

# Workshop Proceedings

## National stakeholder workshop on Groundwater Irrigation in Bangladesh: Changing Modalities, Resultant Policies

Date: 21<sup>st</sup> December 2022

Location: Dhaka/Online Platform

Work Package 5, Event Report: 3



Archisman Mitra (IWMI) introducing session and panel discussion at the National stakeholder workshop on Groundwater Irrigation in Bangladesh Photo credit: Waresul Haque, NGO Forum for Public Health

### SUMMARY

International Water Management Institute (IWMI) brought together in collaboration the CGIAR initiative “Transforming Agrifood Systems in South Asia” (TAFSSA), the “Solar Irrigation for Agricultural Resilience” (SoLAR) project, funded by the Swiss Agency for Development and Cooperation (SDC) and CGIAR initiative MITIGATE+ for organizing a national stakeholder workshop in Bangladesh in partnership with the Infrastructure Development Company Limited (IDCOL) and NGO Forum. The aim was to facilitate deliberations and develop a better understanding of challenges such as replacing diesel with solar irrigation pumps, the consequences of rapid electrification on the groundwater market, and the threat to groundwater sustainability posed by cheaper irrigation. Based on this the workshop envisages strengthening the policy research on the challenges and opportunities of Bangladesh's evolving groundwater irrigation sector.

### BACKGROUND

Despite being one of the key drivers of food production and food security in Bangladesh, diesel irrigation is partly responsible for a rising governmental fiscal burden and has additional environmental costs. For the country's energy security and given the government's Nationally Determined Contribution (NDC) under the United Nation's Framework Convention on Climate Change (UNFCCC), Bangladesh should shift away from diesel irrigation to clean and renewable energy like solar. However, this transition is also unavoidable given the rapid electrification in the country and the proactive introduction of solar irrigation pumps toward the government's commitment to green energy. With an emerging change in the modality of groundwater irrigation in the country, it is critical to understand how access to cheap irrigation may affect farmers' income and agricultural production, as well as the implications on groundwater sustainability in the future. This workshop therefore facilitate deliberations and develop a better understanding of these challenges and implications for Bangladesh's evolving groundwater irrigation sector.

## KEY OBJECTIVES

The workshop was organized with the aim to seek critical engagement and insight from an interdisciplinary panelists on how access to cheap irrigation may affect farmers' income and agricultural production, as well as the implications on groundwater sustainability in the future.

## PARTICIPANTS AND MODALITY

The workshop was conducted in a hybrid mode (virtual + on-site) and in three sessions on (i) the scope and impact of replacing diesel with solar irrigation pumps, (ii) the consequences of rapid electrification on the groundwater market, and (iii) ways for tackling the threat to groundwater sustainability posed by cheaper irrigation. Panel discussions brought together different stakeholder groups, including – government policymakers, policy implementers, international and grassroots civil society, research and academics, and user groups.

## DISCUSSION

### Welcome by IDCOL- Md. Enamul Karim Pavel (Head of Renewable Energy)

Md. Enamul Karim Pavel from IDCOL introduced solar irrigation work in Bangladesh and emphasized the importance of agriculture in terms of livelihood and food security. In this context, he gave the background of the current irrigation pattern in Bangladesh. More than 1.2 million diesel pumps are in operation, extracting huge amounts of groundwater. Water supply from diesel is expensive due to price shocks and it also contributes to GHG emissions. So, in this regard, solar irrigation becomes a vital course correction. Till now IDCOL has installed 1523 Solar irrigation pumps (SIP's) with a combined capacity of 42 MW while ensuring government regulation of min pump-to-pump distance. From the operational point of view, most of the pumps are in good condition and can provide benefits at a competitive price. 10 to 15 SIP 's can replace around 16000 diesel pumps countrywide. With this background, Mr. Pavel laid down the importance of the ongoing work of IDCOL, and the SoLAR project. Given the progress made, he looked forward to future collaboration to understand crop water and energy nexus, and areas of improvement in the sector.

### Opening remarks by SDC- Divya Sharma, Deputy head of cooperation, SDC,

Divya Sharma, from SDC, spoke about the works of SDC in the Southeast Asia region focusing on various thematic areas aligning to climate change such as Farmer's resilience and mitigation, Solar irrigation. She highlighted how climate change is leading to higher levels of energy and water use which has a cascading effect on water and GHG footprint. In this context, she elaborated on the aim of the project, which is to contribute to Climate resilient and socially inclusive agrarian livelihoods in the Southeast Asia region. Madam Joshi highlighted the broader contours that the project tries to examine through three core ore questions, which are as follows:

1. Impact of adoption of solar irrigation on smallholder farmers? How are the benefits being transferred to the smallholder farmers?
2. What is the impact of large-scale scale adoption of solar irrigation on groundwater?
3. What is the financial viability of solar irrigation, particularly in the context of increasing levels of grid connectivity



Dr. Timothy J. Krupnik, TAFSSA (*left*) and Ms. Munira Sultana, SHEDA (*right*) presenting opening remarks in the opening plenary panel  
Photo credit: Waresul Haque, NGO Forum for Public Health

## Introduction of workshop's partner organizations

- IWMI- Dr. Alok Sikka, (IWMI, country representative), discussed the SoLAR project, touching upon the broad contours of the key areas and the role of IWMI as a research organization working across various thematic areas (agriculture, justice, gender) by focusing on providing solutions to challenges to water management.
- NGO Forum - SMA Rosheed introduced different aspects of the organization engagement which included activities in promoting WASH, nutrition, health, governance, humanitarian responsiveness, safe migration, and climate resilience to improve public health and safety, especially for the poor, marginalized, and excluded segments of society.
- TAFSSA – Timothy J. KRUPNIK (Lead, TAFSSA), explained the role of TAFSSA Irrigation and groundwater as the primary currency of the agricultural economy. The TAFSSA initiative focuses on a bottom-up approach to look into the agri-food system. It incorporates an integrated approach to examine broad-based issues on the production-to-consumption continuum. The integrated food system approach investigates complex issues in Bangladesh in a more holistic manner. The idea is to incorporate localized contextual information to promote sustainable groundwater usage through “the right tools at the right time with the right crops, with a bottom-up approach”.
- MITIGATE+ - Dr. Aditi Mukherji (one of the centre leads for the initiative) introduced the goal and objectives of MITIGATE+ initiative to the participants which is to reduce annual global food systems emissions by 2030 by working closely with key actors in the target countries to ensure they are equipped to make evidence-based decisions and address challenges in food systems discourse, policy development and implementation to reduce greenhouse gas emissions.

## Opening remarks from the Chief Guest - Ms. Munira Sultana, (Chairman SHEDA)

Munira sultana, Chairman SHEDA, opened the discussion floor by highlighting the importance of agriculture and the transition from diesel to solar pumps. Agriculture contributes around 13.47% to the GDP of Bangladesh (2020-21). Around 3.75 lakh electric and 13.4 Lakh diesel pumps are being used. The irrigation system is marred with challenges as diesel pumps use 900 million USD worth of diesel every year, electric pumps face outages during peak season, and these contribute to GHG emissions. Over time, rice production has increased from 8 to 34 million tonnes. Expansion of Deep tube well led to Bangladesh achieving self-sufficiency by increasing production levels. Currently, 144 million Bangladeshi are dependent on groundwater. At the same time, 80 percent of the groundwater is used for irrigation. Intensive irrigation puts immense pressure on groundwater therefore corrective measure is need of the hour. In this context, SIP is vital owing to its wide range of applications. Transitioning to Solar can provide a sustainable solution saving millions of foreign currency.

## Presentations, Panel discussions, and Stakeholder engagement

The workshop was conducted in three sessions across the following core areas:

- I. the scope and impact of replacing diesel with solar irrigation pumps,
- II. the consequences of rapid electrification on the groundwater market, and
- III. ways for tackling the threat to groundwater sustainability posed by cheaper irrigation.

The workshop aimed to facilitate deliberations and a better understanding of these issues to strengthen the policy research on the challenges and opportunities of Bangladesh's evolving groundwater irrigation sector.



Dr. Aditi Mukherji presenting introductory remarks at the opening plenary. Photo credit: Waresul Haque, NGO Forum for Public Health



## **Session 1: Role of SIPs in replacing diesel – status and future scope**

The objective of the First session of the workshop was to introduce the SoLAR project and discuss the scope and impact of replacing diesel with solar irrigation pumps. During this session, two studies were presented by IWMI and IDCOL respectively. Both studies tried to highlight the benefits of SIP over diesel in the current policy regime of Bangladesh.

### ***The promise of SIPs in Bangladesh-Presentation by Archisman Mitra (IWMI)***

Archisman Mitra from IWMI began the session with a brief presentation on the overall context of the SoLAR project, highlighting the core research questions and different work packages to set the tone and motivations for the research study. Through the presentation, it was highlighted that 88% of total food grain production is paddy, with boro being the most important (47%). Therefore, boro cropping is crucial for food security in Bangladesh, but it requires intensive irrigation. For this, there are significant levels of diesel dependence which adds to the energy insecurity and financial burden of the country. Around 1.24 million diesel pumps are used for irrigating 3.0 million hectares. Diesel uses in the agricultural sector contribute roughly 3.2 million metric tonnes of CO<sub>2</sub> emission annually. This dependency puts the NDC targets in Jeopardy which is emission reductions by 6.73% below BAU by 2030 unconditionally.

In this context, Solar irrigation pumps provide a cleaner alternative, but Solar irrigation is at a nascent stage with around 2732 SIPs. From the study area, it was observed that around 1500 IDCOL SIPs mitigate 4300 5600 metric tonnes of CO<sub>2</sub> per year. Diesel use within the SIP command area is just 8% during the boro season, 3% during Aman season, and 22% during the Rabi season. Annual diesel use in the SIP command area was reduced by 89%. Therefore, the study estimated that solarizing 3 million hectares of diesel-irrigated areas can reduce 1.2 to 1.6 million metric tonnes per year. Overall, SIPs mitigate emissions by replacing diesel, without any penalty on yield or farmers' profit. The Cultivators, receive co-benefits of cost and labour saving as well (500-1000 BDT per season time-saving cost over diesel pump users). It has been observed that SIP users have a 230 kg /area increase in yield and profit of 5000 BDT per acre. This profit comes from the lower cost of irrigation and higher yield (probably from reallocation towards inputs). Similarly, Potential earnings from grid integration (BDT 0.11 0.16 million/year) are similar to irrigation revenue (BDT 0.1 million/year). However, right incentives are needed for speeding up the grid integration (current gestation period 10 12 years).

The study had the following concluding remarks:

- Higher buyback rate by BREB (subsidized by Government) for example BPDB purchases at 8.02/unit from IPPs (Current buyback rate is 4/unit.)
- Promote net metering with safeguards (capping max energy use, compulsory net
- Electrification have a negative impact on adoption of SIP's
- Alternative use of panels is of utmost importance for financial sustainability
- Increasing capacity utilization crucial increase sponsor revenue, reduce dependency on Boro
- Promote grid integration (net metering where possible), also other alternative uses of panels



Panel discussion (right) and Stakeholder feedback (left) during thematic session at the workshop  
Photo credit: Waresul Haque, NGO Forum for Public Health



Stakeholder engagement and consultations for various sessions during the workshop  
Photo credit: Waresul Haque, NGO Forum for Public Health

### **Panel discussion**

- The first panelist, Iftikar Hossien from WAVE foundation, pointed out the major challenges to scaling up grid integration, which are: 1) lack of awareness, 2) sites are remote (far away), so the cost of grid connection increases substantially with the distance from the grid line, 3) full power of the solar panel has yet not been connected to the grid since the local PBS has not accepted more than 70 percent of the total capacity, 4) High cost of components such as transformers, transmission lines, and inverters. Therefore, for streamlining the scale-up, measures such as separate tariffs, and subsidies are required along with capacity building and increasing institutional-level cooperation.
- Badrul Alam Khan of GRECL, shared his concerns on the revenue aspects of SIP's, and spoke about making the system more financially sustainable. He highlighted that demand charges tend to increase the cost. Currently, the capital cost is too large to have a sustainable model in place for scale-up. Similarly, another problem is with respect to the low levels of buyback tariffs. Thus, charges/costs need to be revisited to have a more sustainable system.
- Mohammed Aluddin from SREDA, recommended a few pathways to improve grid integration. These pathways are 1) by implementing net metering policy, 2) by developing a carbon pricing system to generate revenue, which would bring down project cost making it viable, 3) by developing a system of Direct transfer of grants to the beneficiary driven by a farmers cooperative, 4) fixing up tariff rates by farmer cooperatives at the local level, 5) Government intervention through a regulatory measure to increase the level of grid integration.
- Lastly, Md. Abdullah Al Matin from IDCOL, highlighted that scaling up grid integration required a streamlined implementation process. Based on IDCOL feedback experience, he commented that the major challenges were a lack of know-how at the local PBS level and a higher cost of integration in the off-grid areas due to the large distance.
- Another important aspect was discussed during the Q&A session regarding quota/ fixing KW of electricity during boro season. During the boro season due to prevailing foggy weather, farmers shift to diesel pumps. Therefore, an option could be to fix KW of electricity during the boro season for irrigation. This was an interesting suggestion however this was addressed as a management-related issue and not a technical issue.

## Session 2 Access to affordable irrigation: Threat to GW sustainability?

The second session of the workshop focused on understanding whether the affordability aspect of irrigation was a threat to groundwater. Anwar Zahid of BWDB presented the study on Groundwater sustainability concerns and the Bengal Water Machine in Bangladesh, to set the tone of discussion.

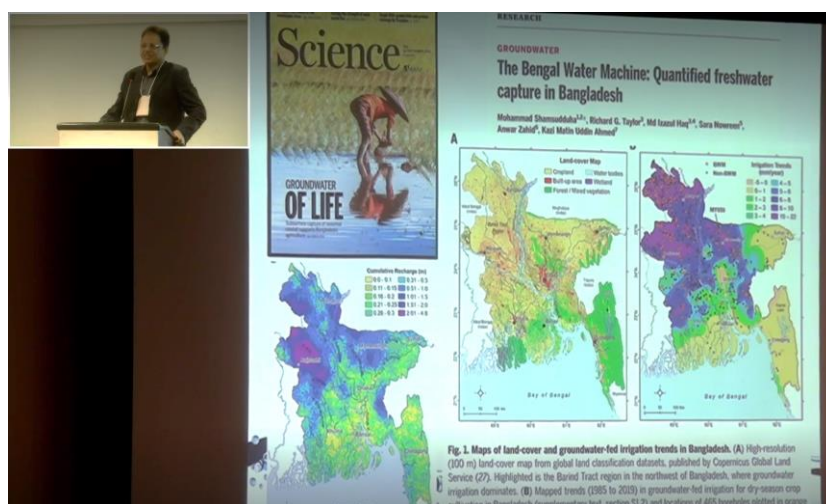
### **Groundwater sustainability concerns and the Bengal Water Machine in Bangladesh presentation by Anwar Zahid(BWDB)**

The presentation by Anwar Zahid, showcases a unique process in Bangladesh namely the “water machine”. The presentation builds on the narrative about how Bangladesh has gained significant success in the development of groundwater for its irrigated agriculture, and industrial and domestic water supply. Along with surface water irrigation, DTW and STW irrigation was extended rapidly during the late 1970’s and 1980’s. As a result, the target for self-sufficiency in food has almost been achieved. In Bangladesh, about 98% of drinking water and 80% of the irrigation water supply has been provided by groundwater. Approximately 32 km<sup>2</sup> of groundwater is withdrawn annually of which 90% is used for irrigation, and 10% for domestic and industrial purposes combined. The overuse of groundwater resulted in cascading impacts over time. Around 24 % of the land area is exposed to extremely high to high risks of elevated arsenic, salinity, and groundwater depletion hazards, and an estimated 2.3 million to over 5.7 million people, who depend on groundwater-fed irrigation are exposed to extremely high to high risks of multi-hazard groundwater risks. This stress factor was a post-1980’s phenomenon when DTW and STW increased over time. One of the reasons for the changes in irrigation patterns from surface to groundwater owing to easier Maintenance of tube well pumps. However, the most interesting aspect of the study was the process of “water machines”.

The study presented two cases which are as follows:

- There are areas where due to extensive extraction the groundwater levels are decreasing but get replenished because of rainfall recharge. Thus, these regions work as “water machines”, symbolizing a perpetual cycle implying no impact on groundwater use. These areas account for 1/3rd of the area of Bangladesh.
- However, there are other areas where the depletion due to groundwater usage permanent depletion e.g. the Barind region. Due to Climatic and geological factors, these areas do not get replenished to adequate levels. These areas account for 2/3rd of the total area of Bangladesh

His concluding remark on ensuring sustainable groundwater use was through assessment and monitoring. Presently monitoring levels are up to the upzilla level. These monitoring networks need to be linked to BWDB , BADC as well to have a holistic set of information. Sustainable resource use can be ensured through regulatory measures which point to the method of allocation. Overall, the aim is to ensure that discharge must not be higher than recharge.



Dr. Anwar Zahid presenting the Bengal Water Machine (left), Md. Sarwar Hussien, BADC (top) in panel discussion  
Photo credit: Online presentation stills



### **Panel Discussion**

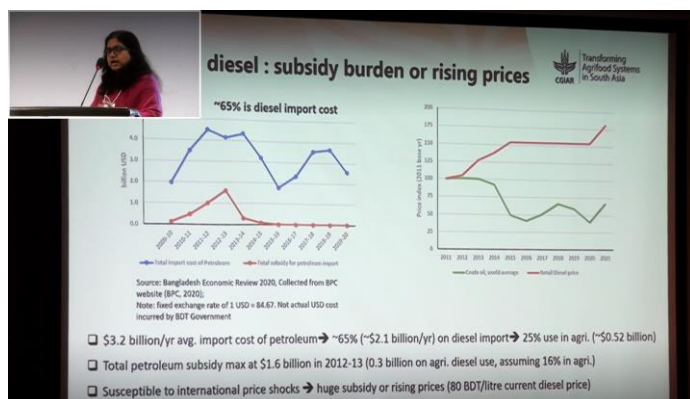
- Jahangir Alam Khan, from BMDA, gave his viewpoints on, to what extent the tube well permit system will be effective in sustainable groundwater management, & what steps are necessary for Groundwater management in Barind region. Based on the experience from Rajsahi monitoring, he pointed that over-drafting is a major challenge with exceeding beyond annual renewable recharge. Therefore new rules and permit-based allocation on the basis of spacing for equipment, and ground of water storage, can be a sustainable pathway. In the context of Barind area steps such as diversification of crops through the introduction of maize, wheat, cotton, (AWD) alternative wet-dry methods have been undertaken to address the depletion of groundwater levels.
- Md. Sarwar Hussien from BADC reflected upon whether the tube well permit system can create a hurdle on the path to electrification. Reflecting on this conundrum, he cited historical trends showing how, in 2007 the government had to revisit the regulation of 1985 because lifting the regulation during 1991, resulted in a drop in group water level, and arsenic pollution and these had a cascading impact on the livelihoods of the inhabitants. He tried to emphasize the fact that government regulation would boost electrification rather than being a deterrent. The current norms aim for equitable distribution such that the discharge-recharge balance is maintained. The Groundwater management act of 2018, has made administrative provisions in the form of upazilla irrigation committees to approve new irrigation schemes/sites based on factors such as distance, lithological factors, etc. Currently, the 9-member committee review process is a time taking process, but it is possible to bring down the processing time significantly in the future using technology-based dynamic monitoring systems.
- Dr. Md. Ayub Hossain from BARI reflected on how the tube well permit system is going to impact the farmers and the groundwater market. Commenting on the previous speaker's position he was skeptical about how the monitoring system would be translated into the ground level where there are significant knowledge gaps in the upazilla committee. Dr. Hossain was also critical of the water act of 2013 specifically the aspect of space requirements and command area for permits. On the contrary, he suggested developing location-specific regulations and opined that the decision-makers must be supported by monitoring experiences. Speaking regarding the water replenishment issue and water usage, he suggested that this should be location specific rather than countrywide. In terms of water usage, domestic and drinking water needs should be prioritized.

### **Session 3 – Implications of expanding the grid on informal groundwater markets**

The objective of the third and final session of the workshop was to introduce and discuss a new primary research study conducted by IWMI in collaboration with IFPRI under the TAFSSA research initiative. The study aims to provide rigorous descriptive data that characterizes the informal groundwater markets in North Bangladesh.

Dr. Aditi Mukherjee and Dr. Deepak Varshney from IWMI began the session with a brief presentation on the context and motivations for the research study. They began by reminding the participants of the crucial role of diesel-based groundwater irrigation in Bangladesh's story of food security. According to data from the Minor Irrigation Survey 2018-2019, the area under groundwater irrigation has jumped from 50% to 70% in comparison to surface water irrigation, and the share of 'boro' rice in Bangladesh's total food grain production has jumped from 33% to 53%. Further charting the evolution of groundwater irrigation from 2010 to 2018, the survey data shows a significant increase in electric pumps compared to diesel pumps, particularly for Rajshahi and Rangpur divisions in the north.

Around 25-30 per cent of pumps are electric in North Bangladesh. Additionally, due to electricity subsidies, the irrigation cost by electric water sellers is cheaper by 25 per cent compared to its counterparts. The region also saw a rise in diesel prices from 80 BDT per liter in 2021 to 109 BDT per liter in 2022. It is within this dynamic context that the research study aims to understand the workings of the groundwater markets in North Bangladesh. Despite being interwoven in its agrarian story, Bangladesh's groundwater markets are yet to be critically studied. The study aims to fill this research lacuna. With this background, the presentation set the stage for a rich discussion among the panelists on the impact of pump electrification on the groundwater markets in North Bangladesh.



Dr. Aditi Mukherji presenting paper on groundwater-energy linkage in Bangladesh (left) and expert panel for session 3 (right)  
Photo credit: Online presentation stills

## Panel discussion

- The first panelist, Dr. Mondol from IRRI, explored the impact of rapid pump electrification on cropping patterns and crop diversity. He began his analysis by stating the prime importance of boro production in maintaining Bangladesh's overall food basket and contributing to the nation's food security. Moving beyond sustenance, however, he mentioned the importance of crop diversity to ensure balanced food diets and diverse farm incomes. In the future, foresees no significant shifts in cropping patterns due to the land's topography and the market dynamics, which are heavily dependent on the boro price. He recommends that the government observe a delicate balance between rice and non-rice crops while encouraging the diversification of crops.
- Dr. Md Ayub Hussain from BARI spoke next on farmers' access to electric connections and any entry barriers they faced. He presented the conundrum that although electricity is a cheaper energy source than diesel at 4.19 BDT per unit and a 20% rebate from the government, farmers have been slow in its adoption. One possible explanation is that the waiting period between applying for an electricity connection and getting permission is quite long, around two months or more. Such a long waiting period and an irregular electric supply could deter farmers from switching from diesel to electric pumps. Another hindrance is the high initial cost of electricity connection, including the high line cost for farmers with plots far away from the main line. Dr. Hussain proposed that reducing the number of government departments in charge of the permits could ease the bureaucratic burden faced by farmers. He also recommended that the government provide subsidies to farmers to manage the high initial costs of electric connections.
- Echoing similar concerns, Md. Saidur Rahman from BAU expressed that despite the willingness of farmers to shift from diesel to electric pumps to avoid high diesel prices, they are unable to due to a complex permissions system. He recommended reducing the number of steps in this system and delegating decision-making away from overburdened Union Nirbahi Officers. He also alluded to the importance of ensuring an uninterrupted electric supply, especially during the dry season, for the farmers to reap the benefits of cheaper irrigation.



- Lastly, Dr. Nazmun Karim from BARC illustrated the role of the power division in ensuring food security in the country. She detailed several initiatives from the BARC during the irrigation season, including forming central and regional load management committees and greater coordination between power generation, distribution, and transmission utilities. On the issue of electric tariffs, the BARC held public meetings with major stakeholders to form the pricing framework and establish the retail and bulk tariffs. Dr. Karim argued that access to electric pumps has led to a greater proportion of irrigated land, thereby increasing agricultural production. To conclude, she does not envisage any negative externalities from pump electrification. However, she calls for greater accountability from the BARC to ensure regular electric supply and reduce transmission and distribution costs.

## CONCLUSION

The panel discussion offered many significant inputs for strengthening the understanding of how access to cheap irrigation may affect farmers' income, food security, and production, as well as the implications on groundwater sustainability in the future. These included capital cost, regulatory measures, shifts in energy usage and its corresponding impacts.

## PARTICIPATING STAKEHOLDER INSTITUTIONS

Some of the key institutions represented at the workshop were:

- Bangladesh water development board)
- Bangladesh Agricultural Development Corporation(BADC)
- Barind Multipurpose Development Authority(BMDA)
- Bangladesh agricultural university(BAU)
- Bangladesh Agricultural Research Council(BARC)
- Sher-e-Bangla Agricultural University(SAU)
- Banga Bandhu Sheikh Mujibur Rahman Agricultural University(BSMAU)
- Bangladesh Rice Research Institute(BRRI)
- International rice Research institute(IRRI)
- Bangladesh Agricultural Research Institute(BARI)
- Infrastructure Development Company Limited(IDCOL)
- Sustainable And Renewable Energy Development Authority (SREDA)
- Asian Development Bank(ADB)
- Rural Development Academy(RDA)
- WAVE
- GRECL
- International Food Policy Research Institute(IFPRI)
- CIYMMT
- Swiss Agency for Development and Cooperation (SDC)
- Ngo FORUM
- Bangladesh Institute of Nuclear Agriculture(BINA)
- Department of Agricultural Extension(DAE)
- BREL
- Gazi Renewable Energy Ltd.
- Npolymer
- SARPV
- BGEF

## WORKSHOP SESSIONS AGENDA

TIME	Presentation/panel (with panelists)		DURATION
9:30 – 10:00	Registration		
10:00 – 10:10	Welcome remarks from IDCOL and SDC		10 min
10:10 – 10:20	Introduction of workshop’s partner organizations		10 min
10:20 – 10:30	Opening remarks from the Chief Guest - Ms. Munira Sultana, Chairman SREDA		10 min
SESSION 1 – Role of SIPs in replacing diesel – status and future scope			
10:30 – 10:40	The promise of SIPs in Bangladesh	Archisman Mitra (IWMI)	10 min
10:40 – 10:50	SIP grid Integration in Bangladesh: Setting the incentives right	Md. Abdullah Al Matin (IDCOL)	10 min
10:50 – 11:30	Panel discussion: Prioritizing grid integration of SIPs in BD Participants 1. Salima Jahan (Ex. Member SREDA) 2. Nazmun Nahar (ADB) 3. Mr. Iftekhar Hossain (WAVE) 4. Badrul Alam Khan (GRECL) 5. Md. Abdullah Al Matin (IDCOL)	Moderator –Aditi Mukherji (IWMI)	40 min
TEA BREAK (15 mins) 11:30 – 11:45			
SESSION 2 – Access to affordable irrigation: Threat to GW sustainability?			
11:45 – 11:55	Groundwater sustainability concerns and the Bengal Water Machine in Bangladesh	Anwar Zahid (BWDB)	10 min
11:55 – 12:40	Panel discussion: Tackling GW over-extraction through permits Participants 1. Anwar Zahid (BWDB) 2. Sultan Ahmed (BADC) 3. Md. Jahangir Alam Khan (BMDA) 4. M. G. Mostofa Amin (BAU) 5. Dr. Wais Kabir (Ex. BARC)	Moderator – Alok Sikka (IWMI)	45 min
LUNCH BREAK (1 hour) 12:40 – 13:40			
SESSION 3 – Implications of expanding the grid on informal groundwater markets			
13:40 – 13:50	Electrification of agricultural pumps in Bangladesh	Shreya Ray (IFPRI)	10 min
13:50 – 14:30	Panel discussion: Implication of electrification of agricultural pumps on water markets Participants 1. Md. Saidur Rahman (BAU) 2. Nazmun Nahar Karim (BARC) 3. Manoranjan Mondal (IRRI) 4. Dr. Md. Ayub Hossain (BARI) 5. Shadman Bin Zahir (IDCOL)	Moderator –Shreya Ray (IFPRI)	40 min
14:30 – 14:40	Closing Remarks	Aditi Mukherji (IWMI)	10 min
End of Event			
TEA BREAK (20 mins) 14:40 – 15:00			
15:00 – 16:30	5 <sup>th</sup> SDC-SoLAR C-PMC meeting (only for SDC-SoLAR CPMC members)		1.5 hours

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<https://www.cgiar.org/funders/>

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## ABOUT TAFSSA

TAFSSA is One CGIAR regional integrated initiative to support actions that improve equitable access to sustainable healthy diets, improve farmers' livelihoods and resilience, and conserve land, air, and water resources in South Asia. For more details about the initiative see <https://www.cgiar.org/initiative/20-transforming-agrifood-systems-in-south-asia-tafssa/>

## ABOUT SoLAR

Solar Irrigation for Agricultural Resilience (SoLAR) is a South Asia regional initiative involving Bangladesh, India, Nepal, and Pakistan, implemented by IWMI and funded by the Global Programme of SDC. The project aims to support the climate-compatible development of energy and water systems in rural South Asia for resilient livelihoods. For more details see: <https://solar.iwmi.org/>

## ABOUT MITIGATE+

Mitigate+ is a CGIAR initiative that aims to reduce annual global food systems emissions by working closely with key actors in the target countries to ensure they are equipped to make evidence-based decisions and address challenges in food systems discourse, policy development, and implementation to reduce greenhouse gas emissions. For more details about the initiative see <https://www.cgiar.org/initiative/low-emission-food-systems/>

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