

Stakeholder Forum of the Sub-sector Working Group on Irrigation (SSWG-IR): The opportunities for solar-powered irrigation in Lao PDR

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Abbreviations

ADB	Asian Development Bank
AWD	Alternative Wetting and Drying system
DAFO	District Agriculture and Forestry Office
DALaM	Department of Agriculture Land Management
DLF	Department of Livestock and Fisheries
DOI	Department of Irrigation
IWMI	International Water Management Institute
Lao PDR	Lao People’s Democratic Republic
MAF	Ministry of Agriculture and Forestry
MRC	Mekong River Commission
NUOL	National University of Lao PDR
O&M	Operation and Management
PAFO	Provincial Agriculture and Forestry Office
PICSA	Participatory Integrated Climate Services for Agriculture
SRIWMS	Sustainable Rural Infrastructure and Watershed Management Sector
SSWG-IR	Sub-sector Working Group on Irrigation
SWG-ARD	Sectoral Working Group on Agriculture and Rural Development
WUG	Water User Group

Executive summary

This report summarizes the 2024 second semiannual Stakeholder Forum of the Sub-sector Working Group on Irrigation (SSWG-IR), held in Vientiane Capital, Lao PDR, on October 14, 2024. Organized by the Department of Irrigation (DOI) under the Ministry of Agriculture and Forestry (MAF), and supported by the Asian Development Bank (ADB) through the International Water Management Institute (IWMI), the forum gathered over 80 participants from government, academia, development organizations, farmer groups, and enterprises.

The forum's main objective was to facilitate discussions on solar-powered irrigation opportunities in Lao PDR. It also presented policy frameworks for irrigation development from 2026 to 2030, seeking initial feedback to shape the upcoming Irrigation Development Master Plan. Discussions emphasized solar-powered irrigation as a climate-resilient, cost-effective option for areas without grid electricity, with benefits for dry-season agriculture, food security, and organic farming.

Key Outcomes and Recommendations

- **Solar-Powered Groundwater Irrigation:** Solar-powered systems are effective for dry-season agriculture in off-grid and non-irrigated areas, supporting food security and sustainable practices. However, concerns remain about energy generation capacity, technical know-how, and community ownership.
- **Recommendations:**
 - Ensure comprehensive user training and provide user manuals for all operators before system handover.
 - Strengthen institutional support, including regular extension services and community mobilization, to enhance technical capacity and ensure community ownership.
 - Foster access to financial and technical resources, encouraging communities to utilize emerging business services for solar-powered irrigation.
- **Reflections on Irrigation Development Priorities:** The event's discussions align with future priorities for 2026–2030, emphasizing climate resilience through solar-powered groundwater irrigation. Participants recommended cross-sectoral cooperation, such as integrating the groundwater management role of the Department of Agricultural Land Management (DALaM) with DOI initiatives and joint studies on sustainable groundwater management. Enhanced capacity-building for irrigation personnel and establishing accurate irrigation databases were highlighted as essential to ensuring effective policy implementation.

1. Introduction

This report documents a summary of the second semi-annual Stakeholder Forum of the Sub-sector Working Group on Irrigation (SSWG-IR). It was organized on 14 October 2024 from 13.30 to 17.00 pm in Vientiane Capital, Lao People’s Democratic Republic (Lao PDR). The event was co-chaired by Mr. Thongleang Sanganong, a Deputy Director General of the Department of Irrigation (DOI), and Mr. Omer Zafar, a Principal Natural Resources and Agriculture Specialist of the Asian Development Bank (ADB), featured in Photo 1. There were 80 participants, with 25 women, represented from government agencies, academia, development partners, the private sector, and farmer organizations.

“Using solar-powered groundwater irrigation is one of the five action programs of the Irrigation Development Plan of DOI from 2021-2025 to ensure water supplies in non-irrigated areas.”, Mr. Thongleang, during the opening remarks.



PHOTO 1: Mr. Thongleang, the Deputy Director General of DOI, left side, was delivering his opening remark. *Photo credit:* Division of Information and Disseminations (DID), MAF.

The event was organized to serve as a coordination platform for SSWG-IR, a component of the main Sectoral Working Group on Agriculture and Rural Development (SWG-ARD), similar to other SSWGs such as Agroecology, Agrobiodiversity, and Farmers and Agribusiness of the Ministry of Agriculture and Forestry (MAF). It is also convened to facilitate their discussions and consultations on irrigation planning and implementation of particular irrigation matters or priorities for more effective resource utilization and harnessing of their synergies. This second Stakeholder Forum of SSWG-IR is to feature opportunities and potential of solar-powered irrigation from different development projects and research implemented by the government and development partners and to present the irrigation development plan from 2026-2030 to receive initial feedback from the participants prior to its further developments.

2. Meeting process

The event had two technical sessions, including presentations and discussions, in addition to the opening and closing remarks. The agenda is attached in Annex 1. Summaries of the presentation and discussion sessions are as follows:

2.1. Presentation 1:

The presentation described the contributions of the irrigation sector to agricultural production and food security via two development projects convened by DOI. These projects include an ADB funded project “Sustainable Rural Infrastructure and Watershed Management Sector (SRIWMS)” and “Participatory Integrated Climate Services for Agriculture (PICSA)” funded by the International Fund for Agricultural Development. The presentation was delivered by Mr. Khansavanh Sisopha, a member of the project governance team, as shown in Photo 2 below. Key messages of his presentation were as follows:

- Project background:
 - Overall, both projects are to promote food security, income generation, and nutrition improvement in Xayabouly, Houaphan, Xiengkhouang, and Louangprabang, as shown in Map 1. PICSA has project sites in 353 villages from 19 districts for the implementing period from 2020 to 2025, focusing on integrated agriculture and value chain improvements. SRIWMS shares 10 of the districts in 120 villages for an implementation period from 2020 to 2028, focused on increasing food production and improving watershed-based ecology and command areas of irrigation.



PHOTO 2: Mr. Khansavanh was presenting irrigated project achievements. *Photo credit: DID, MAF.*



The designations employed and the presentation of the material in this map do not imply the expression of any opinion whatsoever on the part of IFAD concerning the delimitation of the frontiers or boundaries, or the authorities thereof.
 IFAD Map compiled by IFAD | 27-03-2019

MAP 1: A map of the project areas of PICSA and SRIWMS. Source: The presentation slide of Mr. Khansavanh.

- Project activities:
 - Key roles of DOI in relation to irrigation and water governance to support food security, climate resilience adaptation, and capacity enhancement are as follows:
 - Rehabilitating small irrigation schemes and strengthening water user groups (WUGs) via training on sustainable water use and irrigation management to facilitate food productions.
 - Applying efficient irrigation options, i.e., solar-powered pumps and sprinklers, and training for farmers on water management and dry seasonal plantations, for climate resilience adaptation.
 - Training government staff for both the provincial and the district level on different topics such as WUG management, water management, and project management.
- Further priorities:
 - For further project implementation improvements, some key focusses on the irrigation component will be about maintaining existing irrigation schemes to increase water supply and irrigated areas for agricultural productions; strengthening WUGs to enhance their capacity on water fee collection; and strengthening village technicians to handle farm-level operation and maintenance of irrigation schemes.
 - To enhance food production and increase market access capacity, a key focus will be on strengthening agricultural production groups to increase their capacity and group scale.
 - Another key priority is to work on the existing strategies of the projects to facilitate the sustainability of further practices.

2.2. Presentation 2:

The presentation showcased solar-powered irrigation systems in Attapeu Province. It was delivered by Mr. Alounsack Phonesarasean, the Head of Irrigation Section of the Provincial Agriculture and Forestry Office (PAFO) in Attapeu, as shown in Photo 3. Key contents of the presentation were as follows:

- Existing irrigation projects in the province:
 - Attapeu has 136 existing irrigation projects with an average coverage of 21,903 hectares (ha) of water supply for dry seasonal cultivations, as shown in Table 1 below.

No	Details	Quantity	Irrigated areas (ha)	
			Rainy seasons	Dry seasons
1	Public irrigation projects	35	2,390	1,502
2	Private irrigation projects for commercial plantations (banana/sugar)	19		20,360
3	Household solar-powered irrigation	82		41
	Total	136	2,390	21,903

TABLE 1: Current irrigation projects in Attapeu Province. Sources: PAFO.

- Advantages and disadvantages of solar-powered irrigation systems:

- It is evident that solar irrigation is suitable for dry seasonal agricultural production, areas without electricity, and remote areas and helps farmers save electricity costs for water pumps.
- However, the solar-power system has a limited time for energy generation from 9.00 to 15.00 hours on adequate sunshine days and requires high investment costs and large space for installing large-scale schemes. Besides, technical capacity and experience of local public agencies are still issues of concern for further operation and maintenance.

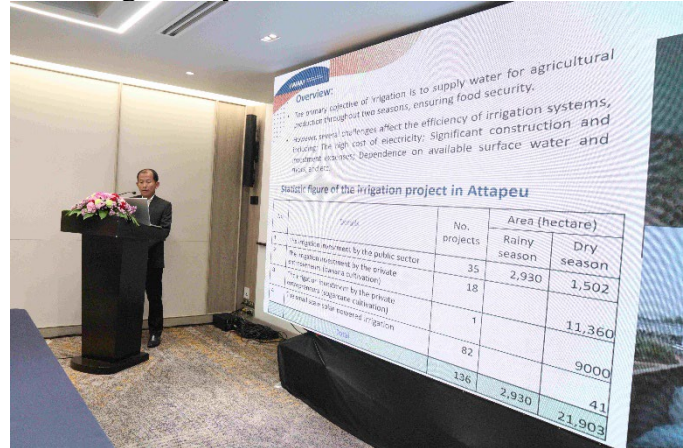
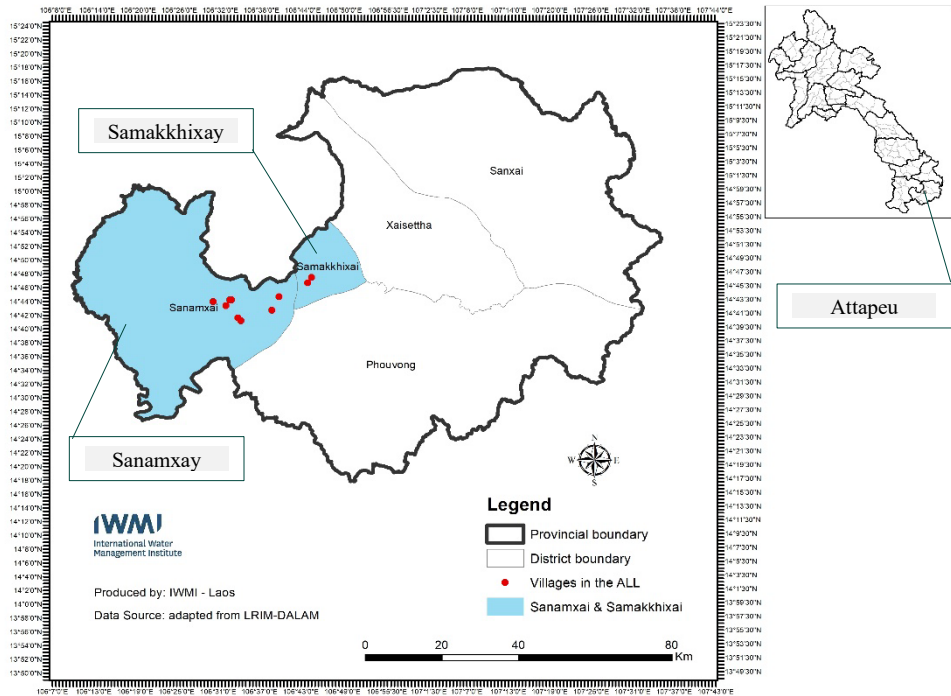


PHOTO 3: Mr. Alounsack delivered his presentation on solar-powered irrigation in Attapeu. Photo credit: DID, MAF

- A case study of community-managed groundwater irrigation with solar power technology in Sanamxay and Samakxixay districts:



MAP 2: A map of the district locations of the CGIAR Initiative on Agroecology in Attapeu. Source: Adapted from the Land Resources Information Management System (LRIMS) of the Department of Agricultural Land Management (DALaM).

- The community-managed groundwater irrigation with solar power technology is supported by the CGIAR Initiative on Agroecology and implemented by IWMI and local partners, i.e., PAFO. The exact project locations are shown in map 2.
- The installation of solar-powered groundwater irrigation is introduced to help address domestic water usage and food productions due to water shortages during March to April each year, part of the dry season from November to May.
- As a project on research for development, another key intervention objective is also to understand interaction between groundwater systems and surface water sources, i.e., Nonglom lake, where villagers use its water for agricultural productions.
- The infrastructure model of the solar-powered groundwater irrigation of the project was developed on a co-design basis via community consultations.
- On the water governance aspects, the installation process included testing the yield of a well, water discharge, and water quality, as well as installing a water logger for monitoring purposes. In addition, a formal community water management group and their management rule were established and endorsed by the respective District Agriculture and Forestry Office (DAFO) to facilitate ownership of the asset and effective groundwater use for agricultural productions and domestic utilities.
- Overall observations and recommendations for further solar-powered irrigation adoptions:
 - Solar-powered irrigation systems are considered appropriate for both agricultural productions in groups and individual household farming.
 - The solar-powered groundwater irrigation model is also suitable for remote areas where electricity sources are not accessible, which is a major setting in the Attapeu rural context. The model is widely used by individual houses in all five districts in the province for their agricultural production and domestic utilization.
 - It is recommended to develop operation guidelines and arrange training for users and operators of the solar-powered irrigation to address concerns for further operation and maintenance challenges, particularly the system with a large scale, i.e., more than 20 hectares of water supply capacity.

2.3. Presentation 3

The presentation is on irrigation water management practices by DOI. It was delivered by Mr. Vansay Sayasouk, the Director of Operation and Maintenance Division of DOI, as shown in Photo 4. Key messages are as follows:

- Overview of irrigation context in Lao PDR:
 - Nationally, there were 19,453 projects with irrigated areas of more than 499,000, according to DOI's database in 2023. Details of these irrigation projects are demonstrated in Table 2.



PHOTO 4: Mr. Vansay delivered his presentation on irrigation water management. *Photo credit: DID, MAF.*

Irrigation types	Irrigated areas (ha)		Projects
	Dry season	Rainy season	
Weirs	41,946	105,655	3,091
Reservoirs	19,565	33,170	336
Pumps	101,499	111,746	2,306
Dikes and gates	7,722	10,880	580
Temporary weirs	11,737	55,957	13,140
Total	182,468	317,408	19,453

TABLE 2: National irrigation data in 2023. Source: DOI

- Guiding policies:
 - Currently, DOI is implementing the policy on Irrigation Management Transfer to decentralize irrigation management to local communities to enhance local ownerships on operation and maintenance (O&M) of irrigation schemes.
 - DOI has the Irrigation Law and technical guidelines and manuals to guide the implementation and management to ensure quality, standardization, and sustainability.
 - As part of O&M policy frameworks, DOI has two new agreements issued in January 2024. One of the agreements is about the establishment and management of WUGs, outlining their roles, rights, and obligations. The other agreement is on the establishment and management of irrigation funds, outlining principals for water use, exceptions for water use, and fees for water use. This implies that farmers who use irrigation water are required to pay for the irrigation fee, unless there are any exemptions in the agreement.
- Challenges:
 - Water management is affected by seasonal challenges due to monsoon floods and water scarcity in dry seasons, as well as degradation of watersheds, presenting a significant risk to many irrigation systems.
 - Irrigation maintenance is affected by aging irrigation infrastructures requiring frequent repairs and modernization, while financial and technical constraints are hindering issues.
 - Besides, community-managed O&M of irrigation facilities cannot be well performed by many WUGs due to their small scale and constraints on leadership skills and financial capacity.
- Future directions:
 - Application of irrigation schemes and services that are resilient to climate change, such as increasing irrigation cycles for crop production, building water storage in the production areas, and promoting flood-resistant crops.
 - Cooperation expansions with development partners to introduce the use of motors/vehicles with mobile water pump systems and water pumps to respond to disasters, i.e., droughts in the agricultural areas.
 - Rehabilitation and upgrading of existing irrigation infrastructures affected by natural disasters will be prioritized.
 - Formulate a downstream water management policy by involving relevant sectors to work on water management, types of water use, and demarcation of agricultural production areas as per the government rules and regulations.

- Support the establishment of irrigation funds.
- Enhance capacity building for water user groups through training provisions and other support, including application technologies.

2.4. Presentation 4

The presentation communicated research findings on farmer-led irrigation in Lao PDR. It was delivered by Dr. Phonevilay Sinavong, a Senior Research, at the National Agriculture and Forestry Research Institute, as shown in Photo 5. Key contents of the presentation were as follows:

- From the global context, farmer-led irrigation is often needed as a supplementary means to insufficient public irrigation coverage. This is also applicable to the case of Lao PDR. For example, irrigation coverage in 2017/2028 was approximately 20 percent of the production areas.
 - The farmer-led irrigation often has a small operational scale, and it is managed by individual farmers or farmer groups.
 - This contributes to a strong ownership of the farmers, which is productive for their agricultural productions.
 - A successful implementation of the farmer-led irrigation model requires a robust combination of multiple factors, including water, land, knowledge, technologies, capital, labor, institutions, and markets.
- Opportunities for farmer-led irrigation with solar power technology:
 - As the promotion of dry seasonal cultivation is seen as potential for food production and commercialization while water supply remains a constraint, the introduction of solar-powered irrigation tends to be promising, recalling the advantage geography of Lao PDR exposing abundant sunshine for renewable energy production.
 - Another potential is that the application of solar-powered systems for groundwater irrigation has been practiced in many areas of the country.
 - Currently, the installation cost of solar-powered systems tends to be decreasing while service providers and traders in the country are increasing. This is also seen as an enable environment for farmers to adopt irrigation with solar-powered systems for their agricultural production.
- Findings on the assessment of early adopters of solar irrigation in Lao PDR in 2022 and 2024:
 - Positive results were found on water security, cost savings, and water quality for different crop production systems, such as vegetable cultivations under regular and organic agriculture standardization, livestock, and fish culture.



PHOTO 5: Dr. Phonevilay presented findings of the assessment of early adopters of solar-powered irrigation. *Photo credit: DID, MAF.*

- On the performance and investment return, it is found that the solar-powered irrigation provided medium to high performance and payback time can be expected before the fifth year of the investment, according to interviews with owners of solar-powered groundwater irrigation in Vientiane Capital and Attapeu Province.
- The major factor influenced the investment to adopt the solar-powered irrigation by the farmers was that a high running cost of using the grid electricity and fuels for water pumps was.
- A major given challenge for the solar-powered irrigation is due to limited sunshine hours each day, and the need for regular cleaning of panels and low yields from groundwater wells were found as minor challenges. Another challenge is that training to farmers prior to handing over to the community.
- Key lessons from the overall introduction of the community-based solar water pumping systems in southern Lao PDR:
 - A handing over plan of the solar-powered groundwater irrigation to the community management should be prioritized, well prepared, and comprehensively organized in order to avoid technical and operational challenges the community would encounter.
 - Recalling the capacity and understanding of local villagers, they would often need at least training on basic knowledge of the system and groundwater resources. The training shall be provided to all users, not only a few farmers nor the head of a farmer group.
 - In other words, the planning stage shall be emphasized and well prepared. This shall include, for instance, a pre-survey of water yield, which is also recommended to ensure sufficiency of the water supply to meet the water needs of all farmer household members.
 - Another important lesson is that there is a need to ensure active community involvements by any feasible means and the local context because this may be influenced and affected by other factors; for example, a current emerging cassava plantation may affect farmer involvements and interests to utilize and manage the provided groundwater well.
 - A dilemma on community comprehensive consultations is that i) if the groundwater well is located on the compound of the head of the group, it will affect further access and utilization by other members, and ii) if the groundwater is located on a common land of the village, farmers are often reluctant to take lead on O&M, so that parts of the well could be left with broken or taken away by other villagers.
 - In conclusion, with the benefits and potential of the solar-powered groundwater irrigation, a fundamental question as a food-for-thought for extension officers is how we can best provide information about the system to interested farmers. The basic information may include suitable models, sources of suppliers, and also financial sources.
 - In terms of the policy engagements, a focus shall be made to enable the extension service, farmer training, and mobilizing groundwater awareness campaigns, for instance.

2.5. Presentation 5

The presentation introduced the irrigation development plan 2026-2030. It was delivered by Dr. Vongsakda Vongxay, the Director of Planning and Cooperation Division of DOI, as shown in Photo 6. Key contents of the presentation were as follows:

- Strategies for irrigation development 2026-2030:
 - Maximizing returns from agricultural productions on irrigated areas to increase income generations for farmers.
 - Ensuring greater returns on public investments in irrigation infrastructure.
 - Ensuring climate resilience and sustainable irrigation developments.
 - Ensuring irrigation contributes to food security, nutrition, and agricultural commodity commercialization.
 - By 2030, the irrigated area for agricultural productions shall reach 475,000 ha.
- Policies for irrigation development 2026-2030:
 - Increasing water storage for irrigation schemes, i.e., reservoirs and ponds, and introducing water-saving distribution systems.
 - Upgrading earth canals by canal lining, including the use of dipping pipes and sprinklers.
 - Introducing modernizing water delivery services through technical options that enable a higher level of service delivery to farmers, i.e., gravity surface water and groundwater solar-powered pumps.
 - Improving irrigation systems to enhance water management by using field sensors, for instance, and modeling to improve scheduling to better match supply delivery with crop water needs.
 - Improving capacity building of WUG for irrigation O&M system.
 - Improving irrigation supply efficiency through enhanced water management, i.e., an Alternative Wetting and Drying (AWD) system to help save water at the farm level and an intermittent irrigation method on irrigated productivity to reduce emission of methane and increase the yield of rice.
 - Introducing asset management to help monitor and evaluate irrigation needs through a real-time application basis.
 - Improving irrigation data collection or irrigation database management, which DOI and Mekong River Commission (MRC) took initiative to develop the database in 2013/2014.
 - Introducing irrigation development funds, which the funds will be associated with strengthening WUGs on water management at the farm level and O&M.



PHOTO 6: Dr. Vongsakda delivered his presentation. *Photo credit: Souphalack Inphonehong, IWMI.*

- Formulating irrigation development policies to facilitate agriculture value chain development and improve linkage between input supplies and output markets so that farmers can increase their income generation and be able to contribute to the irrigation investments.
- New promising irrigation models for climate resilience:
 - DOI has an overall policy to develop irrigation models for flooded-plain areas and non-irrigated areas or dried areas.
 - These irrigation models include groundwater irrigation using solar energy and flood embankment or dike irrigation.
 - The flood embankment or dike irrigation project is to plan the use of the agricultural land in the low-lying and flood-prone areas. The model comprises a water barrier, a reservoir, a drainage system, and an irrigation system to help prevent flooding and support agricultural productions in both dry and rainy seasons. It is planned that a pilot scheme will cover from 300 ha to 500 ha of the land.
 - Groundwater irrigation using solar energy will be implemented in non-irrigated areas where many farmers are doing their agricultural farms by using water from digging wells. Under this model, a solar power system will be installed to pump groundwater to a pond for effective water storage. The pond will be constructed higher than the ground level to facilitate a gravity system for agricultural production around 30 ha to 50 ha.
- Action Plan 2026-2030:
 - Formulating the Irrigation Development Master Plan from 2026-2030 and Vision to the year 2040.
 - Increasing irrigated areas to 475,000 ha by 2030 by developing irrigation projects focusing on the gravity surface water system and groundwater irrigation using solar energy.
 - Developing irrigation projects to irrigated agricultural projects combining water management, agricultural productions, and market linkage.
 - Rehabilitating the existing irrigation schemes that are deteriorated and affected by natural disasters.
 - Transforming small-scale electric pumping irrigation projects to use solar power to reduce production costs.
 - Improving drainage and preventing flooding in areas of agricultural production, such as in Vientiane Capital, Khammouane Province, and Savannakhet Province.
 - Applying modern technologies in irrigation management.
 - Establishing/improving irrigation databases by using a Geographic Information System (GIS) to enhance national/regional level irrigation planning and management.
 - Strengthening WUG capacity to effectively manage irrigation water use.
 - Monitoring and evaluating the implementation of irrigation projects and irrigation development funds.
 - Improving rules and regulations for irrigation use and fees varying in different provinces and irrigation projects such as weirs, reservoirs, and pumping irrigation.

- Establishing an Emergency Disaster Relief Team within DOI to help farmers affected by floods and water shortages in the event of drought and provide social services by equipping mobile water pumps, emergency water pumps, fast-moving boats, and other tools.
- Establishing a monitoring plan and inspections for the safety of irrigation dams as well as improvements of the dam to ensure stability and security.
- Improving and disseminating technical documents, guidelines, and manuals to relevant sectors and actors such as irrigation technicians, institutions, schools, and water user groups at both the central and local levels.
- Linkage between the Irrigation Development Master Plan and irrigation database:
 - The irrigation database is crucial for the formulation of the Irrigation Development Master Plan as it requires a comprehensive analysis of the existing irrigation structure, governing policies, and challenges, for instance.
 - Therefore, irrigation projects will be required to establish their database and shall be linked to GIS.
 - The database will include scheme name, responsible agency, scheme type, years of construction, project cost, diversion volumes, water source, irrigated areas, major crops, major structures, and types of control structures.

2.6. Discussion session:

The discussion session was facilitated by Dr. Mark Dubois, IWMI Representative in Lao PDR and the Southeast Asian Region. Participants were asked to share comments, feedback, and questions on the presentations. Main comments and thoughts shared during the session were as follows:

Solar-powered irrigation:

- A participant from DALaM supported the application of solar-powered groundwater irrigation to facilitate food production for villagers. He added he found some cases during his work on land use planning and land allocation in a northern province of Houaphan in 2015 that local villagers wanted to grow vegetables in the dry seasons, but irrigation was not available during this time.
- Solar-powered groundwater irrigation systems could also be a feasible solution for the uplands a participant from the Faculty of Water Resources of the National University of Lao PDR (NUOL) commented. He stated that the current irrigation development priorities seem to focus on irrigation schemes for lowland areas. He elaborated that a concern for forest exploitation for shifting agricultural production may be reduced when villagers have permanent sources of water/irrigation supply. This is good for reducing climate change effects, he added.
 - A similar comment was also raised by a participant from Thangone Irrigation College, who suggested that irrigation development priorities should promote diverse irrigation model options that are suitable for crop cultivation as many high-market value vegetables and crops require minimum water supply. By so doing, a commercialization with lower cost production can be feasible and reduce the issue of ineffective use irrigation.

- A participant from the Organic Agriculture Cooperative proposed to have a pilot project of solar-power groundwater irrigation for the cooperative's member farms to address water shortages during dry seasons. He shared the market supply capacity of the cooperative in the past stating that it reached eight tons of vegetables and crops per week when they had sufficient irrigation supply. However, the existing canal, which was built in 2008, is not in a good condition to provide sufficient water supply for production. Although some farmers have their own shallow well, the water provided is not enough to have sufficient water discharge when there is no irrigation supply to the area and the dried period each year. He expressed his interest in the new technology of the solar-powered groundwater irrigation system, which will help address the challenges.
- The participant from Thangone Irrigation College also supported adopting solar-powered groundwater irrigation for food production and commercialization. He urged for further thoughts and reflections on the sustainable adoptions of solar-powered groundwater irrigation. He added that a kind policy engagement, i.e., a decree or an agreement to be issued by respective provinces and districts as guidance.
- A participant from the Department of Livestock and Fisheries (DLF) also shared positive thoughts on the use of solar power systems for fish farms and showed interest in working in cooperation with DOI to promote fish culture in different irrigation schemes, i.e., reservoirs of the embankment model.
- A participant from MRC shared his thoughts to promote sustainable solar-powered groundwater irrigation. He suggested taking account of a comprehensive study on water availability, recharging, and water quality in broader areas around a target point.

Operation and maintenance:

- The participant from Thangone Irrigation College reflected on a practice that many irrigation schemes are often handed to villagers after their construction work, which caused difficulty and challenge for the community to handle further O&M. He suggested outsourcing O&M services to a contracting company as a pilot project and taking the opportunity to develop O&M guidelines and lessons for further applications in other projects.
- A participant from Attapeu PAFO also seconded the O&M challenge encountered by villagers in his province, and some communities have proposed to PAFO to back the ownership.
- The participant from MRC shared that MRC has a newly developed manual on irrigation asset management, which may be a useful reference for the irrigation O&M. The manual also comprises irrigation monitoring to check the performances of an irrigation system at different elements so that regular maintenance needs of any elements can be identified at an initial stage so that major maintenance of the entire system, which is often costly, can be avoided.
- The participant from Attapeu PAFO raised some challenges in relation to irrigation management and utilizations. These include:
 - A high cost of electricity for water pumps and urged for any policy support so that villagers can use the provided irrigation schemes.
 - Turning irrigation land into other utilizations, especially in urban areas.

- Ineffective utilization of irrigation in private areas of local villagers who own the land in the irrigated areas but do not use the production means for their ultimate agricultural production.

Cross-sectoral cooperation:

- The participant from DALaM proposed to enhance cross-sectoral cooperation on development activities and research on agricultural production promotion, water management, and land use planning. He added that DALaM also has a new duty on management of groundwater use in agricultural land areas, in addition to other missions on soil improvements and fertilizer production, which are crucial for agricultural cultivation.
- A challenge in dam irrigation management raised by the participant from Attapeu PAFO may be associated with cross-sectoral cooperation between DOI and other sectors. He explained that water was not released for irrigation supply during dry seasons because water level in the dam reservoir was also decreased during the time. He added that the decrease in water may be associated with forest exploitations in the upstream areas of the watershed.

Capacity building:

- The participant from NUOL shared a concern for the deployment of personnel plans in the future. He raised the current decreasing trend of student registration at the faculty, which may affect further supply of irrigation personnel. He urged for responsive plans or measures such as a new graduate employment plan and scholarships for irrigation and water resource management students. He added that many District Agriculture and Forestry Offices (DAFOs) where he visited still lack irrigation personnel to support irrigation management and development.
- The participant from Thangone Irrigation College shared his thoughts on the Irrigation Development Plan 2026-2030, suggesting that it may also need to focus on staff capacity development at all levels. He added that there is also the need to have provincial irrigation development master plans so that more accurate needs for the irrigation development investments could be made available at the provincial and district levels.

3. Summary and reflections

This section summarizes outcomes of the second-seminal Stakeholder Forum of SSWG-IR of the year, which was organized on 14 October 2024 in Vientiane Capital. There were more than 80 participants from public agencies, development partners, and farmer organizations. The event aimed to facilitate discussions and consultations among the participants on the opportunities of irrigation with solar power technology in the context of Lao PDR. In addition, the event is to present DOI's irrigation development frameworks from 2026-2030 to receive initial feedback from the participants for further formulation of the Irrigation Development Master Plan 2026-2030 and to present the contributions of SSWG-IR to SWG-ARD. The discussions and consultations were facilitated with inputs from different presentations of lessons learned from solar-powered irrigation projects and research and irrigation development plans and strategies. Key outcomes of the event were summarized as follows:

The opportunities for solar-powered irrigations:

The solar-powered irrigation systems are seen as the opportunities for irrigation development in the context of Lao PDR, based on the evidence from different project presentations, positive thoughts during the discussions, and policy frameworks. The focus of the discussions during the event was about a small-scale solar-powered groundwater irrigation system.

- It is evident that solar-powered groundwater irrigation is an efficient production means for food security and commercialization of high-value vegetables and crops in terms of addressing water shortages in dry seasons, non-irrigated areas, and areas without the grid-electricity supply and providing clean water for clean agricultural productions like organic agriculture and domestic utilization of farmer households.
 - Recently, its adoptions are broadly emerging in both lowland and highland areas. The other key accelerating factor is the increasing costs of electricity fees for water pumps, apart from their water supply benefits. Key actors who initiated the adoptions are development organizations, government agencies, and farmers themselves. Different models and scales have been introduced.
- However, concern and some associated challenges were raised during the event, including a limited period for effective power generation, which is often from 9.00 am to 3.00 pm under a sunny condition; a lack of capacity and experience by respective public agencies, i.e., District Agriculture and Forestry Offices (DAFOs), to provide monitoring and extension support to target communities; and many communities and farmers often lack ownership and know-how knowledge to handle further O&M.
- Some clarifications and recommendations for the concern and challenges are as follows:
 - For further clarification, although the solar power generation period is often limited to a certain time of the days, no evidence was raised during the event around its impact on the water shortage of the irrigation system. This may be well explained by the system's design, which includes a water storage tank to maintain a required water level.
 - Regarding the capacity and technical know-how on O&M matters, a major concern seems to be more relevant to the large-scale irrigation system using solar power to synchronize with the grid system for pumping water from rivers for further supply to individual farms.

- Having friendly-user manuals on O&M developed and trainer and user training arranged prior to a handover stage of the irrigation system was a common recommendation proposed in the event. However, a point to note for the implementation is that comprehensive training for all users and operators shall be aimed for.
- In addition, the current business environment, with a rapid expansion of the solar-powered service providers offering different technology and cost options, can be seen as an enabler to help address the technical know-how concern for the community. However, enhancing farmer capacity to access business services and supplies is still necessary in terms of knowledge, information, and finance.
- Making available institutional support like extension services by respective District Agriculture and Forestry Offices (DAFOs) is recommended to help enhance the access capacity of the farmers and address current capacity and knowledge constraints of the public agencies.
- Having regular community mobilization campaigns and comprehensive consultations prior to installation of any solar-powered groundwater irrigation organized by respective public agencies and relevant sectors, respectively, is a kind of required policy engagement to enhance community ownership, which is associated with different factors such as equal accessibility among farmer households, community needs of the irrigation facility for their food production and commercialization, and basic knowledge of the system.

Reflections for irrigation development priorities:

- The main topic of the discussion of the event on the opportunities of solar-powered irrigation systems is well aligned with the priorities for the next irrigation development term from 2026-2030. The solar-powered groundwater irrigation system is also one of two newly developed irrigation models for climate resilience.
 - It is expected that the lessons, comments, and recommendations mentioned above will be useful for the implementation and operational stage to enhance the coherence of the clear irrigation development policies and strategies.
 - In addition, to promote sustainable solar-powered groundwater irrigation, a worth-considering suggestion is also about prioritizing more comprehensive studies on water availability, recharging, and water quality.
- Another suggestion in relation to the implementation of the irrigation development plan is about strengthening cross-sectoral cooperation as water management is associated with different sectors; for example, DALaM also has a management role in groundwater use in agricultural land and fish culture cooperation with DLF.
- There is also an interest recommendation on capacity building for irrigation personnel in the irrigation development plan, recalling the emergence of non-public investments in solar-powered groundwater irrigation among farmer households and applications of solar power for pumping irrigation systems, and O&M challenges in both operational and farm levels. These imply the need for the technical supervision and advisory roles of the irrigation sector to facilitate both public and non-public irrigation developments. Active capacity building should be a key priority too.

- Another point to note on the priority from the perspective of DOI is that the establishment of databases for individual irrigation projects will be encouraged in the coming development term, as accurate databases are crucial for planning irrigation development investments.

Annex 1: Agenda

Time	Activity	Person in-charged
13.00-13.25	Registration	All
13.25-13.30	Greeting participants and stating the purposes	MC from the Department of Irrigation (DOI)
13.30-13.50	Opening remarks by the chair and the co-chair	<ul style="list-style-type: none"> • Mr. Thongleang Sangnong, DOI Deputy Director General • ADB Representative
13.50-14.10	A presentation on DOI's contributions to food production and commercialization, including questions and answers (Q&A).	DOI – Mr. Khansavanh Siso-pha
14.10-14.30	A presentation on groundwater irrigation with solar power technologies, enhancing resilience to climate change, including Q&A.	Attapeu Provincial Agriculture and Forestry Office
14.30-14.50	A presentation on irrigation water management, including Q&A.	DOI – Mr. Vanhxay Sayasouk
14.50-15.10	A presentation on farmer-led irrigation status and assessment of early adopters of solar irrigation in Lao PDR, including Q&A.	NAFRI
15.10-15.30	Group photos and coffee break	All
15.30-16.00	A presentation on formulation plan of Irrigation Development Masterplan 2026-2030, including Q&A.	DOI – Dr. Vongsakda Vongxay
16.00-16.50	Discussions on policies, opportunities, ways forward.	IWMI, Dr. Mark Dubois
16.50-17.00	Closing remarks	Mr. Thongleang Sangnong, DOI Deputy Director General
17.00-20.00	Networking dinner	All

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- Mr. Khamphone Bounnavong, Deputy Director of the Planning and Cooperation Division, DOI, Lao PDR.
- Dr. Mark Dubois, IWMI Representative in Lao PDR and Southeast Asian Region.

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Cover photo:

The group photo on the Stakeholder Forum on 14 October 2024, in Vientiane Capital (photo credit: Division of Information and Disseminations (DID), the Ministry of Agriculture and Forestry (MAF)).

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