

To study the Socio-Economic Impact of Solar Based Irrigation System: Focus on Dang District.

Organization name: AKRSPI, Gujarat

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Stream: MBA development
management

Roll no. 0027

About AKRSPI Organization

- The (AKRSPI) Aga Khan Rural Support Program (India) is a non-governmental organization dedicated to improving the lives of rural communities in India.
- Its organization established in 1984, working under the Aga Khan Development Network (AKDN). Focus on improving the lives of rural communities across India.
- Geographical reach: Over 3.5 million people in 3255 villages in Gujarat, Madhya Pradesh, Bihar, and Maharashtra.

MISSION

"AKRSP(I) exists to enable the empowerment of rural communities and groups, particularly the under-privileged and women, to take control over their lives and manage their environment, to create a better and more equitable society"

Vision

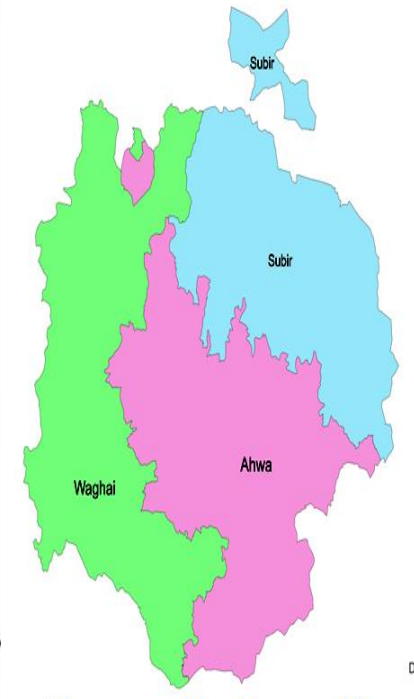
The Vision "AKRSP(I) can contribute in India to the creation of an enabling environment in which rural people can identify their needs and priorities and with professional support, organize themselves to improve the quality of their lives"

VALUES

- Empowerment
- Collaboration
- Transparency
- Equity
- Professional Excellence
- Responsive to Change

Profile Of Dang District

- Dang district, one of the most backward in Gujarat, located on the border of Maharashtra and Gujarat has a predominantly rural population (89.19%) and has limited livelihood options due to its hilly terrain and dense forests.
 - Agriculture, mainly rain-fed, is the primary occupation, with major crops such as paddy, nagli, varai, and groundnut grown during the monsoons. And gram, cowpea, and wheat are grown to a lesser extent in Rabi.
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|---|---|
| <ul style="list-style-type: none">▪ Area: 1,764 sq. km▪ Population (2011 census): 226,769▪ Terrain: Hilly, covered with thick forests▪ Major rivers: Gira, Purna, Khapri, Ambika▪ Population (2011 census): 226,769▪ Tribal population: 94%▪ Below Poverty Line (BPL): 73.84%▪ Scheduled Tribes: 98% | <p>Key Issues:</p> <ul style="list-style-type: none">▪ Economic backwardness▪ Mass migration due to lack of local employment opportunities▪ Need for improved agricultural productivity and irrigation facilities for socio-economic development |
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Introduction

- Sustainable agriculture is crucial for achieving sustainable development goals such as poverty alleviation, food security, inclusive economic growth, and sustainable production methods.
- 56.4% of India's population is engaged in agriculture, in changing times, climate change, shrinking agricultural land, water scarcity, and lack of technology are increasing problems such as rural-to-urban migration, unemployment, and poverty.
- AKRSPI undertakes a multi-pronged approach to rural development focusing on several key areas including agriculture and natural resource management, livelihood development, women empowerment, education and health, climate change, and environment.
- This organization has been actively working in the Dang district since 2010. Intervening through solar-powered irrigation systems under various projects in the Subir and Ahwa blocks of the district. These initiatives aim to address the problem of migration from the district by increasing local employment and income opportunities in agriculture and allied activities.

Research purpose

- In the Dang district (Ahwa and Subir blocks), problems such as agricultural irrigation problems, high cost of diesel compared to production, lack of irrigation facilities unavailability of electricity connection, or uncertainty of power supply, are prevalent.
- This research aims to evaluate the socio-economic impact on farmers of the solar-based irrigation pump interventions implemented by AKRSP(I). It will explore the effects of migration, farmer empowerment especially women and widows (participation in group meetings and decision-making), group management, farming practices, crop diversity, crop production, and farm income.

Study objective

- The objective of this study is to evaluate the socio-economic impact of solar-based irrigation pump intervention in Ahwa and Subir Blocks of Dang District, undertaken by AKRSPI Organization under various projects.
- Identify the potential benefits and challenges of solar-based photovoltaic (PV) pumps



Research problem

- Despite national and international research highlighting the benefits of solar irrigation for agricultural productivity, crop yield, income, and the environment, its impact in remote areas like Dang, Gujarat is unclear.
- The situation, geography, problems, and background, are different to Dang district.
- Various projects were implemented under AKRSP(I), among which "Solar Based Irrigation Pump" was an important intervention, its social and economic impact needed to be understood.
- This study also provides useful insights for understanding the socio-economic impacts of solar-based irrigation pumps in the context of the Dang district and its challenges, benefits, and implications, as well as valuable insights into the future design of such interventions in remote areas.

Research question

1. What is the impact of solar-based irrigation systems on farm productivity, crop diversity, crop yield, and farm income compared to conventional irrigation methods?
2. How effective are solar-based irrigation systems for farmer empowerment (group decision-making) and farmer mobilization (group formation, its management)?
3. What are the potential benefits and challenges of solar-based photovoltaic (PV) pumps?



Literature review

1. Reduction of high operational cost of diesel engine

<https://www.mdpi.com/1996-1073/15/3/1198>

2. Due to the solar-based irrigation system, agricultural production and income increased even during the dry season.

https://www.researchgate.net/publication/368917502_Solar-based_irrigation_systems_as_a_game_changer_to_improve_agricultural_practices_in_sub-Saharan_Africa_A_case_study_from_Mali

3. Solar irrigation systems reduce production costs.

<https://www.adb.org/publications/does-renewable-energy-increase-farmers-well-being-bangladesh>

4. Solar-based irrigation system is an economically viable option for long-term investment

https://www.researchgate.net/publication/296904217_Economic_Analysis_of_a_3KW_Solar_Based_Irrigation_System_and_Comparison_with_its_Diesel_Based_Counterpart

Research design

Descriptive research was conducted using qualitative and quantitative methods. A descriptive cross-sectional study was conducted using a post-test only design to measure potential factors. Both primary and secondary data were collected for research purposes. Solar pump user groups and group members were the main target of this study.

Study setting

This study explores the socio-economic outcomes of farmers adopting solar-based irrigation in two blocks, Ahwa and Subir, of the Dang district. The diverse agricultural landscape and hilly terrain of this district in the southeastern part of the state of Gujarat provide a unique backdrop for the use of renewable energy (solar-based irrigation systems). Dang district is a hilly remote area with a 94% tribal population and 73.84% of people belong to the BPL category. Generally, four months of agriculture and 6-8 months of migration are observed in this area.

Duration of study: 15th March 2024 to 16 Jun 2024 (3 months)

sample size: Sample size: 30% of the total 74 solar-based irrigation pump user groups i.e. 21 solar-based irrigation pump user groups and 3,4 from each group actively participating and adopting solar-based irrigation s were considered as a sample of 63 farmers.

Sampling technique: A study would use of the technique of Simple Random Sample in research.

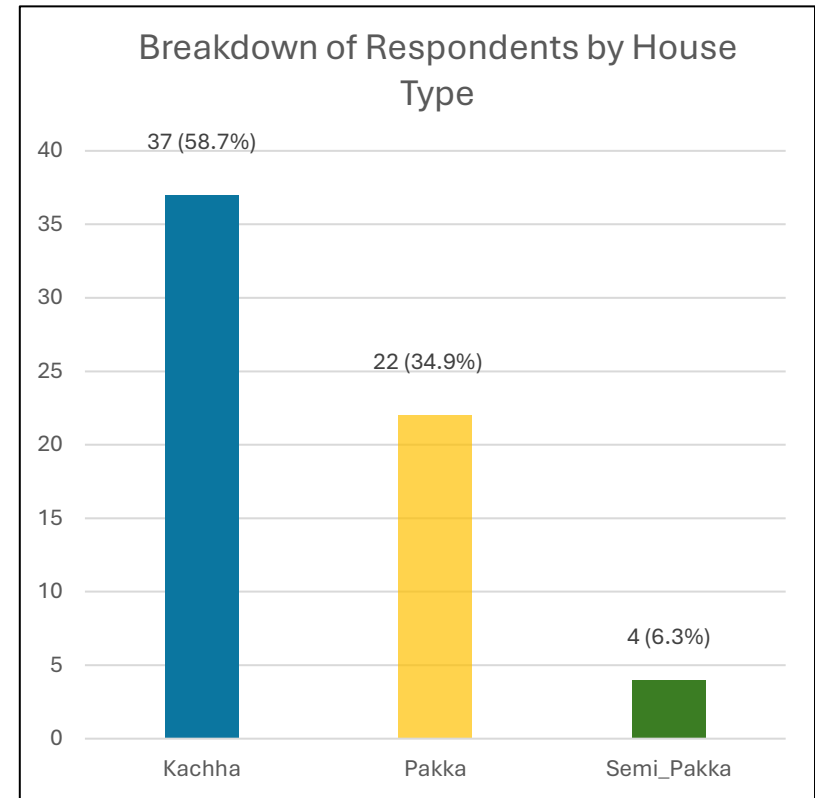
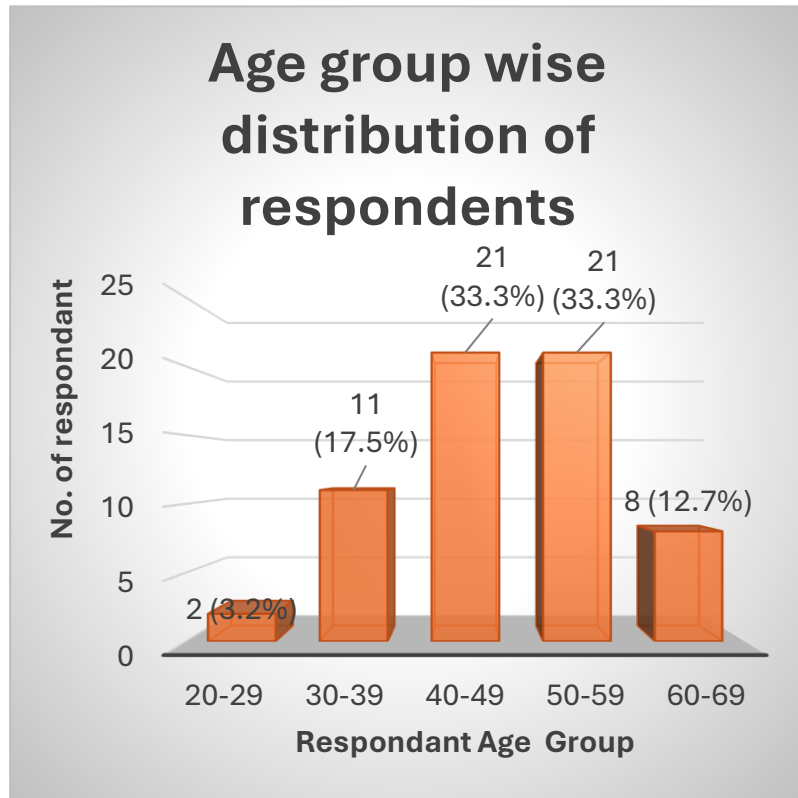
Data collection procedure: Data were collected by conducting surveys and interviews using structured questionnaires. In selected areas, meeting with solar group farmers, in-depth interviews, and observations provided qualitative insights into the local context.

Study instruments: The survey was conducted using a structured questionnaire which consisted of both quantitative and qualitative questions. The survey was mainly done using Cobo tools.

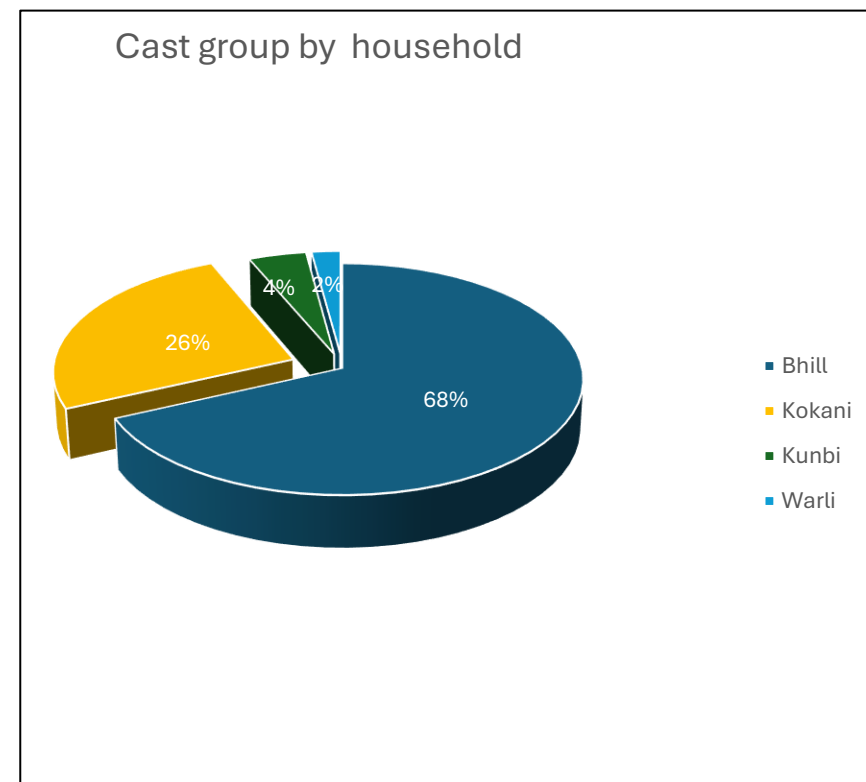
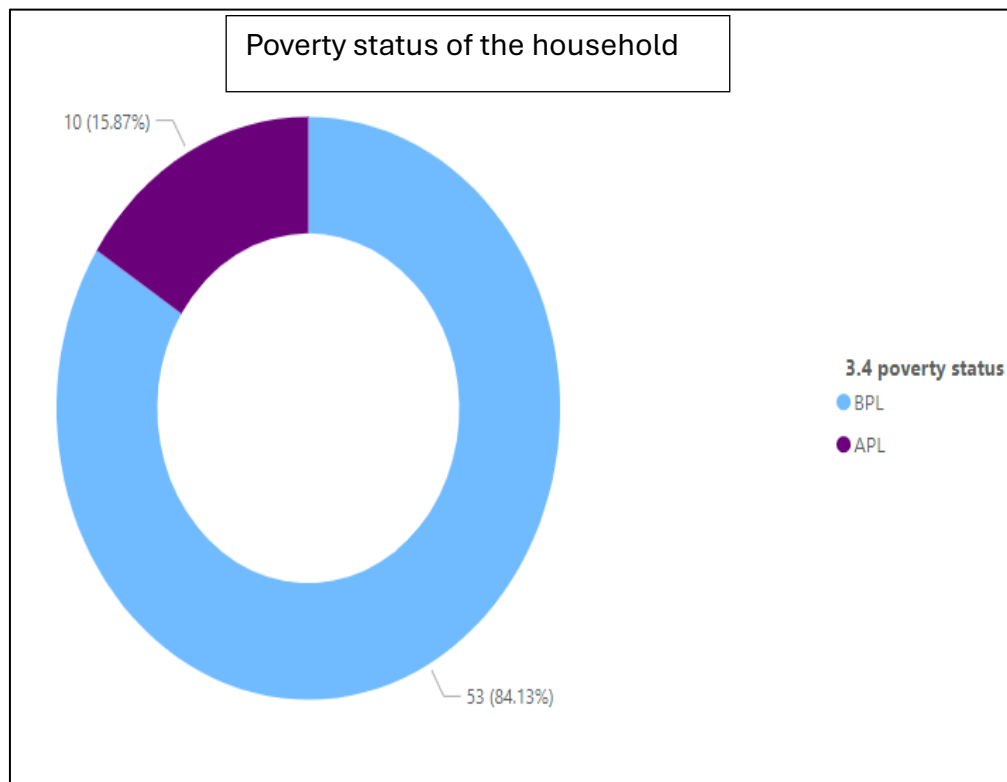
Data analysis: Microsoft Excel, power bi

Analysis and finding

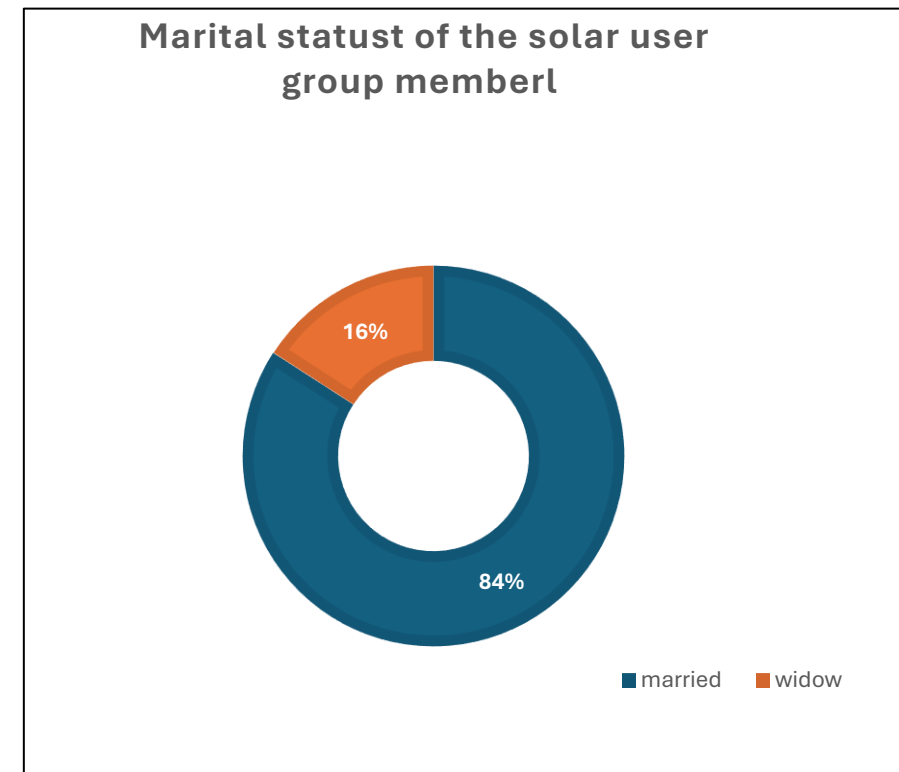
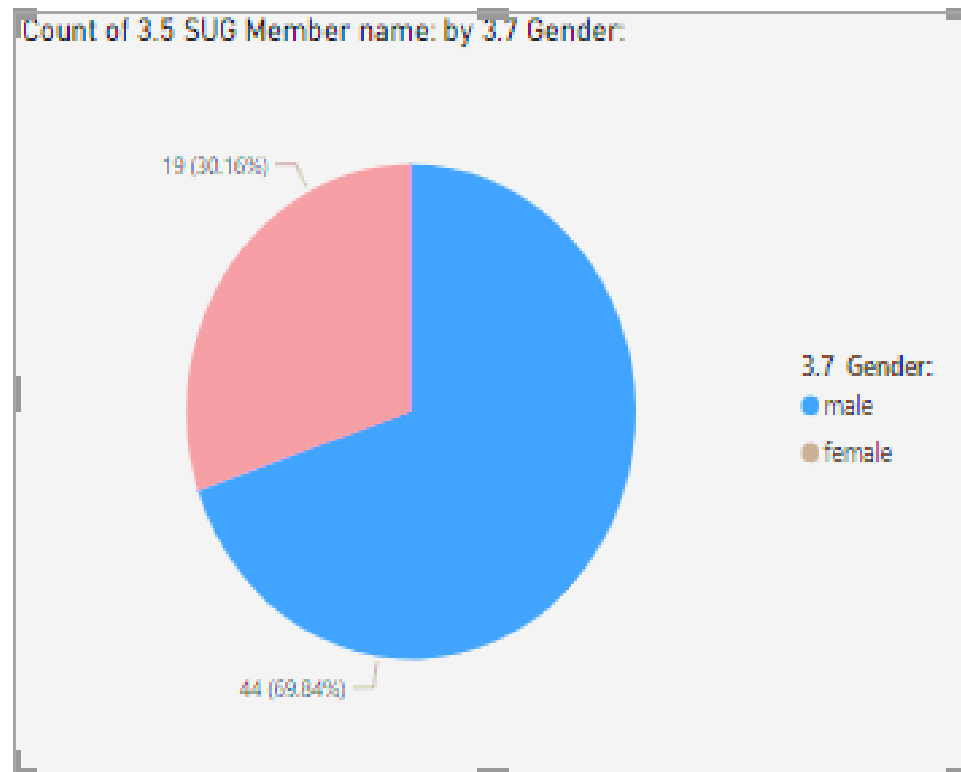
Basic information of the respondent



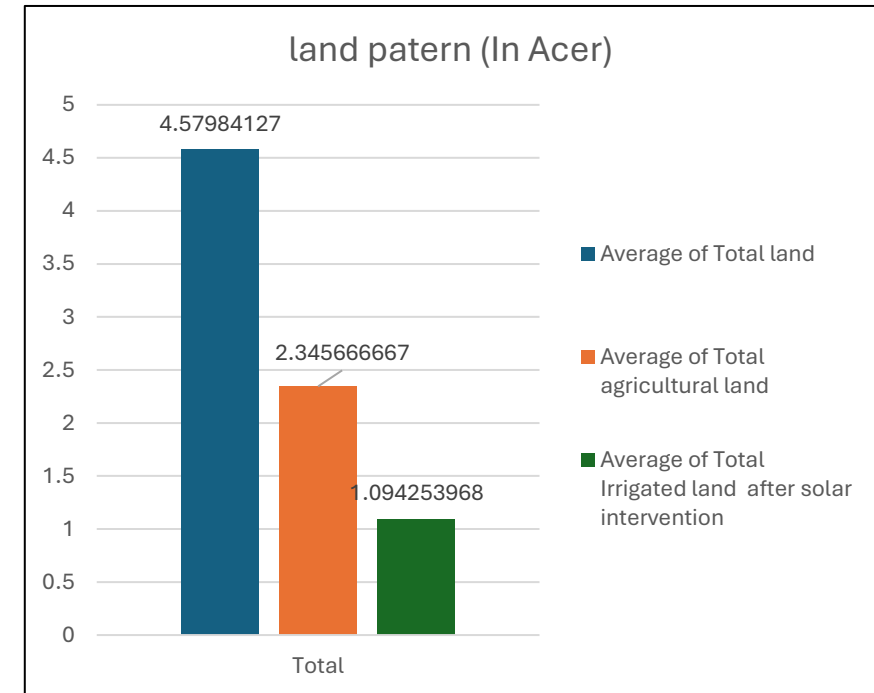
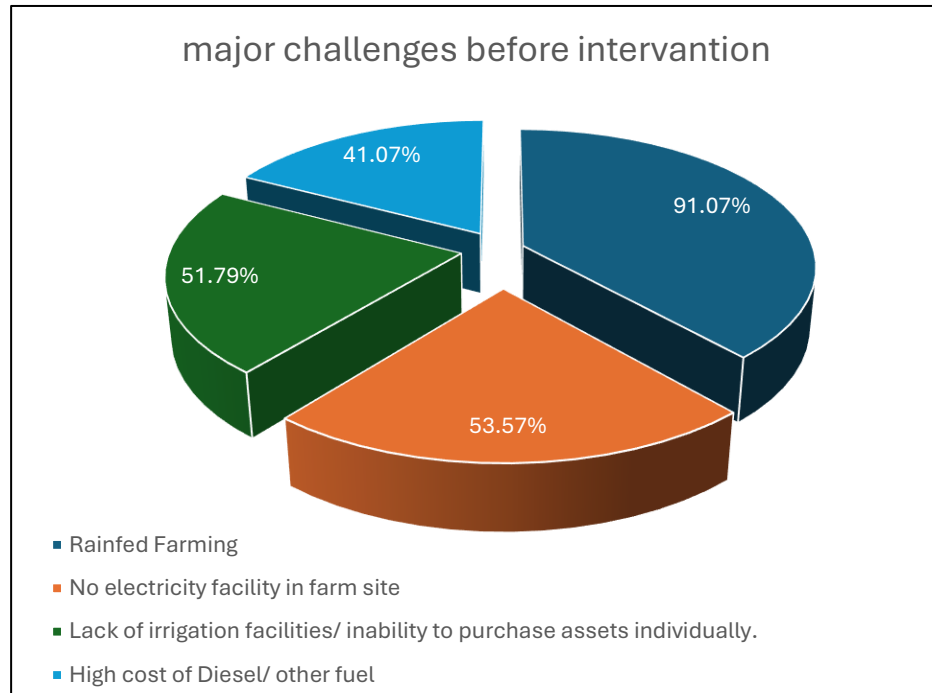
Poverty Status And Cast Group



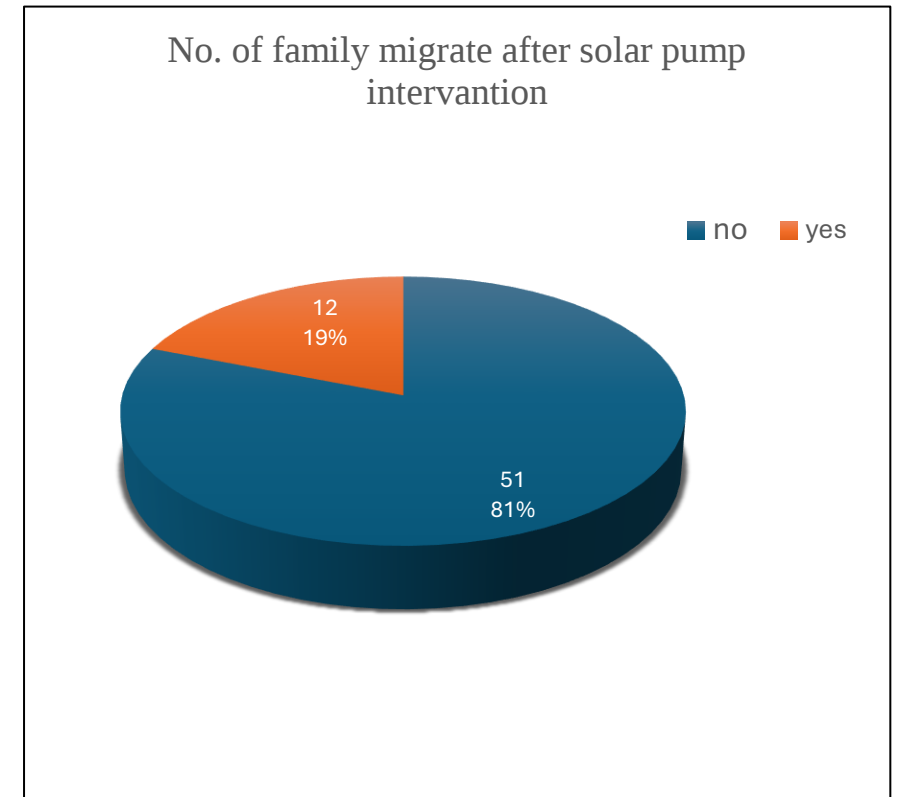
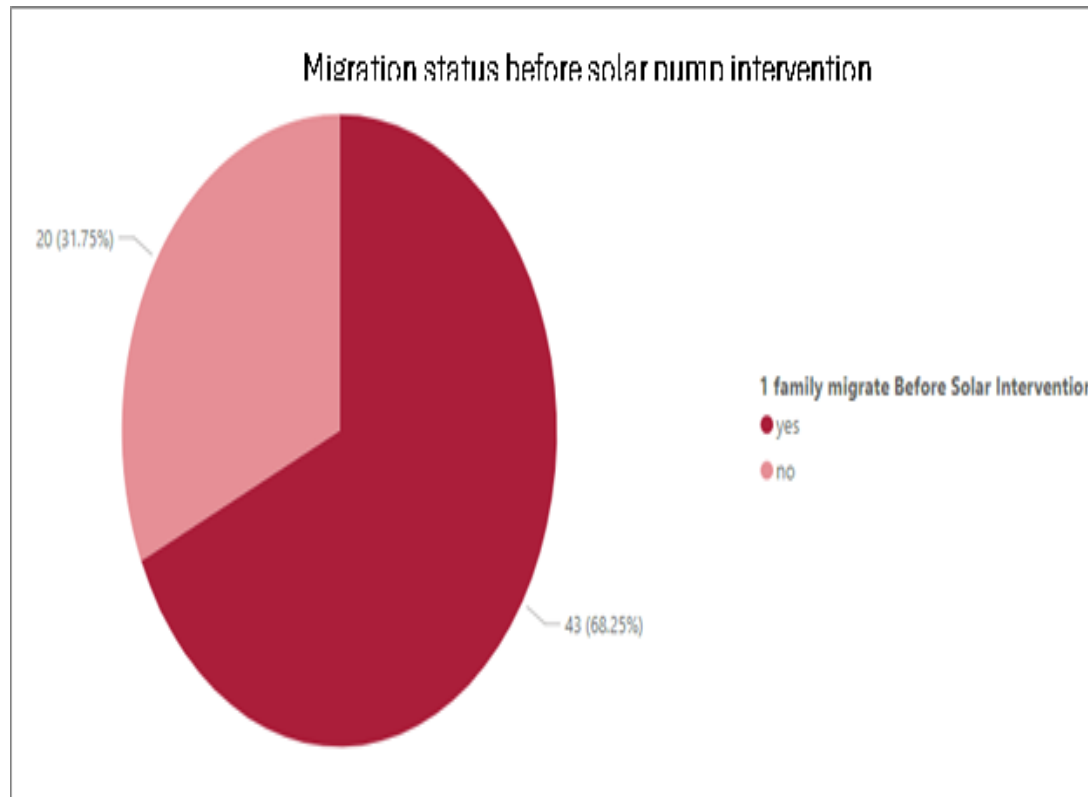
Gender And Marital Status Of SUNG Member



Challenge And land pattern



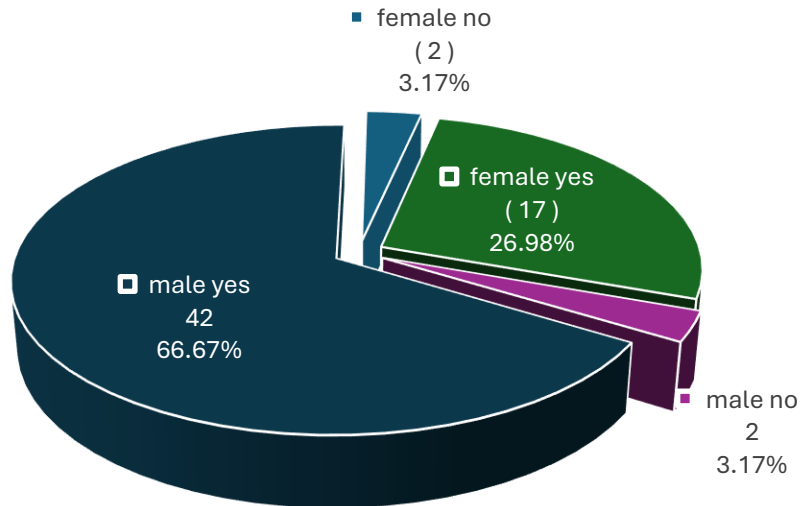
Migration Status After And Before Intervention



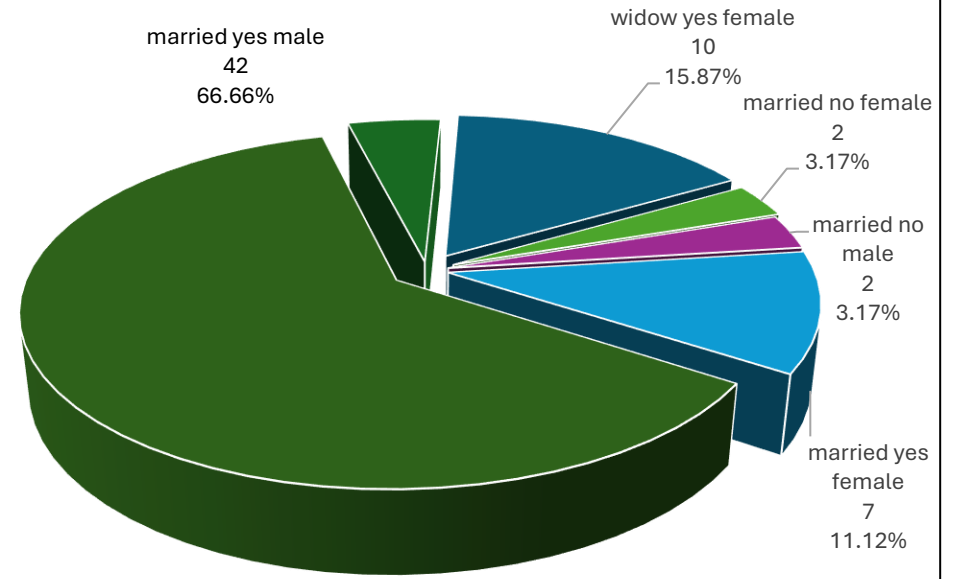
Empowerment

(participation in group meetings and decision-making)

SUG member participation in group meeting and decision making

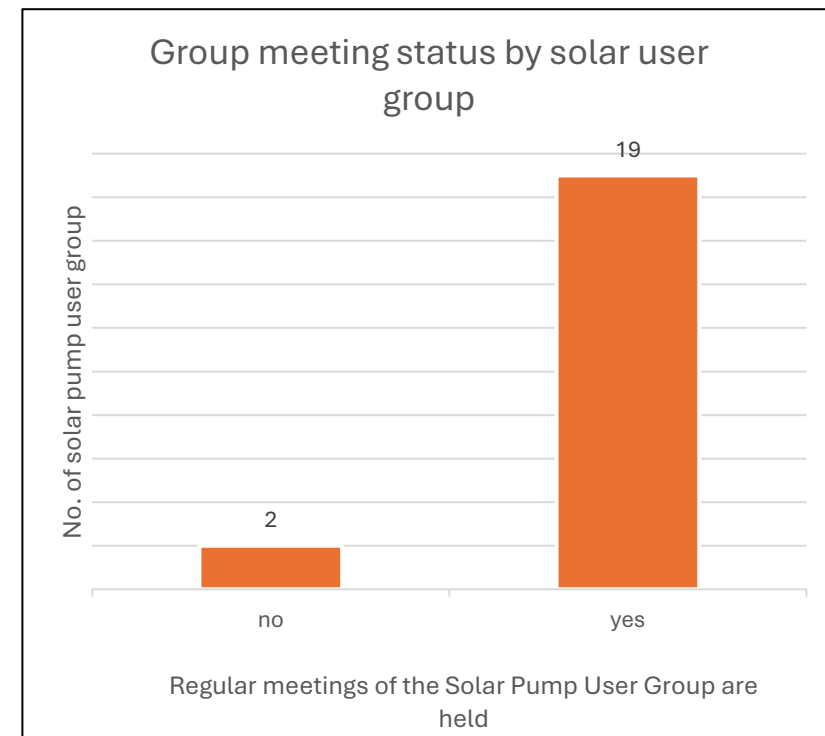
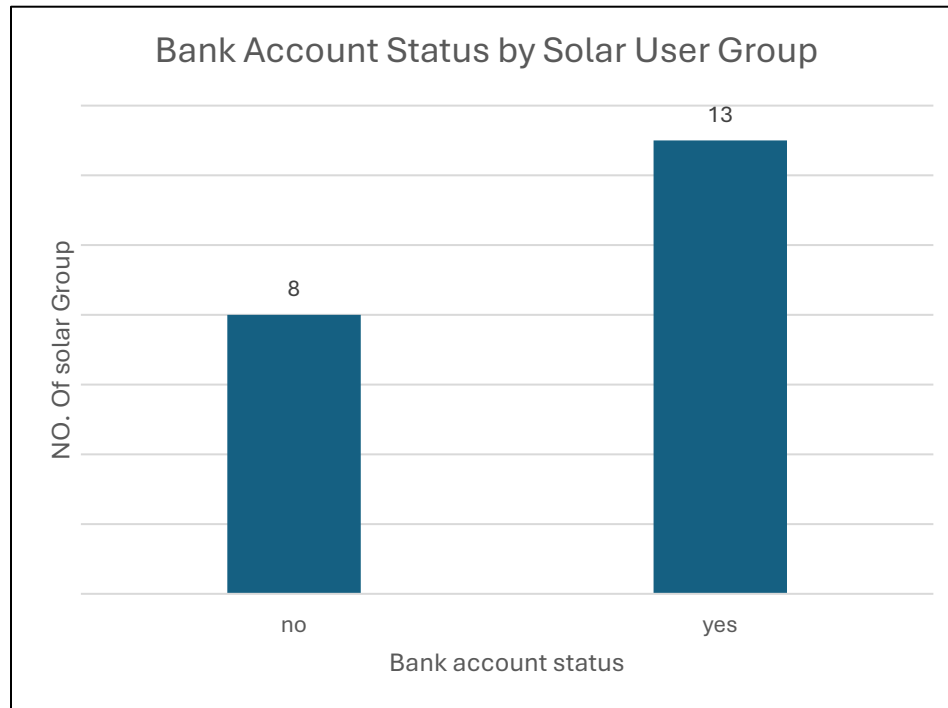


marital status and gender wise participation in the group meeting and decision making

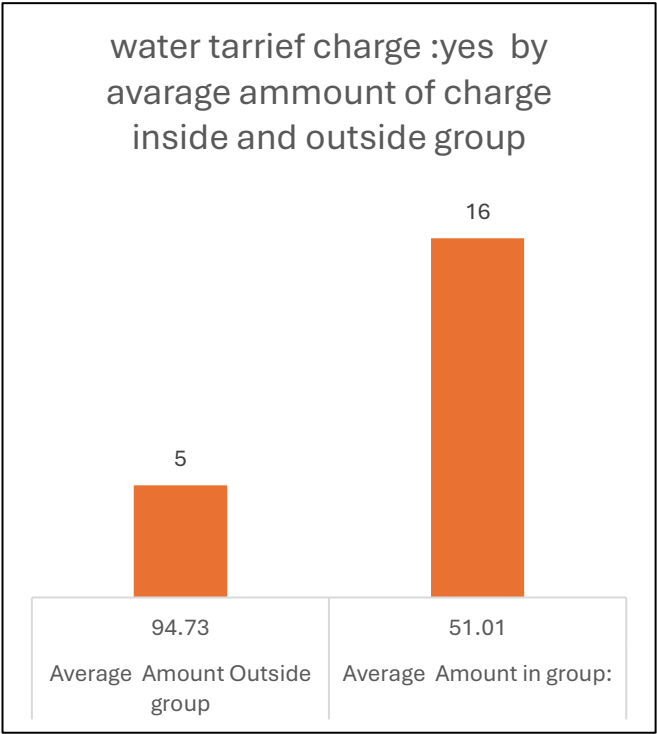
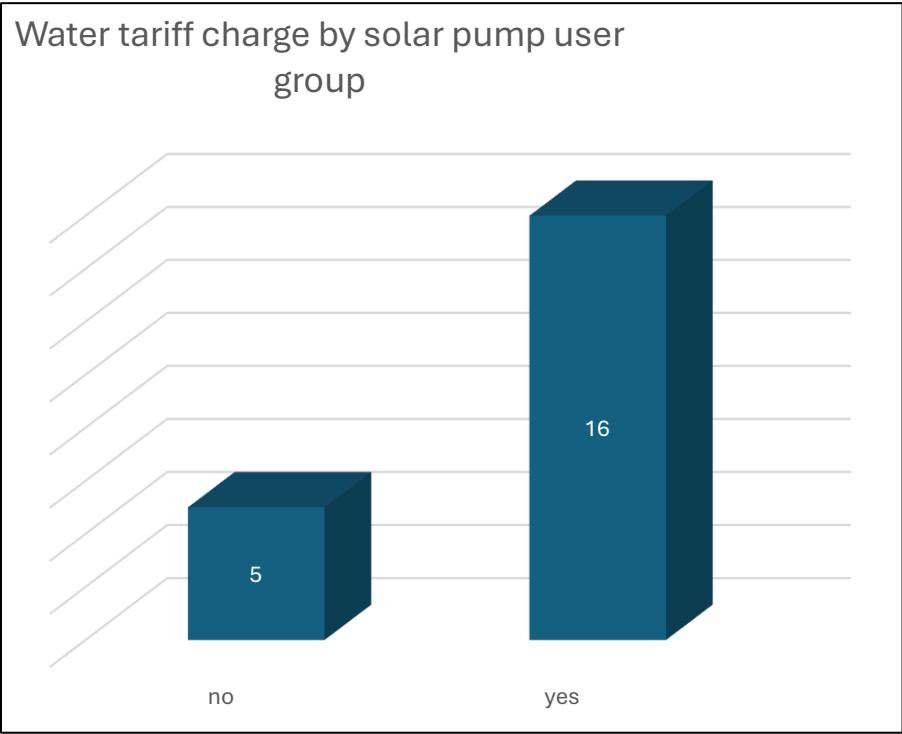


Group management

Group meetings and bank linkage

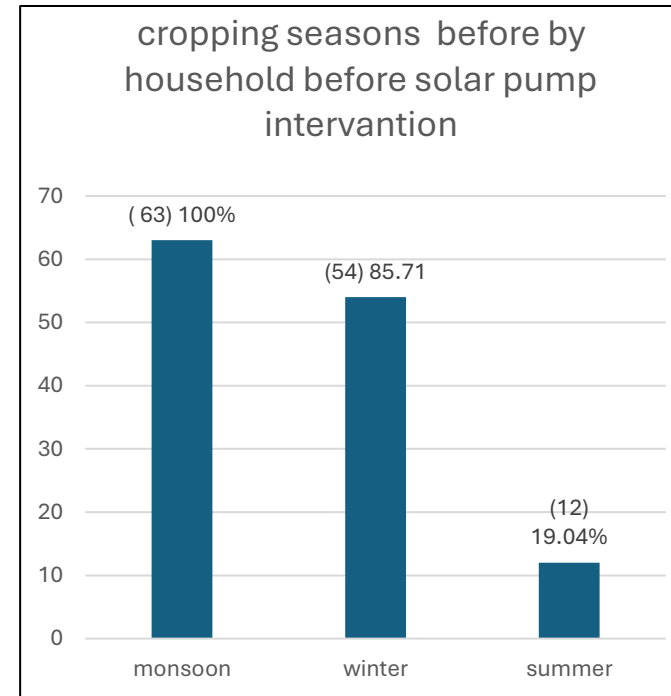
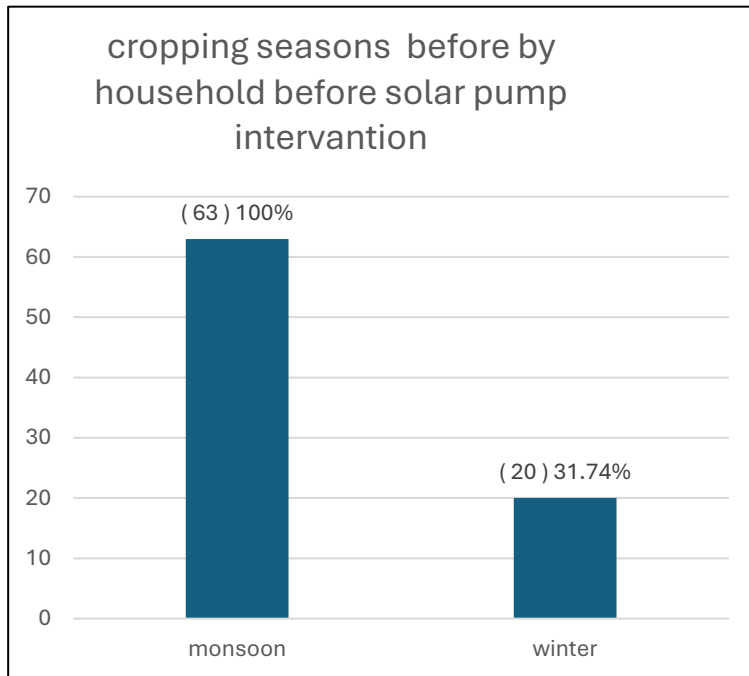


Water taffies charge and amount

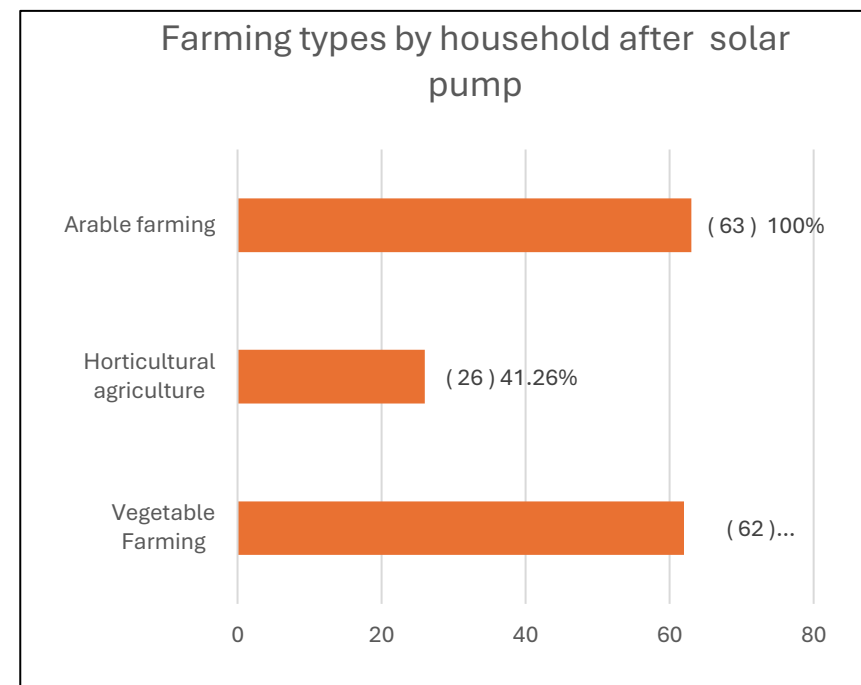
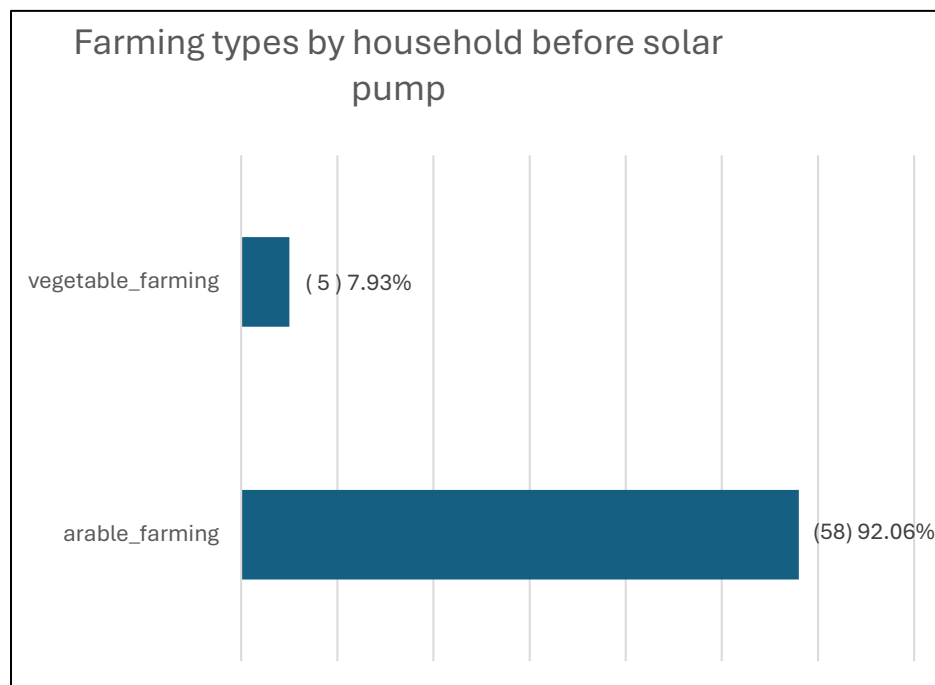


Economic impact

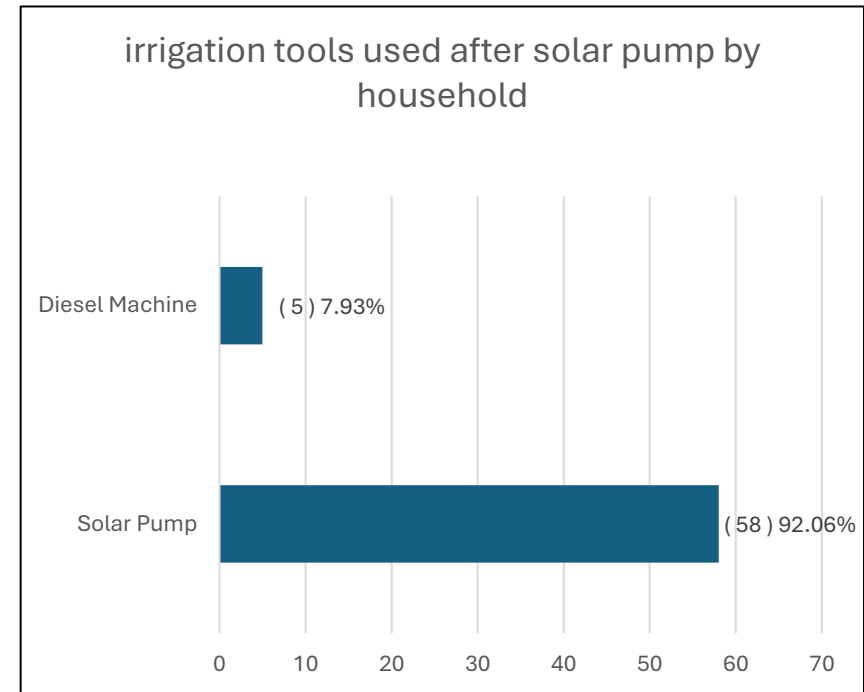
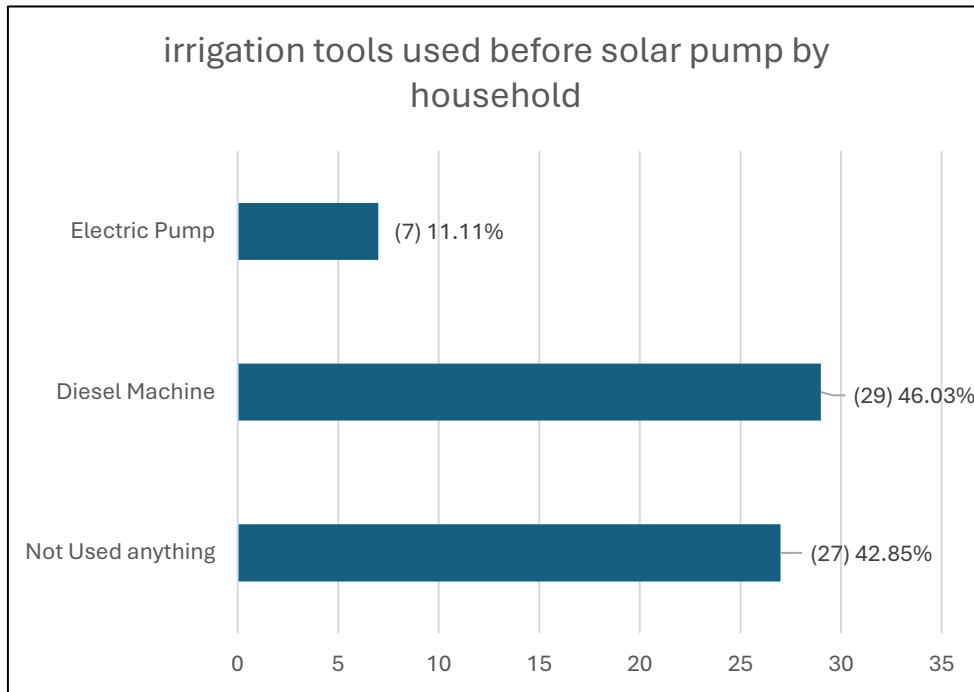
Cropping season before and after intervention



Farming types before and after intervention



Used of irrigation tools before and after intervention



Crop-wise farm productivity, crop yield, and farm income before solar pump intervention

Total Household = 63							
Season Name	Crop name	No. Of household	The area under crop (Acer)	Average productivity (quantal)	Average sales	Average price/ Quantal	Average total income
Rabbi	Chana	19	0.349	0.707	0.0789	1000	342.1
	Cowpea	6	0.2063	0.525	0	0	0
	Groundnut	1	0.29	3	3	1000	3000
	Maize	1	0.15	0	10/pice	10/pice	2500

Crop-wise Average farm productivity, average crop yield, and average farm income after solar pump intervention

Total Household = 63							
Season Name	Crop name	No. Of household	The area under crop (Acer)	Average productivity (quantal)	Average sales	Average price/ quintal	Average total income
Rabbi	Okra	12	0.426	5.741	5.508	5300	28741.67
	Groundnut	15	0.507	2.053	51.4	4937.33	13500
	Chana	25	0.285	2.786	0.085	576	492.48
	tomato	2	0.137	1.1	0.9	3100	2880
	Ridged guard	1	0.5	25.71	25.71	3500	89985
	Sunflower	1	0.2	0.5	0.5	4000	2000
	Brinjal	9	0.2605	1.744	1.388	3000	4027.77
	Sesame/mole	1	0.074	0.15	0	0	0
	Nagali (Ragi)	1	0.0496	0.2	0	0	0
	peanut	12	0.1944	0.405	0	0	0
	cowpea	29	0.291	1.958	0	0	0
	mung bean	3	229	0.4	0	0	0
	Onion	1	0.15	3	0	0	0
	Maize	0.3221	0.8	0	0	0	0
	Udad	15	0.2546	0.5433	0	0	0
	Tuur	5	0.282	476	0	0	0
Summer	Cowpea	12	0.222	0.361	0.0041	250	12.5
	Chana	4	0.191	0.31	0.0625	1650	412
	Tomato	3	0.107	23.17	23.17	3333.33	80451.67
	Maize	2	0.1625	0	10/pice	10/pice	7000
	Brinjal	3	0.0243	0.62	0.5533	800	6640
	bitter guard	6	0.21	16.83	78.66	5691.66	31783.33
	Chili	1	0.074	0.5	50 kg	20000	10000
	mung bean	1	0.14	1	1	5000	50000
	Ridged guard	1	0.29	0.90	0.90	3500	3150
	Groundnut	1	0.74	2	0	0	0
	Onion	1	0.15	2	0	0	0
	Peanut	1	0.15	0.2	0	0	0
	Sesame/mole	1	0.15	0.1	0	0	0

Challenges

- Despite the positive results, challenges remain, such as proper markets, transportation facilities, water scarcity, etc.
- In addition, ongoing support and training are required to optimize pump use crop management, and water management practices ensuring long-term benefits.
- Certain groups of solar pump users have adopted new farming practices like drip irrigation, and mulching, and other farmers are deprived of these, so proper planning is necessary when water is a problem.
- Some solar pump user groups do not have bank accounts, do not hold meetings on time, and do not charge any water usage charges, although these groups may close in the future.
- Water scarcity: Most of the solar pumps are installed on check dams but some of the check dams are filled with earth and do not stop the water so maintenance is required.
- As the market for the purchase and sale of agricultural inputs is far away, local traders benefit and due to this, agricultural activities do not get fair prices.
- Some of the poor farmers do not have the money to cultivate the farm, so the group needs to take appropriate steps for them while they still migrate.

Conclusion

- In conclusion solar pump intervention in Dang district by AKRSPI has revived socio-economic conditions for farmers. Solar-powered water pumps are coming in handy to overcome the lack of irrigation facilities in hilly areas like Ahwa and Subir Talukas of Dang District. These interventions have significantly reduced large-scale seasonal displacement of people and have led to increased livelihoods and more stable living standards.
- Greater participation of farmers, especially women and widows, in solar pump user group meetings and decision-making processes is helping social inclusion and empowerment.
- Strong management practices, including solar pump user group meetings, bank linkages, and water tariff structures, ensure the long-term sustainability of the intervention.
- Interestingly, crop diversity increased. Farmers grow high-value vegetables and horticultural crops, which increase farm productivity and income.

Recommendation

- Water is a major problem here despite abundant rainfall. Since water is the main basis of agriculture, there is a need to pay attention to maximum water retention. Since the check dam is the basis of solar pump irrigation in this area, it needs to be maintained.
- As the people have newly started farming in the rabbi and summer seasons, they need to be trained in different farming methods, practices, water planning, drip irrigation, and other methods that will save water, and get more crop yield at lower cost.
- In this area, even though the crops of okra and kale earn more money, the poor and small farmers cannot afford it because of the lack of transport and high input costs. For this, it is necessary to make efforts like group buying and selling, and group crop planning.
- Solar pump user groups should be linked with farmer producer companies for buying and selling their agricultural produce to eliminate middlemen and benefit farmers.
- Interventions like integrated agricultural equipment centers and seed banks will be useful for small and medium farmers who do not have agricultural implements or have to hire them.

Thank you...

