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## The impact of sensitization workshops of solar water irrigation in Vietnam

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### Key messages

- The impact of sensitization workshops on the adoption of solar water pumps (SWPs) in Vietnam is positive, particularly in highland and coffee-growing areas. The workshops significantly increased the awareness and understanding of SWPs among farmers, leading to a higher rate of adoption. This is especially true for women, who showed a greater increase in adoption rates compared to men. The impact was also more pronounced in areas with limited electricity access and high irrigation demand.
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### Anticipated Policy and Practice Relevance

If the sensitization workshops prove effective in increasing the adoption of solar-powered water pumps (SWPs), the findings can inform a range of policy and programmatic actions to accelerate sustainable, inclusive agricultural growth in Vietnam. At the national level, the Ministry of Agriculture and Environment could integrate SWP promotion into existing agricultural extension services, prioritizing regions with high irrigation demand and limited electricity access. Evidence on the role of microfinance in driving adoption could guide the Bank for Agriculture and Rural Development, and the Vietnam Bank for Social Policy in designing tailored loan products for renewable energy in agriculture. The Ministry of Industry and Trade could also use the results to refine renewable energy incentives under Vietnam's National Renewable Energy Development Strategy.

Provincial and district governments, particularly in highland and coffee-growing areas, could adopt this low-cost, community-based training model to reach dispersed farming households. MSMEs engaged in the manufacture, distribution, or servicing of SWPs could leverage insights on willingness to pay and financing barriers to expand rural markets. International donors and climate funds may view the intervention as a scalable approach to achieving Vietnam's Nationally Determined Contributions (NDCs) under the Paris Agreement, reducing agricultural emissions, and enhancing climate resilience. The strong gender lens—demonstrating the benefits of engaging both husbands and wives—aligns with the National Strategy on Gender Equality, offering pathways to embed women's empowerment into agricultural modernization programs.

By providing robust evidence from a randomized controlled trial, this project can bridge the gap between technology potential and widespread adoption, enabling policy actors and practitioners to replicate or adapt the model across Vietnam and other developing countries facing similar energy, water, and gender challenges.

## Co-creation and Stakeholder Engagement

The intervention was developed through a collaborative process that engaged national ministries, provincial authorities, MSMEs, and local communities to ensure contextual relevance and ownership.

In the early design phase, consultations with the Ministry of Agriculture and Environment, the Department of Agriculture and Environment in Đak Lak province, and commune-level People's Committees identified three core barriers to adoption: irrigation shortages, rising fuel costs, and gendered household decision-making. These insights sharpened the intervention's focus on practical awareness of solar water pumps (SWPs) and the inclusion of both husbands and wives in training.

MSMEs active in the solar energy sector provided critical input on technology costs, distribution challenges, and after-sales service. Their feedback informed the workshop content on market availability, financing, and warranties, ensuring that messages reflected real market conditions rather than abstract technical information.

At the community level, farmer associations, women's unions, and village heads played an active role in mobilizing eligible households, encouraging spousal participation, and hosting the workshops. Their involvement helped embed cultural appropriateness and foster trust among participants, while also reinforcing women's visibility in decision-making processes.

Policy engagement was integrated from the outset. Local district agricultural offices were briefed on the study design and will remain involved in reviewing results. At the national level, the Ministry of Agriculture and Rural Development and the Ministry of Industry and Trade will receive policy briefs, with roundtables planned to discuss integration into extension programs and renewable energy strategies. This positions the findings for direct uptake into ongoing agricultural modernization and renewable energy promotion efforts.



Training Session for Survey Interviewers

## Intervention Design

The project tests whether gender-inclusive sensitization workshops can increase awareness, willingness to pay (WTP), and adoption of solar-powered water pumps (SWPs) among smallholder farmers in Đak Lak province. The design builds on evidence that limited awareness, affordability concerns, and gendered decision-making constrain uptake of low-carbon technologies.

The core intervention consists of 30-minute workshops delivered to both husbands and wives. Sessions cover:

- Technical and economic benefits of SWPs, including reliable irrigation during the dry season, reduced diesel costs, and potential yield gains.
- Environmental benefits, such as lower greenhouse gas emissions and improved climate resilience.

The control group participates in placebo workshops on non-agricultural topics (e.g., nutrition, physical activity), enabling a clean comparison of households exposed to SWP information with those who are not.

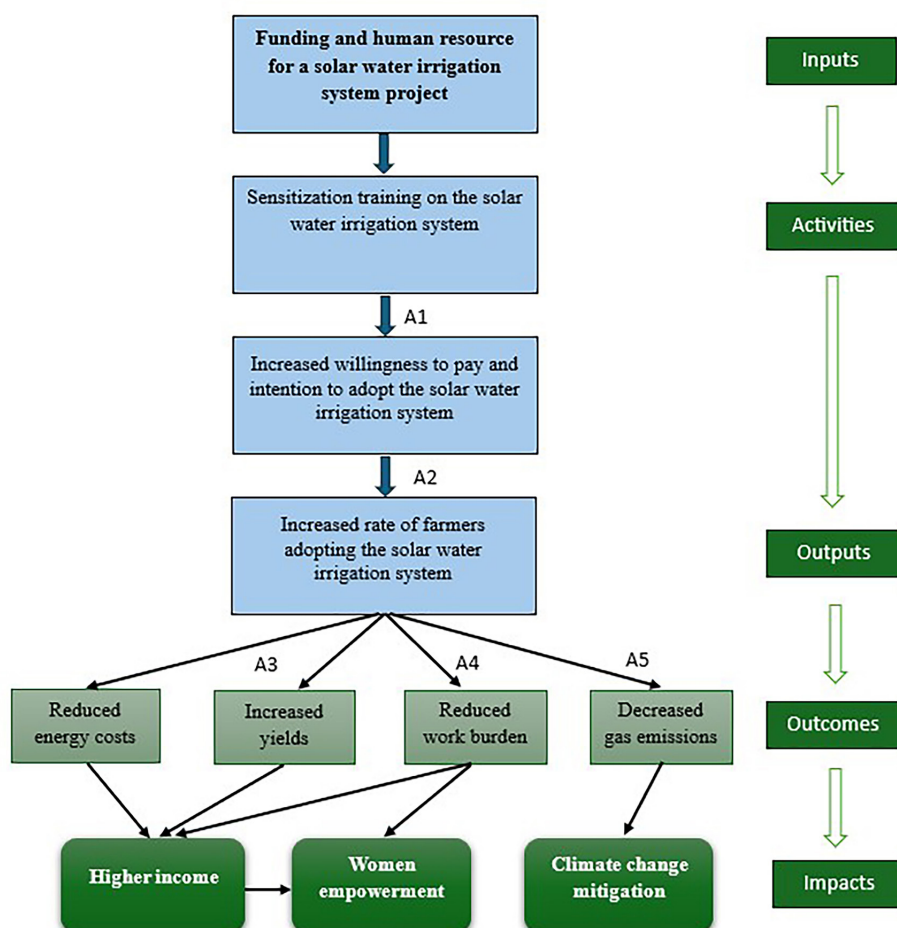
The study uses a cluster-randomized controlled trial (RCT) design, with villages as the unit of randomization. In each commune, two villages were randomly assigned to treatment and two to control, yielding 120 villages

across 30 communes. Ten households per village were selected, for a total sample of 1,200 households. Randomization ensures that differences in adoption outcomes can be attributed to the intervention.

Gender inclusiveness is a defining feature of the design. Invitations were issued jointly to couples, and incentives encouraged dual participation. The workshops explicitly target both men and women to address gender gaps in awareness, ensure women's voices are included in investment decisions, and increase the likelihood of adoption when decisions are made jointly.

The intervention logic is captured in the project's theory of change (Figure 1), which illustrates how information on technical, environmental, and financial aspects of SWPs is expected to shift household decision-making. In the short term, this should increase WTP and adoption intentions among both men and women. Over time, higher adoption rates are anticipated to improve irrigation reliability, raise agricultural productivity, reduce fossil fuel dependence, and strengthen climate resilience. By engaging both husbands and wives, the intervention also aims to foster more equitable household decision-making and women's empowerment.

### Theory of Change



**Key assumptions:** A1 – Farmers are aware of the benefits of the solar water irrigation system; A2 – Farmers can access credit and afford the solar water irrigation system; A3 – The existing technology cannot water for all crops because of operation costs or lack of electricity; A4 – Farmers use automatic irrigation system; A5 – Solar irrigation replaces more carbon-intensive farming practices (e.g., diesel irrigation). A5 - Solar irrigation systems replace existing energy-intensive irrigation methods. If no energy is used at baseline, energy costs may not decrease.

## Baseline Insights

The baseline survey of 1,195 households in Đak Lak province provides critical evidence on barriers and opportunities for solar water pump (SWP) adoption. The findings highlight four main themes: financing, awareness, gender dynamics, and irrigation challenges.

## Awareness gaps

Lack of knowledge is a widespread barrier. As shown in Table 2, nearly 30% of husbands and 40% of wives reported not knowing about SWPs, while about one-third cited lack of money as their main reason for not adopting. This demonstrates that information campaigns must tackle both low awareness and doubts about cost-effectiveness, alongside financial barriers.

## Gendered dynamics

Gender differences in both WTP and decision-making are evident. Husbands consistently report higher WTP than wives (Table 1), while women shoulder most domestic labor, such as food preparation and childcare. At the same time, 71–80% of major agricultural investment decisions are made jointly. This suggests that engaging both husbands and wives in sensitization workshops is vital: women's perspectives must be integrated into household decisions, and joint participation increases the likelihood of adoption.

## Irrigation challenges

Households face persistent difficulties in water access. Farmers most frequently cited high pump and fuel costs (44.4%), water scarcity (32.1%), and pipeline maintenance problems (15.3%). Reliance on diesel pumps remains common, underscoring the high financial and environmental costs of current practices, and the potential for SWPs to offer cleaner, more cost-effective alternatives.

## Financing and willingness to pay

Affordability remains a key constraint. Even after learning the actual price of SWPs, average willingness to pay (WTP) among husbands was VND 33.9 million and among wives VND 27.1 million (Table 1). WTP rises with farm size, suggesting that larger and wealthier landholders perceive greater benefits, while smaller farmers face sharper affordability barriers. Although preferential loans increase interest, fewer than half of respondents—41.8% of husbands and 30.7% of wives—would adopt even with subsidized credit (Table 3). This indicates that financial support alone will not be sufficient; complementary strategies are needed to strengthen knowledge and perceptions of economic viability.



Delivering Training Workshops for Farmers

## Implications for the intervention

Overall, the baseline confirms that barriers to adoption are multifaceted: lack of awareness, limited financial capacity, and gendered decision-making all constrain uptake. By addressing these challenges simultaneously—through gender-inclusive sensitization workshops that provide both technical and financial information—the project is well positioned to shift perceptions and stimulate demand for low-carbon irrigation solutions in rural Vietnam

Table 1. Willingness to Pay by Gender

Size of the crop land of your household that need irrigation	Actual price	Husband		Wife	
		Expected price of solar water pump (million VND)	Willingness to pay for solar water pump after farmers know the actual price (million VND)	Expected price of solar water pump (million VND)	Willingness to pay for solar water pump after farmers know the actual price (million VND)
0-5000 m2	40	25	22	17	18
5000-10000 m2	60	29	30	23	24
Larger than 10000m2	80	41	41	30	33

Table 2. Main Reasons for Not Installing Solar Water Irrigation Pumps by Gender

What is your main reason for not installing solar water irrigation pumps?	Husband	Wife
Do not know	29.61	39.68
Do not have money	32.83	34.35
Not economically efficient	14.47	10.07
Others	23.10	15.91
Total	100.00	100.00

Table 3. Willingness to Install Solar Water Pumps with Preferential Loans by Gender

If you can get a preferential loan, will you install a solar water pump?	Husband	Wife
Yes	41.79	30.71
No	46.95	48.65
Uncertain	11.25	20.64
Total	100.00	100.00

## Planned Outcome Evaluation

The project will evaluate the impact of sensitization workshops on the adoption of solar-powered water pumps (SWPs) using a cluster-randomized controlled trial (RCT) design, with villages as the unit of randomization. A total of 1,195 farming households were interviewed for the baseline survey in late April and early May 2025, and for the midline survey from July 26 to 30, 2025. They will be interviewed again for the endline survey by January 2026.

Key outcome indicators include: (i) willingness to pay (WTP) for SWPs; (ii) knowledge about the technology; (iii) intention to install; (iv) actual adoption and use; (v) agricultural performance (yields, revenues, costs); (vi) women's time use and participation in domestic

chores; and (vii) attitudes toward gender roles and household decision-making.

Data will be disaggregated by gender, enabling subgroup analyses of husbands and wives. Stratification by commune ensures comparability across treatment and control arms. Rigorous estimation will follow an intention-to-treat approach, controlling for baseline values, with standard errors clustered at the village level. Heterogeneous impacts will be explored by farm size, education, and access to finance. This mixed household- and individual-level data will provide robust evidence on both economic and gender-related outcomes.

## Next Steps

Following the midline survey in July 2025, the project will proceed to monitor adoption and prepare for the endline survey in January 2026. Data analysis will be completed by May 2026, with findings disseminated through policy briefs, stakeholder workshops, and a national roundtable with MARD, MOIT, and provincial authorities. Engagements with MSMEs and microfinance providers are planned to explore market and financing solutions for scale-up. This timeline ensures the project remains on track to inform policy and practice on climate-resilient, gender-inclusive agricultural technology adoption.



Electric motor irrigation system

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