Workshop Report

ICIMOD

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CGIAR RESEARCH PROGRAM ON Water, Land and Ecosystems

ACWADAM

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Reviving Springs in the Mid-hills, and Promoting Solar Pumps in the Terai, Nepal

WLE-ICIMOD Final Dissemination Workshop
Hotel Himalaya, Kathmandu
20 December 2016

About ICIMOD

The International Centre for Integrated Mountain Development (ICIMOD) is a regional knowledge development and learning centre serving the eight regional member countries of the Hindu Kush Himalaya (HKH) – Afghanistan, Bangladesh, Bhutan, China, India, Myanmar, Nepal, and Pakistan – based in Kathmandu, Nepal. Globalization and climate change have an increasing influence on the stability of fragile mountain ecosystems and the livelihoods of mountain people. ICIMOD aims to assist mountain people to understand these changes, adapt to them, and make the most of new opportunities, while addressing upstream and downstream issues. ICIMOD supports regional transboundary programmes through partnerships with regional partner institutions, facilitates the exchange of experiences, and serves as a regional knowledge hub. We strengthen networking among regional and global centres of excellence. Overall, we are working to develop economically and environmentally-sound mountain ecosystems to improve the living standards of mountain populations and to sustain vital ecosystem services for the billions of people living downstream – now and in the future.

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The governments of Afghanistan, Australia, Austria, Bangladesh, Bhutan, China, India, Myanmar, Nepal, Norway, Pakistan, Switzerland, and the United Kingdom.

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Abbreviations

AC:	Alternating Current
ACWADAM:	Advanced Centre for Water Resources Development and Management
ADB:	Asian Development Bank
DG:	Director General
DoI:	Department of Irrigation
EMI:	Equated Monthly Investment
GoN:	Government of Nepal
GRDB:	Groundwater Resources Development Board
HP:	Horse Power
ICIMOD:	International Centre for Integrated Mountain Development
IWMI:	International Water Management Institute
MTAP:	Mid Term Action Plan
NGO:	Non-Governmental Organization
SPIP:	Solar Powered Irrigation Pump
TU:	Tribhuvan University
USD:	United States Dollar
VDC:	Village Development Committee
WECS:	Water and Energy
WLE:	Water Land and Ecosystem
WRPPF:	Water Resources Project Preparatory Facility
WUMP:	Water Use Master Plan Commission Secretariat

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Dissemination Workshop: Reviving Springs in the Mid-hills, and Providing Access to Solar Powered Irrigation Pumps (SPIPs) in the Terai, Nepal

20 December 2017, Kathmandu, Nepal

The Opening Session

Opening Remarks

Arun Bhakta Shrestha, ICIMOD, presenting his opening remarks.

The opening remarks of the workshop were delivered by Arun Bhakta Shrestha, Regional Programme Manager for the River Basins programme at ICIMOD. He welcomed all participants on behalf of David Molden, Director General, and Eklabya Sharma, Director, Program Operations, at ICIMOD. He then emphasized on the organizational morphology of ICIMOD and explained how the Water Land and Ecosystems (WLE) Initiative is embedded within ICIMOD. He explained that ICIMOD has six regional programmes which are responsible for implementation and results, and four themes which are responsible for providing expertise, intellectual inputs, methods and frameworks. He further explained that the CGIAR funded project on "Reviving Springs and Promoting Solar Pumps" is a special project under the River Basin Programme (RBP) which he leads, and it draws expertise from the water and air, and livelihood themes. The main goal of RBP is to reduce social and physical vulnerability for people while remaining focused on ensuring water, food and energy security by adopting a nexus approach to solving these issues. He said the significance of spring revival in the mid-hill is related to improving drinking water access for the local community. Similarly, promoting solar pumps in the Terai focuses on using alternate energy use for irrigation and making it accessible to farmers. He highlighted two major accomplishments of the project:

- The development and implementation of an eight step methodology for spring revival which addresses issues such as understanding local hydrogeology and social-economic aspects.
- Use of randomized control trials (RCT) for testing the demand generated under different financial schemes for solar powered irrigation pumps (SPIPs).

He concluded by assuring that both the components of the WLE project – the spring revival and promotion of SPIP, are of strategic importance to ICIMOD regardless of the fact that funding for the project ended in December 2016. Springs and SPIPs will remain an important thrust in the future Medium Term Action Plan of ICIMOD, and work will continue in this context.

Introducing the WLE-Ganges Programme

Md Yusuf Ali on behalf of WLE and World Fish Bangladesh shed light on the work of the WLE-Ganges Programme. He said that WLE-Ganges coordinates all Ganges site projects being conducted in India, Bangladesh and Nepal. Ali spoke about the work being done by WLE-Ganges on ecosystem services provided by the river system, and its positive impacts on life, productivity and the environment. He then

expressed his contentment with the manner in which the ICIMOD led project had been conducted in spite major setbacks such as the 2015 earthquakes, and the political unrest in Nepal during the project period. The high cost of diesel has got farmers interested in solar irrigation pumps. The three pumps piloted in Saptari in August 2015, have led to demand from 65 farmers. Ali emphasized on the importance of spring revival projects for the people of the mid-hills. He said the methodologies developed by ICIMOD could be applied to places with similar geographical settings such as parts of India and Bhutan. Ali concluded his remarks by congratulating ICIMOD and everyone involved with the project on its successful execution.

Expectations from the Workshop

Madhav Belbase, Joint Secretary at the Water Energy Commission Secretariat (WECS) for the Government of Nepal (GoN) was requested to speak about his expectations from the workshop. Belbase explained that the projects that would be discussed during the workshop were of high significance in terms of water resource assessment and utilization. Springs are a lifeline to large numbers of people living in hilly regions, which are geographically dominant in Nepal. People in hilly regions have problem fetching water as they must travel great distances, especially during dry season. He then gave an example of a village in Taplejung from where all residents had to migrate due to a lack of water. Population increase, change in land use and agricultural pattern, and climate have severely affected spring flow, and it is very important that ICIMOD has undertaken this issue for research. Belbase further highlighted the fact that no governmental agencies in Nepal have been involved in assessing springs and understanding the relationship between springs and geomorphology and rainfall. Both the Ground Water Resources Development Board and the Department of Irrigation mainly focused on the Terai in the past. They have started to focus on the mountains and hills only recently. Belbase expressed hope that the spring revival project might help draw a geomorphological relationship between springs and rainfall by also understanding aspects like vegetation, groundwater recharge, and socio-economic aspects.

Belbase then recalled his tenure as Director General of the Department of Irrigation when he had initiated an SPIP to lift water from rivers to irrigate terraces. He recalled the challenges his department faced during the process. The cost of installing one solar pump that could irrigate seven hectares of land was roughly one million Nepali rupees, which was high compared to the cost of installing a pump of similar capacity in the plains. He thus believes producing high value crops using solar pumps rather than conventional crops is justified. He also said that inflexible timing brought in by the use of solar pumps in hills is another challenge. Users can pump water for six hours, and those hours could coincide with other work. He further raised concerns regarding security as extra effort is needed to make sure the panels are anti-theft. The subsidy estimation for SPIP has always been a challenge for the government as the magic number has not been estimated yet. Thus Belbase expects the result of the project to be useful in this matter, providing guidance to policy makers on making new policies and taking initiative.

Objectives of the Workshop

Vijay Khadgi, Coordinator of WLE project, explained the objectives of the workshop. The project was a two-year research programme initiated in January 2015. The main objectives of the project were to obtain sustainable access to drinking water in the mid hills and agricultural water in the Terai. The spring revival component was implemented jointly with ACWADAM and Helvetas in two districts of Nepal, namely Sindupalchowk and Dailekh. The main outputs from this component were: an eight step methodology manual, study and revival of springs in Dailekh, training of local people in hydrogeology and spring revival techniques, and a video documentary.

Khadgi, then explained the SPIP component of the project in which partners were SunFarmer and Sabal Nepal, an NGO based in Saptari. The project had piloted three SPIPs in Saptari since August 2015. Starting August 2016, the project started an extensive campaign for promoting SPIPs in Saptari which lasted for more than 45 days. More than 2,500 farmers participated in these promotional programmes. ICIMOD had offered varying subsidies to women and men farmers under three different financial models. The promotional campaign led to 65 farmers demanding SPIPs. He pointed out that the project details would be presented by his colleagues through a documentary and a presentation. Khadgi explained that the objective of the workshop was to share the findings of the project with next users and learn from the expert panelists who were later invited to share their views on the projects. Khadgi finally expressed his optimism about receiving guidance from the audience on the project to design and implement future research in better ways.

The session ended with the screening of a video that depicted the work done by the team in partnership with SunFarmer, Sabal and Atom Solar.

Session 1

Sustainable Financing Options for Solar Powered Irrigation Pumps (SPIPs): Results from a randomized controlled trial experiment in Nepal

Aditi Mukherji, Theme Leader, Water and Air at ICIMOD and the Principle Investigator (PI) of this project, presented the results from an RCT experiment to determine sustainable financing options for SPIPs. Mukherji started her presentation by declaring that the goal of the project was not to simply compare the performance of SPIPs with traditional diesel or electric pumps because SPIPs are already a mature and well tested technology, but to come up with sustainable financing options which will encourage small holder farmers to adopt solar pumps. Even though Saptari (the research area) is known to receive high rainfall (1,500 mm) and has a shallow groundwater table (5–10 m), the farmers face difficulty cultivating their farms and often keep farms fallow due to lack of affordable energy for pumping groundwater. The energy needed to pump groundwater is expensive, and dirty because of the use of diesel, or very erratic if used with electricity. Recognizing this problem, ICIMOD realized the need to intensify irrigation in a clean and sustainable way. SPIPs easily operate for six to eight hours a day and do not require electricity and diesel, giving farmers an opportunity to save NPR 50,000 a year on diesel costs while easily irrigating three to five hectares. The SPIP project kicked off with demonstrations of solar pumps in three VDCs of Saptari district. Those pumps were tracked for over a year after being installed in August 2015. The technical specifications of the pumps were explained by Mukherji. The 1,200 Watt model has one controller, and a 1 horsepower (HP) Alternate Current (AC) pump, and costs around USD 3,800, the cheapest in the market. The pumps were supplied by Atom Solar and have anti-theft bolts to prevent theft. The pumps can irrigate 10-15 bigha a year with a discharge of more than 70,000 liters a day, and can run five to six hours on a full charge. The three installed SPIPs have operated for 1,600 hours in the past one year, and have a cumulative discharge of 22 million liters. However, for SPIPs to be profitable, farmers cannot solely rely on rice and wheat cultivation. Thus a distinct movement to grow commercial crops and vegetables was observed. The pumps also increased the gross and net irrigated area while saving diesel costs. Mukherji further emphasized the fact that despite SPIP being sustainable, clean and efficient, the cost of obtaining the pump is high, especially for small farmers owning less than one hectare of land. In such scenario, the main research motivation was to find a suitable financial model that could make these pumps affordable to small farmers.

To understand which financial model created the most demand, three financial models were offered to farmers. These were a) grant model where 60% grant was made available to farmers, b) grant-loan model where in addition to the grant component, additional 20% loan at 5% interest rate per annum is also given, and c) grant-pay as you go model where farmers paid a monthly rental fee for use. Additional 10% subsidy was offered to female farmers provided they owned the land on which the SPIP was installed. A randomized experiment was conducted to find that financial model which would generate the maximum demand. A total of 93 VDCs in Saptari were randomly divided into three groups, and one model was offered to each of these groups of VDCs. The randomization was done to eliminate self-selection bias which would have made determination of absolute demand for a financial model in the absence of other models impossible to determine. For the grant-model, a 60% subsidy was provided (following the new AEPC policy); however, a 70% subsidy was provided if the applicant was a woman owning the land on which the SPIP was to be installed. This was done considering low land ownership of women as they own only 3% of land in Saptari. Yet women cultivate most of the land given high rates of male outmigration. The grant-loan model replicated already existing models in India and Bangladesh, the composition being such that 60% was grant, 20% was soft loan (5% interest rate), and remaining was to be paid upfront. The composition for women was: 70% grant, 15% soft loan, and remaining sum to be paid upfront. Finally, the grant and pay-as-you-go model was such that the grant (60% if renting to male farmers, and 70% if renting to female farmers) was availed by social entrepreneur, Sun Farmer, which then rents the pump out to the farmer with no upfront cost to be paid. The ownership would be transferred to the farmer after monthly rent payments for three years. An intensive promotional campaign that lasted for 45 days was organized to solicit demand from local farmers. Promotional campaigns were of two types, targeted for each of the models and generic through newspaper and radio advertisements. Mukherji then delineated the findings from the research:

- It is important to design promotional campaigns very carefully, regardless of the schemes being offered so as to reach out to a maximum number of potential customers. Using existing resources, social mobilizers in this case, was very important as they could reach out to the right farmers and tie up with local NGO, Sabal Nepal. This was very important as they had good presence in all 93 VDCs. Designing multi promotional campaigns is more effective than relying on only one. Face-to-face interaction and on-site technology demonstration were most effective. These could bring in 95% of all demand.
- There is high demand of solar pumps in the Terai. Sixty-five demands came from one district alone. This is a big number given that currently there are no more than 15-20 SPIPs in all of Nepal. Also, Bangladesh, with much intensive irrigation, has all but 400 operational SPIPs.
- Of all three models, the maximum demand came from the grant-cum-loan model (46%) followed by the grant-pay-as-you-go model (34%).
- Giving an additional discount to women farmers can lead to changes in the structural inequity of land ownership. Around 77% of the demand came from women applicants where land now needs to be transferred to women for availing the subsidy. In 82% of the cases, the women applicants already owned land.
- A grant alone is not sufficient. There is the need for additional financing. Banks should be encouraged to give loans at concessional rates.
- Group ownership of SPIPs is not a model preferred by farmers, which is counterintuitive as the per head cost is low in cases of group ownership.
- There is good scope of solar entrepreneurship if entrepreneurs get grants from the government to rent solar pumps out to farmers.
- The farmers who have applied for any of the market models have already invested in irrigated agriculture and have good access to diesel or electric pumps. However, to reach out to very poor and marginal farmers, non-market models will be needed.

All the SPIPs have been procured through a competitive bidding process and are to be installed in January 2017. A baseline survey has already been conducted while midline and endline surveys will be done in the future to find the impacts of all 65 pumps.

Questions and Comments:

There were a few questions and comments raised during and after Aditi Mukherji's presentation. The queries and response are numbered below:

1. *The women were given an additional 10% discount if the land was owned by women. Were there any such cases? (Resha Shakya, Winrock)*

Ans: Around 77% of the people who applied were women, and in 82% of these cases, land had been transferred to the women. In the remaining cases, land has to be transferred to the woman applicant before she is eligible for the additional discount.

2. *In the pay-as-you-go model, what about payment for times when the water is not being used? Will they still need to be paying for the pump? (Romulus Okwany, IWMI)*

Ans: The issue is being discussed with SunFarmer. We are trying to lump the money as seasonal payment since the farmers won't be using solar pumps during the monsoon. The farmers will pay less during the monsoon, and more during winter and summer. Thus, there is the possibility of converting monthly rent to seasonal rent.

3. *Is the cost of borewell included in the grant? (Dibya Ratna Kansakar, Water Resources Project Preparatory Facility, WRPPF, Department of Irrigation)*

Ans: The cost of borewell is not included in the grant. Three years' warranty, insurance payment against theft, cost of civil construction, and fencing are included. Everything besides, borewell cost is included in the grant.

4. *It is quite clear that the number of demands you have generated were quite substantial for pay-as-you-go even when the EMI cost was double. Was it because the loan condition was too stringent? Were people needed to get collateral? (Anjal Niraula, Gham Power)*

Ans: The pump itself is collateral, the land isn't. People who got the pay-as-you-go model were not given the option for any other model.

5. *Farmers don't like to own pumps in groups and the disadvantage of this could be the land ownership pattern. If the farmers own land in parcels, and if they are surrounded by other owners, they would have to transport water from one parcel to another, and might face difficulty. (Madhav Belbase, WECS)*

Ans: There could be a possibility for an active water selling market that sells water to other farms. Bangladesh thrives on this water selling model. Selling water to neighbouring farms could always be an option. Once the 65 pumps are installed in Saptari, a study on how water markets take shape will be conducted.

6. *What could be the way forward after this? It is clear that farming cereal crops would be expensive using solar pumps. There are a few other enterprises in the Terai such as fish which present other opportunities. Will other options be considered during the way forward? (Jharendu Pant, WorldFish)*

Ans: During the demand study, the team found a substantial interest in aquaculture. The profit margins from different types of crops were explored, and cropping intensity analysis was also done. It is clear that if farmers grow vegetables and other remunerative crops, they will break even quicker.

7. *I have some upscaling suggestions. From the data, it can be assessed that the availability of free of cost energy will create chances for over irrigation. When it comes to the government programme, many aspects need to be taken into consideration. First, a government programme will always insist on group ownership as government funding cannot be given to individual property or assets as there will be funding issues. A good economic analysis could be done if we upscale the number of pumps to 10,000 and analyze cost as well as benefit, and an economic and differential analysis to determine interest rate. (Dibya Ratna Kansakar, DOI)*

Ans: Solar pumps bring into the picture positive externalities such as clean air and good health. From past experiences, it is evident that shallow tube wells owned by groups have either been abandoned or individuals have cornered them. Maybe it is time we execute things that work.

8. *Diesel pump are generally 5 HPs which enables them to extract two to three times more water. Hence, apart from cost benefit analysis, we could also do a hydrology study, and a study of the impacts of the pumps on aquifers. (Himanshu Kulkarni, ACWADAM)*

Ans: Solar pumps have inbuilt checks and balances. Solar pumps can work for a limited time while diesel pumps can be operated for 24 hours. In addition, SPIP are used for growing high value crops where over-irrigation negatively affects production. So farmers will have no incentive to pump more than they need. A comparative hydrogeology study between solar pumps and diesel will be undertaken in a future analysis.

Policy Roundtable: How can we sustainably finance SPIPs for small holder farmers in Nepal?

The workshop's policy roundtable took place with the participation of seven panelists representing different stakeholders. Questions were asked to the panelists by the moderator as well as by the audience. This session was moderated by Philippus Wester, Chief Scientist, Water Resources, at ICIMOD. The panelists included:

- Chaitanya Chaudhary, AEPC
- Madhav Belbase, Joint Secretary, WECS
- Amrika Devi, Farmer and SPIP User
- Avisekh Malla, SunFarmer
- Risa Piya, Winrock
- Chanda Gurung, ICIMOD
- Aditi Mukherji, ICIMOD

Panelists from left to right: Chaitanya Chaudhary, Madhav Belbase, Amrika Devi, Avishek Malla, Resha Piya, Chanda Gurung, and Aditi Mukherji with moderator Philippus Wester.

Wester began the roundtable session by putting forward questions to the panelists.

1. *Can you tell us about the financial delivery mechanism that AEPC has proposed, and the government has approved? Do you envisage any special discount for women? How many solar pumps for irrigation have you installed till date? (Philippus Wester to Chaitanya Chaudhary, AEPC)*

Ans: The Government of Nepal, through AEPC, has been implementing solar pumps for drinking water for a long time. Since the latest fiscal year, the government has adopted policies for SPIPs as well. The subsidy policy approved by the GoN is 60% of the project cost or amount, not exceeding more than NPR 2,000,000 for individual projects; the lesser amount being the subsidy. The government targets four different groups of farmers classified as: individual farmers, private company that owns and has leased lands, community based or group of farmers, and Special Purpose Vehicle (SPV). The SPV is a concept in which a company can have access to the subsidy and can rent the system to the farmers. We have already received applications from farmers and now are in the process of screening the applications. Depending upon the results we receive, we will scale it up. There are projects that are being implemented such as SPVs in Bara and in Siraha districts. For financial models, we have an entity called the Central Renewable Fund which will provide a loan or credit facility. Depending upon the availability of electricity, for instance, for places with no electricity or with poor access to electricity, there are credit systems available through partner banks with an interest rate less than 10%. For urban areas, the interest rate will be up to 9% such that 75% of the interest rate will be subsidized. If there is no access to subsidy, but a farmer has an installation subsidy of the nominal NPR 20,000, they can get access to a credit facility as well. In that case, the individual farmer will get a loan at an interest rate of 2.25%. For a private company, the loan will be granted at 4.5%. Both the grant and credit models have been approved by AEPC. However, there is no additional subsidy for women.

2. *As the current WECS Joint Secretary and previously as DG of DOI, and your stint at the Ministry of Water Resources, what do you see as the main impendent for large scale adoption of SPIPs? Is it finance? What do you keep in mind while formulating a sustainable financing policy or guideline? (Philippus Wester to Madhav Belbase, Joint Secretariat, WECS)*

Ans: SPIPs should be thought of as an option to irrigate terraces in the hills where the demand could be higher than in the Terai. This is because most of the hill regions are not connected to the electricity grid are more likely to be in isolation compared to places in the Terai. Another problem in the Terai is the similarity shared with crop types grown in many parts of India. As Indian farmers have better subsidies compared to farmers in the Terai, it is a challenge for farmers in the Terai to compete with better facilitated counterparts in India. Also, it is a challenge to produce conventional crops using SPIPs as cost recovery would be difficult. In hills, where large chunks of lands are unirrigated, SPIPs, and even wind powered pumps, could be used for lift irrigation to produce types of crops that are not grown conventionally in India. Although less sunshine hours are prevalent in the hills compared to the Terai, there could still be more implications in hilly regions than in the plains. The high capital cost of SPIPs could be addressed by financial models such as pay-as-you-go, which could be more suitable, although the research has shown the grant-loan model to be more favourable. Understanding the water market is very important as selling water to neighbouring farms could be a vital incentive for farmers to pursue SPIP installation. The main issues are high cost, competition with neighbouring countries, agriculture extension, and subsidy. The subsidy granting process is often subject to nepotism and favouritism as big farmers with connections often tend to receive subsidies making the process biased.

3. *You have been using solar pumps since August 2015. Can you tell us about its benefits? The pump costs 380,000 Nepali rupees, will you be able to buy it without any assistance? Do you expect a special discount for women? (Philippus Wester to Amrica Devi, Farmer and SPIP User)*

Ans: With Diesel pumps, I could only cultivate 5 katha of land. With SPIPs, I can irrigate 10 katha of land, and cultivate more vegetables. Without the subsidy, it would be impossible for me to buy an SPIP, and I am very thankful to have received the pump for free for demonstration purposes.

4. *You have been working in the private sector. Tell us about your experience and how entrepreneurs can promote SPIPs. Is a rental kind of a model possible? For instance, there exist rental models for other agriculture equipment, like the laser leveler in India. (Philippus Wester to Avisekh Malla, SunFarmer)*

Ans: Without the involvement of the private sector, it is hard to abate poverty. This has been proven in China and India. Despite having low development funds, rapid economic growth from private sectors in these countries has resulted in the creation of more jobs and the utilization of taxes for the improvement of life standards. For Nepal, irrigation has always been a challenge with roughly 300,000 ha of land lying fallow, farmers using land for only one crop cycle, and only 1.4 million ha out of 3 million being irrigated. Challenge is an opportunity for entrepreneurs, and SunFarmer entered the field realizing this. However, adopting the new technology that came with SPIPs was a challenge, especially given its high capital expenditure. The puzzle to be solved with this was getting returns from SPIPs without them being a financial burden on farmers. Finally, a Power Purchase Agreement was signed with the farmers for a pay-as-you-go model that would also allow them to own the pump after three years. This enabled the farmers to afford SPIPs for the first time in their lives; and with the assistance of AEPC and Winrock, 26 SPIP projects were piloted in Chitwan with all farmers being able to pay making the repayment rate 100%. SunFarmer is in the process of securing investments from other financing sources as well, which would allow experimenting with different financial models. There are still 2.2 million small holder farmers waiting for irrigation in this country making this a huge marker. Banks could partner with NGOs and private sectors to address the issues while also mitigating the risk of capital return. Along with banks, a steady subsidy policy needs to be adopted by the government with long term vision to lessen the risks. More private sector bodies are encouraged to invest in infrastructural development.

5. *Winrock has been involved in several pilot projects vis-à-vis SPIPs and often, given these pumps to group farmers. Can you please share your experience? What kind of financial and institutional incentives do we need if we want to target the poorest of poor farmers? (Philippus Wester to Risha Piya, Winrock)*

Ans: Through USAID funded solar irrigation projects and other projects targeted at improving the livelihoods of farmers in Nepal, Winrock International has realized that given the appropriate technology and business models, it is not an issue for farmers to reimburse with the income they make from having a reliable irrigation

source. In the Terai region, an SPIP is an expensive option for irrigation as a majority of farmers already own handpumps, diesel pumps or electric pumps. However, Winrock realized that compared with diesel pumps, given that they are used for at least 500 hours, year solar pumps will prove to be cheaper. Though the payback period for SPIPs when compared to electric pumps is longer, electricity is not a reliable source of energy in Nepal. Thus, declaring SPIPs to be expensive without making an actual comparison is unjustifiable. Winrock International does not focus on subsidies, rather Winrock focusses on sectors like strengthening the supply chain and distribution channel, building the capacities of stakeholders and farmers, creating a sellable and profitable business model, and policy advocacy. Winrock is currently working with more than eight private sector enterprises as well as some financial institutions paralelly to find a suitable financial model for the farmer and to scale up the supply of solar pumps. Winrock has explored multiuse of solar pumps rather than focusing only on irrigation as they have other implications for farmers, especially during times when harvests are low.

6. *Please tell us about what you thought on our results where 77% of the applications are from women. Is this something that needs to be replicated? What do we need to be careful about? Also, so much attention goes to community/group models or ownership, while in our study there was hardly any demand from groups-what might have been the reason? (Philippus Wester to Chanda Gurung Goodrich, ICIMOD)*

Ans: The project has not only successfully addressed structural inequality and discriminatory norms but has also redressed them. However, other aspects need to be considered such as identifying women applicants, the types and amount of lands given, and situations under which they were given land for the extra 10% subsidy. Also, it is clear from the data that although 77% of the applicants were women, less than 30% of women showed up for the demonstration. This needs to be considered as well. But it is a step in the right direction.

7. *Tell us about the next steps for this project, and the way forward for this work? (Chanda Wester to Aditi Mukherji, ICIMOD)*

Ans: ICIMOD hopes the findings of this research will find resonance in policy. ICIMOD will be looking forward to collaborate with various financial institutions, AEPC and DOI to upscale solar projects. Collaborations in financial innovations such as mobile banking, working on policies, and promoting SPIP for hills could something to look forward too.

Questions and Comments:

A few questions were raised during and after the panel discussion. The questions raised were specific and were asked to the concerned panelist only.

1. *Could you share your experience with operation and maintenance? What happens if the pump is damaged after three years? Do you think farmers have the capacity to replace the pump after some time (Madan Bhatta, HELVETAS to Avisekh Malla, SunFarmer)*

Ans: Per the specifications provided by the manufacturers, the pump should work for 10-15 years. However, this depends on factors such as water quality and the amount of sand contained in water. The pumps used by SunFarmer are easily available pumps in the sense that they are easily repairable in the local market. All the components of the pump were examined carefully. As SunFarmer was investing in the system with its own equity, it was necessary to ensure the performance and reliability of the system. The farmers are given a full warranty that covers the system during the whole tenure, which should make banks and other financial agencies more comfortable. Once the three-year period is over, farmers can either pay a minimal fee and continue operation or can learn the operations and keep up maintenance on their own.

2. *What were the reactions of other farmers in your village when they saw you using the solar pump? Is the solar pump robust compared to a diesel pump? (Floriane Clement, IWMI to Amrica Devi, Farmer and SPIP User)*

Ans: People ask the whereabouts of place that gave me the SPIP. They observed the pump to be very economical. Former irrigation minister, Umesh Yadav personally visited the farm to observe the pump. Diesel pumps are often subject to operational problems and require NPR 500 to 1,000 to repair. There have been no problems with my solar pump so far. All it takes for it to operate is sunlight, and pressing a switch.

3. *Wouldn't SPIP design costs be even higher in the hills where there is usually the need to lift water to a higher source? (Romulus Okwany, IMWMI to Madhav Belbase, WECS)*

Ans: The solar panels have gotten cheaper over the years due to technological advancements. However, the only option for recovering cost from solar panels is by cultivating high value crops since the per hectare cost of solar panels is very high. With the right application of enterprise and entrepreneurship, solar pumps should not be expensive. The high valued water that solar pumps pump should be used in a manner that makes recovery possible. The technological aspects of SPIPs need to go together with correct marketing, effective technological dissemination and the right financial mechanisms such as the pay-as-you go model. The government should play an important role by being consistent in policy making, and making sure that funding available to farmers should not lapse with the end of the financial year.

To this question, Mukherji further added that cost of panels has declined steeply over the years. This has brought in two major advantages: supplementary devices to improve efficiency do not need to be used anymore, and efficient pumps are available at a cheap price, she said.

4. Dinesh Dulal representing NMB bank also shared his views on the role financial institutes can play to upscale solar pumps in Nepal. According him, NMB bank has been financing numerous renewable energy projects such as solar, micro-hydropower and bio gas owned by the private as well as community sectors. He also shed light on NMB bank's plans to expand the projects to SPIPs. He said the bank is in talks with Winrock and SunFarmer for developing a suitable financial policy to fund rural agriculture. However, he sees feasibility issues when it comes to financing remote projects. Thus, NMB bank is looking to partner with micro finance institutes that could be funded to fund the farmers. Besides funding, NMB bank has plans to introduce financial technology such as internet banking and mobile banking in rural areas that could come in handy to farmers.

Session 2

Reviving Springs in the Mid-hills of Nepal: Creating the right policy environment

The session started with the screening of a video that depicted the work done by the team in partnership with ACWADAM on a spring revival project. After the video was screened, a more descriptive presentation was given by Rajendra Shrestha, ICIMOD, and Jayesh Desai, ACWADAM. The presentation is covered descriptively in the sections that follow.

Reviving springs – The process, results from two sites in Nepal, and implications for policy

Shrestha started the presentation with a remark stating that the spring revival process had been accomplished through a comprehensive springshed management approach. Despite being lifelines for people living in the mid-hills of Nepal, millions of springs are unmapped and are drying up. ICIMOD, along with ACWADAM, realized this fact, and studied spring to mitigate those that are drying up and to enhance the revival process. Several factors could be linked with drying springs. These include erratic rainfall brought by climate change, change in land use patterns, and change in socio-economic circumstances. When springs, the only life-line for the mid-hills, start drying up, water insecurity immensely increases in the region. This causes water scarcity in terms of domestic use and irrigation. Besides severely affecting the inhabitants, as springs are important sources of rivers, their diminishing severely affects the baseflow of rivers, often causing them to dry up. To address this alarming issue, Shrestha and Desai presented the eight step methodology developed by the team in partnership with ACWADAM, and under the consultation of a wide range of stakeholders. The methodology was implemented in two geographically and socio-economically different study areas: Dailekh district in the far-west and Sindupalchowk district in the east. The eight step methodology, in a chronological order, involves:

Rajendra Shrestha and Jayesh Desai presenting on the experience of reviving springs in Dailekh, Nepal

- Comprehensive mapping of springs: The team mapped 106 springs in Dailekh while they mapped 122 springs in Sindupalchowk. The study areas in Dailekh and Sindupalchowk were chosen based on the Water Use Master Plan (WUMP) developed by Helvetas.
- Setting up a data monitoring system: Three types of data monitoring were required: rainfall data of the area, discharge of springs, and water quality. Local people were employed to measure both rainfall, and discharge of spring. The parameters for water quality included pH value of water, dissolved salts, and salinity and electroconductivity. Based on the data collected, hydrographs were plotted which were later compared with hydrographs drawn after implementing recharge measures.
- Understanding the social and governance aspects of springs: Understanding social issues such as conflicts for water distribution and dependency on springs along with the hydrogeological aspect, enabled the team to

shortlist the springs to be monitored and revived. These aspects were comprehended through focused group discussions, key informant contributions and socio-economic survey. Important data such as the percentage of people that fetch water, number of households dependent on a springs, and water use activities were extracted during the analysis.

- Hydrogeological mapping: A geological survey was required to understand the aquifer system and hydrogeological setting in the area. Finally, a geological map was drawn with the help of Google Earth.
- Conceptual layout development from hydrogeological mapping: The geological mapping done in the former step was used as a skeleton for conceptual layout mapping using a software. The conceptual layout drawn was used to identify aquifer behavior.
- Finding recharge area based on hydrogeological mapping: Hydrological understanding drawn from the conceptual layout was used to identify the behaviour of springs and demarcate the recharge area. For instance, springs that dried up due to the earthquake in Sindupalchowk, one of the research areas, showed a distinct behaviour on hydrographs compared to springs that were diminishing due to other factors, or even compared to the behaviour that the same springs showed pre-earthquake.
- Implementing recharge methods to improve spring discharge: The implementation of recharge methods to improve springs was done in mid-August 2016. Recharge areas were identified for the springs that were shortlisted. These were mostly found to be in private lands, and the private land owners had to be convinced through meetings. Finally, the recharge areas, a majority of which were on farm terraces, were outward sloping and thus had to be transformed to inward sloping. A shallow trench was constructed in the upper part of terraces to facilitate more recharge. Several biological measures were adopted to protect ridges and gullies with the introduction of trenches and hedgerows in uncultivated land.
- Impact monitoring: The ongoing impact monitoring is much like that done in the second step of the methodology in which hydrological data was collected through different monitoring devices. A round of socio-economic survey is to be conducted to understand the impacts brought by the eight step methodology.

Besides the eight step methodology, the team worked on capacity building of local communities for which trainings were conducted in Dailekh and Sindupalchowk. The local community was trained to understand the hydrogeology of springs, and the ways in which the springs can be revived. Similarly, a detailed and comprehensive spring manual based on the eight-step methodology is in the process of being published. The team has announced a 15-day training for practitioners based on the eight-step methodology which is to be backed up by the spring manual.

Questions and Comments:

Following the presentation, a few questions were asked to the team for further clarifications.

1. *What is the accuracy of recharging compared to other methods such as the isotope method? Also, it could be more effective to use local vegetation as a biological intervention instead of using hybrid Napier grass which are not native. (Brij Rathore, ICIMOD).*

Ans: The question was answered by Kulkarni, and he shed light on the accuracy of this method compared to other methods. As nobody in the landscape used the science of hydrology before the method was introduced, the team is optimistic that the method will bring positive impacts. He further emphasized that the isotope method was to be used only after basic hydrogeological analysis.

2. *How did you convince the farmers to allow them to dig trenches in their lands? How effective were methods such as digging trenches and hedgerows? What criteria is considered in designing these structures? (Mohan Bhatta, Helvetas)*

Ans: The question was answered in parts by Desai, ACWADAM, and by Madhav Dhakal, ICIMOD. Desai illustrated with the example of Sikkim's 'dhara vikas' (spring development) project, for which a manual was developed. The manual has descriptive criteria for the structures to be implemented, such as deep trenches or ponds based on slope percentage. Dhakal mentioned the impracticability of comparing the effectiveness of two structures as the total recharge would be the sum of the structures. Dhakal also recalled the process involved

Kansakar presenting his comments.

in persuading the land owners to allow them to dig trenches in their land. In Dailekh, for instance, 80% of the land was cultivated. Based on the slope, a suitable trench was dug for 20% of the uncultivated land. While for the cultivated 80%, prior permission from farmers was needed to convert the land to inward sloping areas, and to dig small ponds. Other measures such as planting Napier grass were also undertaken. Since the implementation was completed in mid-August, its impacts are yet to be observed.

3. *Dibya Ratna Kansakar had an interesting suggestion for the team. He pointed out that the team has mainly focused on the upstream mitigation of springs, where discharge of springs is affected. He thus reflected on the importance of mitigating problems downstream as well, where water is pumped from the bottom of river valleys affecting the discharge of springs upstream.*
4. Madan Bhatta, representing Helvetas, one of the partners for spring revival, shed light on five key activities that were important to the springshed project.
    - Discouraging grazing around water sources
    - Protection through fencing
    - Plantation around water
    - Designing different shaped and sized water retention structure depending on slopes
    - Construction of small dams in gullies

5. *What are the different types of springs, and how did you classify them? For instance, in Nepal, springs are often classified based on the time of year during which they yield. 'Chaitey Mool' for instance, are springs that yield in July. (Anil Pokhrel, Practitioner)*

Ans: Desai illustrated different scientific classifications of springs into five types:

- Depression Spring: Springs formed due to consolidation of loose material
- Fracture Spring: Springs formed due to fractures in rocks
- Contact Springs: Springs emerging due one rock overlying the other
- Cast Springs: Springs emerging out of limestone
- Fault Springs: Springs emerging from fractures caused by faulting

Kulkarni explained the significance of identifying springs based on local terminology. He further explained the typology of springs as intersections of the following four classifications:

- Seasonal and low discharge
- Extremely fluctuating discharge, but seasonal
- High average discharge throughout the year
- Having low to moderate discharge

Policy Roundtable: Creating the right policy environment for the 'conservation and management of spring water'

The focus of the round table was on finding ways to overcome the policy and institutional vacuum in spring management, and thus finding the right policy environment for spring revival in Nepal. The round table, moderated by Aditi Mukherji, saw the participation of seven panelists representing different organizations.

- Jagat Prasad Joshi, Groundwater Resources Development Board, GoN
- Romulus Okwany, Irrigation Engineer, International Water Management Institute
- Moti Rijal, Hydrogeologist, Tribhuvan University
- Madhav Dhakal, ICIMOD
- Anil Pokhrel, Practitioner
- Himanshu Kulkarni, ACWADAM

1. *As a representative of the department that collects data on groundwater, are springs recognized as groundwater, and do you collect periodic data on springs? Why, do you think, do we not talk enough about springs, and will having better data on and understanding of springs help us in preserving them? What can your department do in this regard? (Aditi Mukherji to Jagat Prasad Joshi, Groundwater Resources Development Board)*

Ans: Springs are an integral part of groundwater. GRDB has just started studying springs in three districts: Gulmi, Sinduli and Udaypur. Besides in Kathmandu Valley, no detailed study of springs has been conducted by GRDB. Even though there has been a great deal of interest in studying springsheds, no studies of springs have been done in the past. GRDB has recently started this process.

2. *What is some of the work IWMI is doing regarding springs? How do you incorporate science with local knowledge? (Aditi Mukherji to Romulus Okwany, IWMI)*

Ans: IMWI's research mainly focuses on water usage for agriculture. Water monitoring has not been on its main agenda. However, for the past one and a half year, IMWI has been involved in groundwater and spring monitoring as part of a project in which hydrogeological analysis was done. The monitoring will enable IWMI to discover the effectiveness of interventions on springsheds. During monitoring and intervention, it is very important to consider interactions between upstream and downstream communities. It is also very important for all related stakeholders to incorporate among themselves and the impacted local communities to have more holistic impact.

3. *What is the difference between a watershed and a springshed, and why is it important to consider the concept of the water tower approach when it comes to spring management? (Aditi Mukherji to Himanshu Kulkarni, ACWADAM)*

Ans: Recharge area is often external to a classical watershed and it is important to understand how it functions in a larger context. The concept of hydrogeology breaks the myths of watersheds and springs. Springsheds have multiple dimensions and may be morphed into water towers in some of the areas. Since most of the spring management happens at local scales, it is very important to consider springs at a local scale.

4. *What kinds of roles can a university system play in influencing policy? How can we bring springs forward as an important issue at the national policy making level? (Aditi Mukherji to Moti Rijal, Tribhuvan University)*

Ans: Since the past four years, students are being trained on springs. In the past, no students from Tribhuvan University were trained on spring. Most of them worked on their theses in Kathmandu or in the Terai plains. Universities can work as long-term monitoring partners for different intervention projects for springs. The intervention sites could be study and demonstration areas for students in the geology and hydrogeology fields.

5. *Given that there is an institutional vacuum in spring management, and a lack of incorporation among different departments, how can we have a more integrated programme in spring revival? What are your views on the eight step methodology that the team has come up with? (Aditi Mukherji to Anil Pokhrel, Practitioner)*

Ans: Even though there are different departments working for water resource use and management, there has always been an institutional vacuum when it comes to spring revival. Pokhrel recalled the initial phase of an ADB funded project from 2011 which focused on solving water security problems in the mid-hills by recharging soils. Finding institutional housing was a key issue for the project, and it took the team four months to find a suitable governing department. Springs are not prioritized at the ministry level as much as the impacts are. Hence the policies for springs need to be considered beyond the government. It is thus very important to consider springs at a local level and decentralize spring management. Furthermore, the government should consider co-operation with different NGOs and institutions and act locally to revive springs by understanding the community science aspect of each spring. The eight-step methodology developed by the team is a very important achievement in spring management, and will be critical for the Himalayan region. The methodologies have added scientific rigour to the spring management process.

6. *Having had a lot of experience in watershed management in the past and being involved in springshed management for the spring revival project, what were the similarities and dissimilarities that you noted? If people need to make a switch from a springshed to a watershed approach, how do they go about doing it? (Aditi Mukherji to Madhav Dhakal, ICIMOD)*

Ans: Dhakal recalled past work in which his team had tried to recharge springs using watershed management and could not get any yield for a few springs. The watershed approach used by the team at the time had almost all the activities that the springshed approach includes, except that it did not consider the hydrogeological mapping of springs. Thus, the springshed approach brings in an added dimension through hydrogeological mapping and correct identification of recharge area.

7. *Can you tell us of some of the Indian government's initiatives for reviving springs? Till a few years ago, springs were not considered by groundwater departments when they conducted their assessments. However, springs are increasingly receiving attention. Can you please tell us what exactly happened that made policy makers in India take note of springs? Are there any generic lessons for other countries like Nepal and Bhutan? (Aditi Mukherji to Himanshu Kulkarni, ACWADAM)*

Ans: Kulkarni recalled seven key milestones that changed the perception of the Indian government towards spring management.

- Initially, the central groundwater board in India had neglected many areas in India that had springs because they were tasked with reassessing ground water every two years in areas not having more than 20% slope. Changing this assessment criteria to areas with more than 20% slope was one of the key milestones.
- Convincing policy makers by reflecting the importance of springs such as them being major contributors to rivers, mostly having religious significance, was very effective.
- The Himalayan region is one of the most studied geological regions in the world. Yet no studies were dedicated to springs. It was necessary to point out to the significance of the inclusion of hydrogeological studies along with geological studies to put emphasis on springs.
- Over the last eight years, ACWADAM has worked in partnership with 20 different organizations which helped develop a pedagogy of springshed management on both the hydrogeology and policy aspects.
- A resource management strategy was approached by India as they opted for an aquifer based groundwater management system in India.
- A partnership with the 'Dhara Vikas' programme of the Government of Sikkim was a fulcrum on which many spring management projects were developed. 'Dhara Vikas' started with the putting together of a socio-economic database of local people and thus put emphasis on capacity building. The Sikkim government was the first state government in India to partner with nine institutes, and saw a convergence of public programmes like the Mahatma Gandhi Rural Employment Guarantee Act, and brought in funds for springshed management.

There are now eight states that have declared an interest in springshed management.

Questions and Comments:

Further questions were asked by the audience to the panelists. Some suggestions and comments were also provided.

1. *Sikkim's exemplary spring management activities were made possible by good leadership which brought a number of institutes together and made them work efficiently. There could be no substitute to good leadership in terms of bringing all stakeholders together. Who, within the government in Nepal, can provide this leadership? (Aditi Mukherji to Jagat Prasad Joshi)*

Ans: For spring management, no government organization in Nepal has taken any initiative. A few initiatives were taken by the Department of Soil Conservation and Watershed Management, but the Groundwater Resource Board is going to start an intensive spring conservation processes next year. The board will be cooperating with organizations

2. Romalus Okwany, IWMI, pointed out that the Water Use Master Plan (WUMP) could be an important tool to develop plans at the local level. He also highlighted the importance of different stakeholders working together under a common framework. Aditi Mukherji further emphasized the significance of the WUMP being developed by Helvetas. WUMP is a database under development and has data for more than 100 VDCs so far. The database provided by WUMP could be used to map and find the number of springs at any VDC. WUMP also came in handy for the spring revival project in implementing the eight-step methodology.

3. Nawaraj Pradhan, ICIMOD, spoke about how important it is for policy to be known at the National Planning Commission level. It is vital that the National Planning Commission be made aware of springshed management so that they can prioritize spring revival in different parts of Nepal.

4. *Who is coordinating groundwater resource activities? How will the activities be planned to incorporate all key stakeholders? (Jharendu Pant, WorldFish to Jagat Prasad Joshi)*

Ans: In the case of Nepal, GRDB does groundwater assessment, while DOI does irrigation development. DOI cannot study groundwater.

5. *There is some indigenous knowledge related to watershed management. How do you link community science and aquifer recharge? (Jharendu Pant, ICIMOD, to Anil Pokhrel)*

Ans: The most successful fundraising programme in Nepali villages is a sapataha, which is a prayer ritual that lasts one week. Thus, religion and beliefs are deeply rooted in Nepali communities. Water, being deeply embedded within religious beliefs, could be an incentive for spring management to the local community. The main linkage is brought when water is made everybody's business.

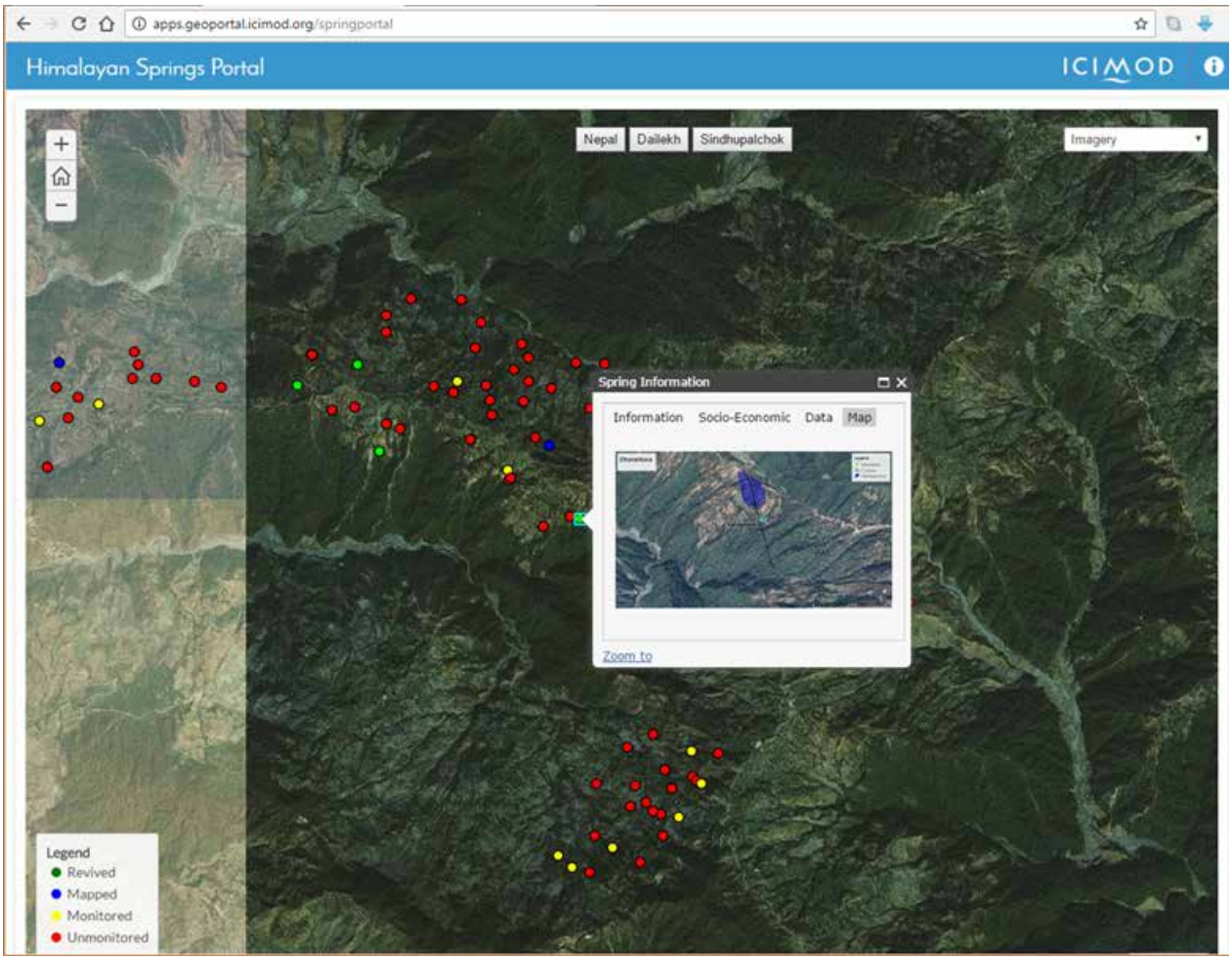
6. Mohan Bhatta, Helvetas, commented on the development of national sector planning to improve efficiency among different governmental stakeholders. For instance, the development of national water sector planning would improve efficiency and incorporate all ministries and departments dedicated towards water management and conservation.

7. *How was your experience of the workshop given by the team while working on spring revival in Sindupalchowk? (Himanshu Kulkarni, ACWADAM to Sarita Tamang, Resident, Sindulpalchowk)*

Ans: The locals were given knowledge on springs and how to classify them. The team trained locals on recharge measures. Anyone who attended the training is indebted to the team for giving them valuable insights into spring management.

Closing Session

Following the productive discussions, Vijay Khadgi introduced the beta version of the 'Himalayan Springs Portal' that ICIMOD is developing. The link to the portal is available on the project website: http://www.icimod.org/spip



The beta version displays spring locations, and information on whether the springs are monitored, mapped, or revived. A click on each of the springs opens pop-up windows with additional information on the selected spring. Khadgi also said that ICIMOD was making an effort to make the portal accessible to partners so that they might also feed the system with information about the springs they are monitoring.

For closing the workshop, Khadgi invited comments from the floor on the workshop. The generic feedback from the floor was that both the project components were very timely in addressing accessibility to water for people of the hills and the Terai. Participants looked forward to learn about the results of the two components as and when they become available. Mr. Khadgi assured everyone that ICIMOD would circulate the proceedings of the workshop as well as keep the participants posted about the results.

Nabina Lamichhane and Devesh Belbase, rapporteurs for the workshop, summarized findings from the two sessions.

Session 1– Solar Powered Irrigation Pumps (SPIPs): Learnings and policy implications

- SPIPs technology is easy to operate, reduces diesel costs considerably, and provides irrigation during the dry season. Farmers in demonstration sites are satisfied with the system, but in general, farmers require subsidies to adopt this technology as the capital cost of the system is high and unaffordable.
- The government is in the process of providing financial schemes for the adoption of solar pumps. The private sector should be encouraged to invest in solar pumps as well.

- Different financial mechanisms should be tested rigorously to provide appropriate support to farmers. Offering special discounts to women farmers may provide empowerment and encourage women in agriculture.

Session 2 – Reviving springs in the mid-hills of Nepal: Creating the right policy environment

- At the moment, there is an institutional vacuum in relation to springs management. However, the Groundwater Resources Development Board is planning to study springs in detail. Of late, springs and springs management are being included in the curriculum of educational institutions as well.
- Communication is very important in holistic spring management as it involves a large number of stakeholders. Interaction between upstream and downstream users must not be undermined. Understanding issues at the local level in a decentralized manner rather than generalizing cases for all springs is vital.
- There is the need for a government institution to lead springs management activities. An umbrella of governmental policies to protect springs, a good inventory database, and a responsible stakeholder from the side of the government – who could collaborate with different stakeholders such as NGOs and INGOs – are very important.

Vijay Khadgi then thanked the participants for attending the workshop, particularly the panelists. He said the workshop was successful because it met the objective of receiving feedback that could be used to guide ICIMOD's future work in these areas. He also expressed gratitude to the project partners, consultants and his team within ICIMOD for supporting the implementation of the project.

Annexes

Annex 1: **Agenda**

Time	Description	Responsible
9:00-9:30	**Registration**	Sarita Joshi
9:30-10:00	**Opening Session**	
	Opening Remarks	Arun Bhakta Shrestha, Regional Programme Manager, ICIMOD
	Introducing WLE Ganges Programme	Md Yusuf Ali, WLE-World Fish
	Expectations from the workshop	Madhav Belbase, Joint Secretary, WECS
	Objectives of the workshop	Vijay Khadgi, Coordinator, WLE Project, ICIMOD
10:00-10:30	Tea Break and Group Photo	
10:30-13:00	**Session 1- Solar Powered Irrigation Pumps (SPIP): Learnings and policy implications**	
10:30-10:40	Screening of video on solar powered irrigation pumps in Nepal (the Terai plains)	ICIMOD
10:40-11:00	**Sustainable financing options for SPIP: Results from a randomized controlled trial experiment in Nepal**	Aditi Mukherji, Theme Leader and PI, WLE Project, ICIMOD
11:00-11:15	Q&A and discussions	All
11:15-13:00	**Policy Roundtable: How can we sustainably finance SPIPs for small holder farmers in Nepal?** **Panelists:** • Chaintanya Chaudhary, AEPC • Madhav Belbase, WECS • Amrica Devi, Farmer and SPIP User • Avisekh Malla, SunFamer • Rishu Piya, Winrock • Chanda Gurung, ICIMOD • Aditi Mukherji	*Moderator:* Philippus Wester, Chief Scientist, Water Resources, ICIMOD
13:00-14:00	Lunch	
14:00-14:15	Screening of video on springs in the mid-hills of Nepal	ICIMOD
14:15-14:35	**Session 2 - Reviving Springs – The process, results from two sites in Nepal, and implications for policy**	Rajendra Shrestha, ICIMOD and Jayesh, ACWADAM
14:35-15:00	**Q&A and discussions**	
15:00-16:45	**Policy roundtable: Creating the right policy environment for the 'conservation and management of spring water'** **Panelists:** • Jagat Prasad Joshi, Groundwater Resource Development Board • Romulus Okwany, IWMI • Madhav Dhakal, ICIMOD • Anil Pokhrel, Practitioner • Himanshu Kulkarni, ACWADAM • Moti Rijal, Tribhuvan University	
16:45-17:00	**Closing Remarks and Vote of Thanks**	Vijay Khadgi, ICIMOD
17:00-20:00	Refreshments and Dinner	

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