Coimbatore district with a sample size of 30 farmers. The sampling method used was convenient sampling and the data was analyzed using conventional analysis and Garrett ranking method. The results indicated that 61.40 per cent of the farmers' purchased solar water pump as the cost of diesel was high, 47 per cent stated that it was due to lack of electricity connection and 40.40 per cent stated that frequent power cut was the reason. The study also resulted in indicating the problems faced by farmers after the installation of solar pumps and suggested suitable recommendations on these issues.

#### Keywords

Renewable energy,  
Solar pumps,  
Farmers

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### Introduction

Countries at the global level are concerned about power generation as the non renewable power source being widely used by huge industries causing air pollution artificial. Subsequently, this lead to the global warming, so countries greatly involved in developing clean energy technologies and alternative renewable power generations techniques to combat energy crisis, climate change, global warming and to bring sustainable development in the energy sector. Indian

power sector is under massive change due to sustained economic growth that drives electricity demand were the supply of electricity is minimum. As India is located in the equatorial sun belt of the earth, it is bound to receive an ample amount of solar radiation. In the country Rajasthan and Gujarat are said to be experiencing the highest solar radiation in a year (Sharma, 2011). National action plan on climate change had reported that India receives about 5,000 trillion kilowatt-hour of solar energy per year and if at least one per cent of this was converted, then it would be

enough to meet the energy crisis of the nation (MNRE, 2019).

In India most of the rural households around 45% do not have access to electricity. Most of the regions in India receive 300 to 330 sunny days in a year, equivalent to 5,000 trillion kilowatt of solar energy per year, which is more than the total annual energy consumption (MNRE, 2012). Growing population with increasing temperature due to the destruction of ozone layer, because of the energy crisis government is also making effort to promote the solar technology among all the rural and urban households. The consumption of electricity has said to be growing whereas the production is not on par with the growing consumption of energy.

There is a huge untapped market potential for this sector in different avenue such as food processing industries, energy industries, agriculture, household, and other avenues of business etc. The market is hardly exploited by the private and public sector. Since, the major raw material solar cell used in the production of solar panel is being imported for the production in the country due to which the investment is huge. By virtue of the reason like high cost and unawareness among the farmers and households to adopt this renewable technology, there is low penetration of solar technology among the consumers.

Solar pumps not only enhance access to irrigation but also, helps agriculture advance in terms of low-carbon emission and improve farmer's resilience against changing climatic conditions. Solar pumps also reduce the burden on government for electricity subsidies (Jain and Shahidi, 2018).

Prasad (2020) reported in their study about KUSUM program an initiative leveraged to farmers for the purchase and installation the solar water pump and support the grid

connected solar power projects in the farms. This intervention by government was made to protect the farmers against financial and water crisis. Thus, farmers would get a boundless support by saving water resources, reducing dependency on the grid, and they could also earn additional revenue through grid power generation. Sustainability with water resources and power generation for the farm purposes could be achieved.

### **Rationale behind the Need for Renewable Energy in Agriculture**

As there is a drastic change in the agriculture environment where most of agriculture land are becoming dry and drier with less rain, decreasing groundwater level than erstwhile and unexpected monsoon delays are the reasons ought to be increase in electricity consumption in agriculture.

The electricity in agriculture is mainly used for irrigation purpose. In order to increase production to meet out the demand of growing population. The electricity is one of the necessary factors for the agricultural production in dry land areas than rain fed areas.

The electricity consumption is said to be increasing in the imminent future due to scarcity of water resource for agriculture use. But the conventional electricity is in crisis in India due to the reasons like pollution, high cost and heavy consumption by other sectors. So, the alternative renewable resources should be deployed in the farming sector to provide the continuous supply of power for irrigation and thus production could be made continuous feeding the huge demand.

Thus the alternate use for electricity is the renewable energy such as diesel engine, hydro power, wind energy, solar energy among these energy solar energy ought to be efficient in terms of availability of solar power, easy

way of electricity generation and minimum maintenance but only the investment on solar power generation is said to be higher for medium and small farmers in India.

The fig. 2, showed that government was also showing more interest towards implementing more number of solar renewable energy in the country through various schemes which provided funds for the establishment of solar energy.

From the table it is predicted that the highest funding were done in the states of Andhra Pradesh, Rajasthan, Punjab, followed by Jharkhand, UP, Uttarakhand, Tamilnadu and Karnataka. These states were considered to be the potential states where there is a huge scope for the utilities of solar energy for agriculture purpose. The highest funding states were ought to receive highest solar energy, also highest producers of agricultural commodities where the rural electrification and water availability is also said to be minimum in these states. Because of these reasons there is an untapped market potential for solar power generation.

The fig. 3, depicted that the number of pump sanctioned was higher among highest temperature receiving states like Rajasthan, Maharastra, Ultra Pradesh, Karnataka and Tamil Nadu.

It was clearly shown from the table 1, that India as of 2019-2020 installed 1, 81,521 number of solar water pumps in which 1545 solar water pumps were installed in India. According to Mercom India report, the major factors influenced the land under solar powered irrigation was capacity of the pump, type of crop, groundwater level, etc. The most widely used motor was a five horsepower (HP) of solar water pump linked with a micro-irrigation system that was a suitable for irrigation 2.5 hectares (Prasad, 2020).

Thus, with the status of growing number of initiative and a way for sustainability solar water pumps serves the potential resources for mitigating the water crisis. The growth of utilization is expected to increase in the coming years. In this context it necessary to study the retail strategies followed by the solar water pump dealers and the farmer's perception towards the purchase will be explored among the farmers of Coimbatore district

A spate of past studies relevant to solar water pump irrigation and its advantages from different perspectives were covered in this section.

Solar-powered irrigation systems (SPIS) facilitated irrigation access and were environmentally-sustainable in nature. The key drivers for the sector are that 70 per cent of the population is involved in agriculture, demand-supply gap of energy and the concern for environment and pollution. Studies related to strategic market approach for investing in solar water pumps market in India, explored various aspects like technology reliability and feasibility, opportunities and threats, etc. certain studies also shed light on developing marketing goals, strategy, marketing mix, business models that are appropriate for this sector. One of the study measuring farmers' perceptions towards irrigation embedded the factors like use of irrigation for insurance against drought, crop yield improvement, higher income, food security and poverty reduction. Farmers had poor access to agricultural information and markets, inadequate knowledge on water resources management and lack of agricultural credit were the major constraints faced by the farmers (Nonvide, Sarpong, Kwadzo, Anim-Somuah, and Amoussouga Gero, 2018).

Studies have indicated that the bargaining power of suppliers was low, bargaining power

of buyers, threat of substitutes and rivalry were moderate and; threat of new entrants were low. The growing economy combined with energy deficit, legal framework encouraging the use of renewable energy, stakeholders' pressure to promote the use of environmental technologies and; the availability of subsidies and soft loans were some of the opportunities for the sector. Changing the end-users' perception of the product was found to be essential to create the demand and widen the target customers (Almanasreh, 2011). Studies also explored farmers' experience in using solar pumps where, local dealers had a big influence on farmers' choice of supplier, most of the subsidies went to medium and large farmers, increased water productivity; and farmers wanted multiple use of solar panels (Kishore, Shah, and Tewari, 2014). Studies have also investigated and compared operation cost and maintenance of the conventional power irrigation (such as diesel and petrols, etc.) with solar powered irrigation. Fuel powered water pumps incurred a lesser capital cost but was expensive to maintain and operate unlike the solar pumps. The results indicated that, unless farmers received an external financial support, it would be expensive for them to afford solar pumps and benefit from the energy usage (Bengtsson and Nilsson, 2015).

The results of a study on socio-economic assessment of solar irrigation systems were consistent with the previous studies where, the findings revealed that the overall costs and energy consumption of solar pumping systems were lower despite the higher initial investments. Also, farmers' savings could be increased if the irrigation systems, agricultural procedures and crop patterns are optimized (Raut, Nakarmi, and Singh, 2017). Solar-powered irrigation provided farmers the opportunity to harvest in relatively higher number of plots and due to better coverage and reliability of such irrigation, yield and

return per acre of land was also higher (Hossain, 2019).

Certain studies investigated the risks afflicting the flow of finance for solar pumps. Risk of information asymmetry, technology-specific risks, and policy risks in relation to availability and impact of capital subsidy were the perceived risks. Studies investigated the operational challenges faced by financiers in financing solar pumps. The results indicated that financiers faced difficulties in appraising the solar pump loan applications due to factors such as the shortage of trained staff, information gaps, and uncertainty about future water availability, crop profitability, and inability of farmers to provide proper collateral (Agarwal and Jain, 2018).

### **Materials and Methods**

The main focus of the present study was to explore the farmer's interest who installed solar water pump and the retailer's market share and marketing strategy towards sale of solar water pump.

Primary data was collected from the farmers who installed solar water pump and retailers that sell solar water pump in Coimbatore constituted the study respondents. Data was collected through a well structured and pretested interview schedule. Nanjappa road is said to be the pump dealers hub of Coimbatore were majority of the retailers in the study were selected. The total sample size was 40 among which 30 of them were farmers and 10 of them were retailers. The total sample size was 40 among which 30 of them were farmers and 10 of them were retailers. Convenient sampling method used to select the samples for the study. The farmer's interest assessed with landholding size, level of education, information source for purchase, and the problems faced with solar water were analyzed using conventional analysis and

reasons for purchase of solar water pump were analysed using Garrett ranking. While the Market share of Solar water pump retailers in Coimbatore and the marketing strategy were analysed using conventional analysis, while farmers perception towards the purchase of solar water pump

It is inferred from the table 2, that majority of the sample farmers 53 per cent were in the age of more than 50 followed by 16 per cent in the age of 41-50 which shows that farmers of more experience in cultivation has interest towards the solar water pump.

From the table 3, it is inferred that most of the sample farmers 46 per cent had primary level education, followed by 33.33 per cent were illiterate and a meagre 3.33 per cent pursued a school graduate level education.

It is inferred from the size of landholding that majority 53 per cent of the sample farmers hold land size of 2-4 acres followed by 30 per cent of farmers with 5-10 acres clearly shows that there is a huge potential for solar water pump.

It is figured out from the table 5, that 70 per cent of the farmers got to know about solar water pump through fellow farmers followed by family members 13.33 per cent and a meagre 6.67 per cent of farmers had self

interest to know more about the solar water pump irrigation.

It is interpreted that reasons for purchase of solar water pump listed in table 6, were said to be power cut, no electricity connection and cost of diesel.

**To analyze the retailers share and marketing strategy followed towards the sale solar water pump**

To find the major retailer selling solar water pump and thereby the marketing strategy evolved in selling the solar water pump to farmers were analysed. A represent the data a simple percentage analysis was used. The results were formulated in the figure below.

The above fig 4, showed that the market share of each sample retailer among which the majority 21 per cent retained by KCP solar, followed by 21 per cent Jaisun Solar followed by 10 per cent Koondaas Automation Pvt Ltd and other retailers.

From the table 7, it was evident that most of the farmers felt that the current irrigation required high cost for the operation, followed by the perception that farmers had very low awareness on the solar water pumps and its maintenance.

**Table.1** Number of Solar Water Pump Installed in India and Tamil Nadu

State	2016-17	2017-18	2018-19	2019-2020	Total
<b>Tamil Nadu</b>	849 (1.60)	0 (0)	221 (0.34)	475 (7.62)	1545 (0.85)
<b>India Total</b>	53,044	56350	65892	6235	1,81,521

(Source: Data collected from Mercomindia.com)

**Table.2** Age Distribution of the Respondents

S.No	Age (Years)	No. of Respondents	Percentage
1.	Less than 30	1	3.33
2.	31-40	5	16.66
3.	41-50	8	26.66
4.	More than 50	16	53.33
	Total	30	100

**Table.3** Educational Level of the Respondents

S. No	Education	No. of Respondents	Percentage
1	Illiterate	10	33.33
2	Primary	14	46.66
3	High school	5	16.66
4	Graduate	1	3.33
	Total	30	100

**Table.4** Size of Landholding (acre)

S. No	Size of landholding (Acre)	No. of Farmers	Percentage
1	<2(Marginal)	0	0.00
2	2-4 (Small)	16	53.33
3	5-10 (Medium)	9	30.00
4	>10 (Large)	5	16.67
	Total	30	100.00

**Table.5** Information Source for the Purchase of Solar Water Pump

S. No	Source of Information	No. of Respondents	Percentage (n=30)
1	Agrl.Dept	3	10.00
2	Other farmers	21	70.00
3	Self interest	2	6.67
4	Family members	4	13.33
	Total	30	100.00

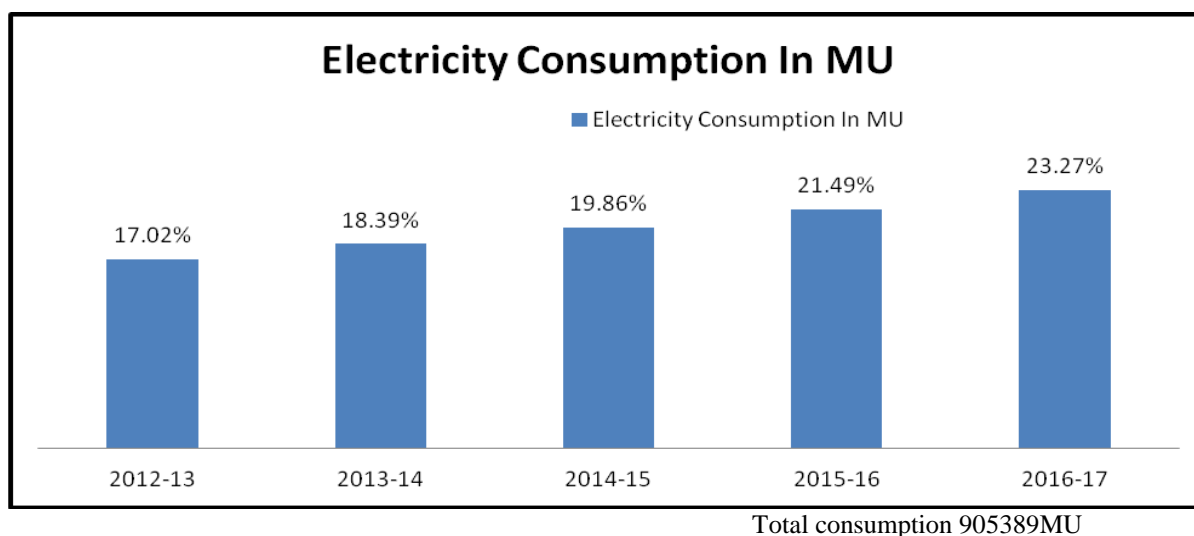
**Table.6** Reasons for Purchase of Solar Water Pump According to the Rank Order

S.No	Reasons	Garrett score	Rank
1	Power Cut	40.4	I
2	No Electricity connection	47.2	II
3	High cost of diesel	61.4	III

**Table.7** Farmers Perception towards Solar Water Pump

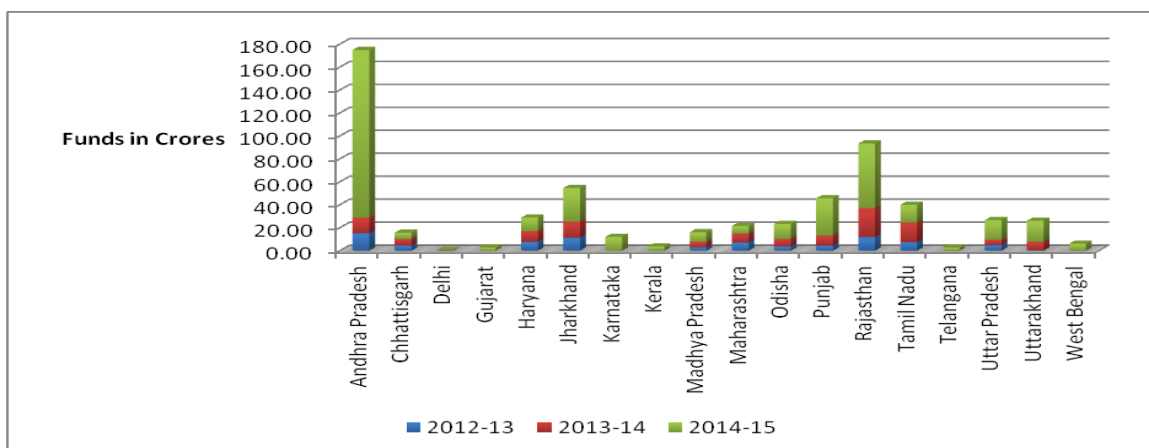
S.No	Statement	Mean score	Standard Deviation
1	I feel that conventional irrigation expenditure is high	4.57	0.50
2	There is no much awareness on solar water pump and its maintenance	3.67	1.07
3	Need more subsidy and credit for purchase of solar water pump	3.43	1.09
4	I perceived the zero operational cost of solar water pumps would be beneficial	3.13	1.23

**Fig.1** Electricity consumption in Agricultural sector (2016-17)



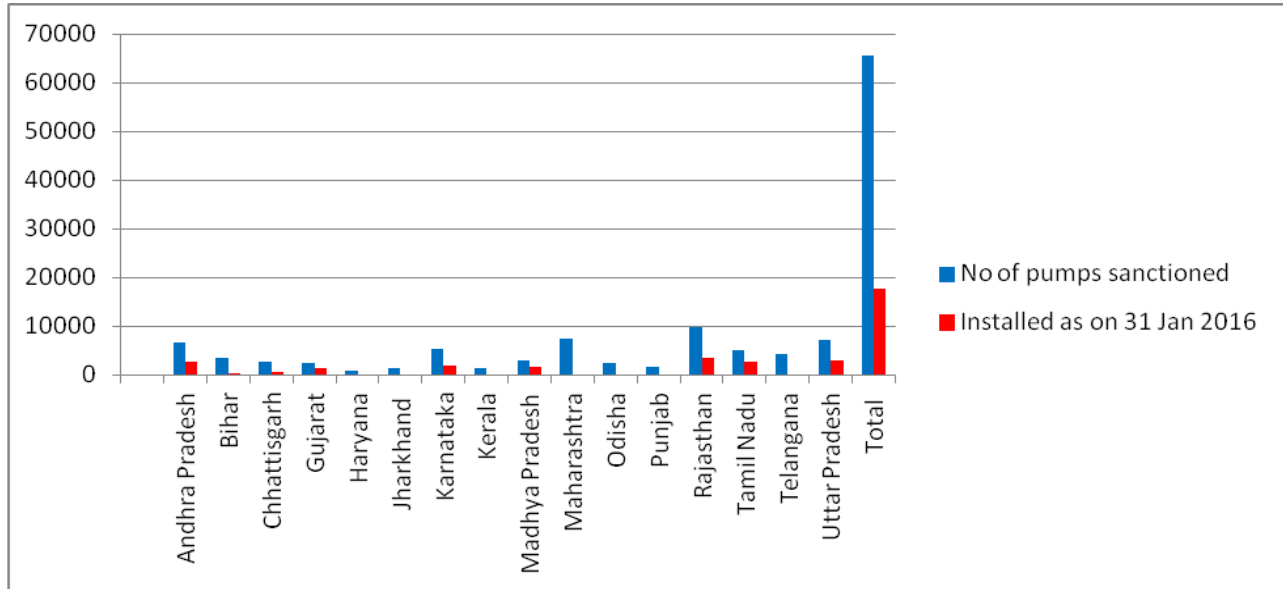
Source: Indiastat data on renewable energy

**Fig.2** Selected State-wise Funds Sanctioned/Released Government for Setting up Solar Power Plants in India (2012-2013 to 2014-2015)



(Source: Indiastat data on renewable energy)

**Fig.3** Status of Solar Pumps for Irrigation Installed (as on 31.01.2016) by Various State Nodal Agencies



(Source: Indiatat data on renewable energy)

**Fig.4** Share of retailers percentage in selling solar water pump in Coimbatore

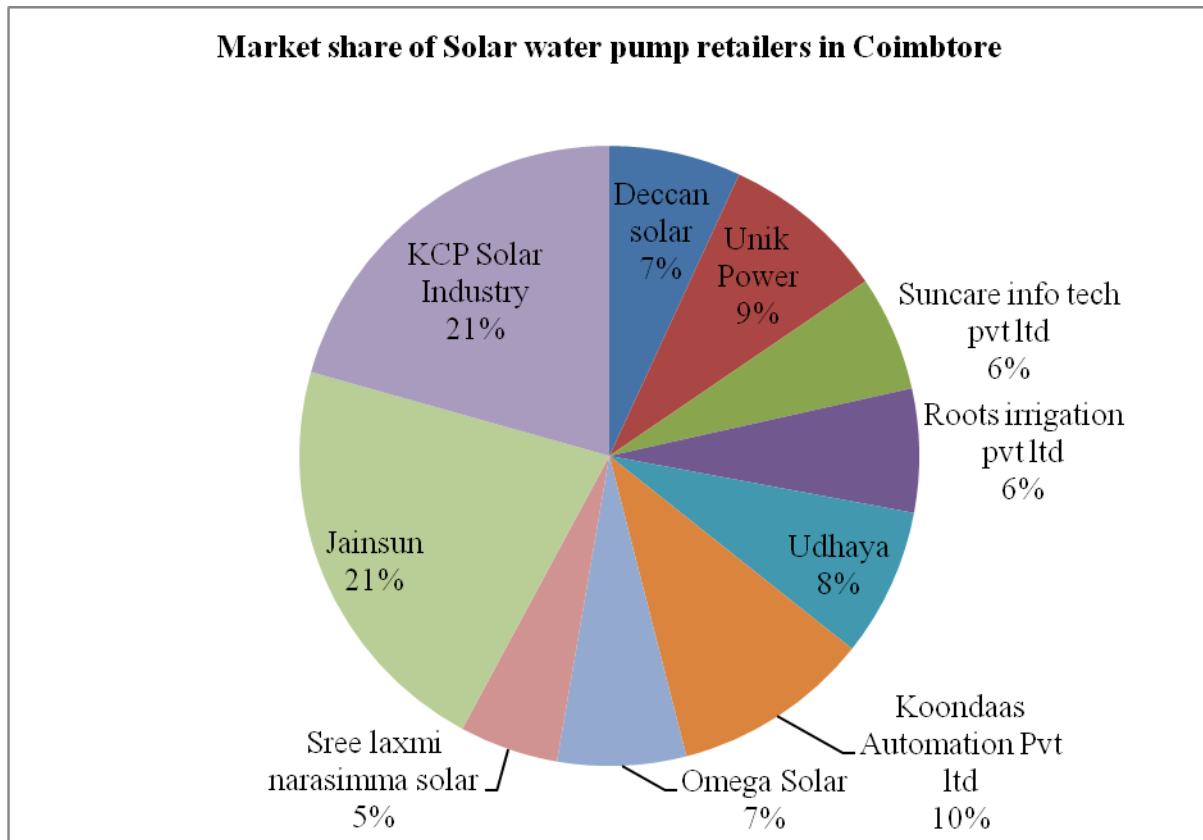
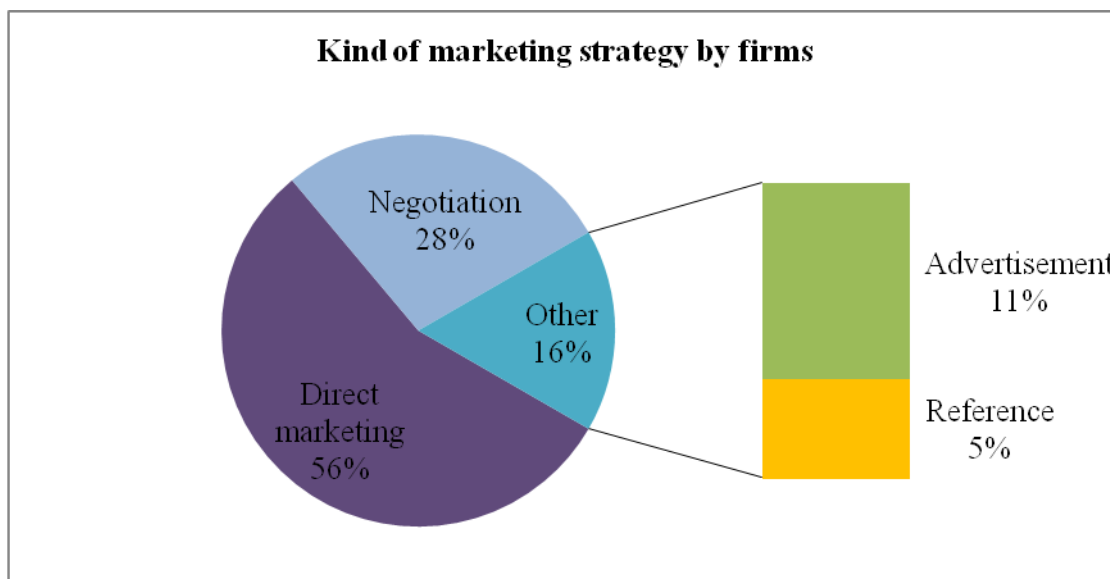




Fig.5 Kind of Marketing Strategy Followed by firms



The above fig.5, showed that kind of marketing strategy used by the sample retailers for selling the solar water pump. The marketing strategy followed by sample retailers was direct marketing, negotiation, advertisement and reference. Among the strategies majority of the retailers 56 per cent adopted direct marketing followed by 28 per cent of the retailers adopted negotiation.

In conclusion, this study provides individual solutions to water problems where conventional water supply systems fail or simply cannot reach. The outcome drawn from the study is that the farmers purchased solar water pump because of the reason like no electricity, high cost of diesel and even though the cost was said to be high, they would prefer solar water pump than other system. The study concluded that the sample farmers have no awareness on the brand of solar water pumps available in the market. Hence, there exists opportunity for solar water pump retailers to promote their product by various marketing techniques with good quality product. Since most of the farmers were uneducated about the product, the level of utilization was low among the marginal

and small farmers. To bring a wide use of the solar water pump, more credit by banks and government schemes shall be promoted to increase the purchase and utilization of solar water pump.

It is suggested to heighten the solar water pumps sale and purchase, both the government and the sellers should focus on adopting context-specific deployment strategies and customer-centric approach, improve target of its subsidies and improve awareness on the technology (Jain and Shahidi, 2018). Only a multi-pronged approach sensitive to the farmers' need, social context and environmental situation would help achieve sustainable deployment of solar for irrigation.

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