Solarization of Indian Agriculture

| Challenges and Prospects | 2nd February 2021 |

Schweizerische Eidgenossenschaft
Confédération suisse
Confederazione Svizzera
Confederaziun svizra

Swiss Agency for Development and Cooperation SDC

german cooperation
DEUTSCHE ZUSAMMENARBEIT

giz

IWMI
International Water Management Institute

Solarization of Indian Agriculture

| Challenges and Prospects | 2nd February 2021 |

Intro

Shilp Verma, IWMI

Evolution of Solar Irrigation in India

Neha Durga, IWMI

Experience from States

Maharashtra | Ashwin Gambhir, PRAYAS

Karnataka | A.V. Manjunatha, ISEC

Gujarat and Bihar | Neha Durga, IWMI

Andhra Pradesh | Siddharth Goel, IISD

Jharkhand and Odisha| Ayan Deb, CInI

Chhattisgarh | Anas Rahman, CEEW

Asset Utilization | Mandvi Singh, GIZ

Can PM-KUSUM live up to its promise?

Abhishek Jain, CEEW

Grid vs. PV based power supply for irrigation

Priya Jadhav, IIT – Bombay

PANEL DISCUSSION

Key Lessons for PM-KUSUM and Way Forward

Schweizerische Eidgenossenschaft
Confédération suisse
Confederazione Svizzera
Confederaziun svizra

Swiss Agency for Development and Cooperation SDC

german cooperation
DEUTSCHE ZUSAMMENARBEIT

giz

IWMI International Water Management Institute

Mukhyamantri Saur Krushi Vahini Yojana

Experience of Maharashtra

Ashwin Gambhir, PRAYAS Energy

International Water Management Institute

Surya Raitha

Experience of Karnataka

A.V. Manjunatha, ISEC

Innovative water solutions for sustainable development

Food · Climate · Growth

IWMI-TATA Water Policy Program

CGIAR RESEARCH PROGRAM ON Water, Land and Ecosystems

IWMI International Water Management Institute

Gujarat and Bihar

SKY and Solar Entrepreneurs

Neha Durga, IWMI

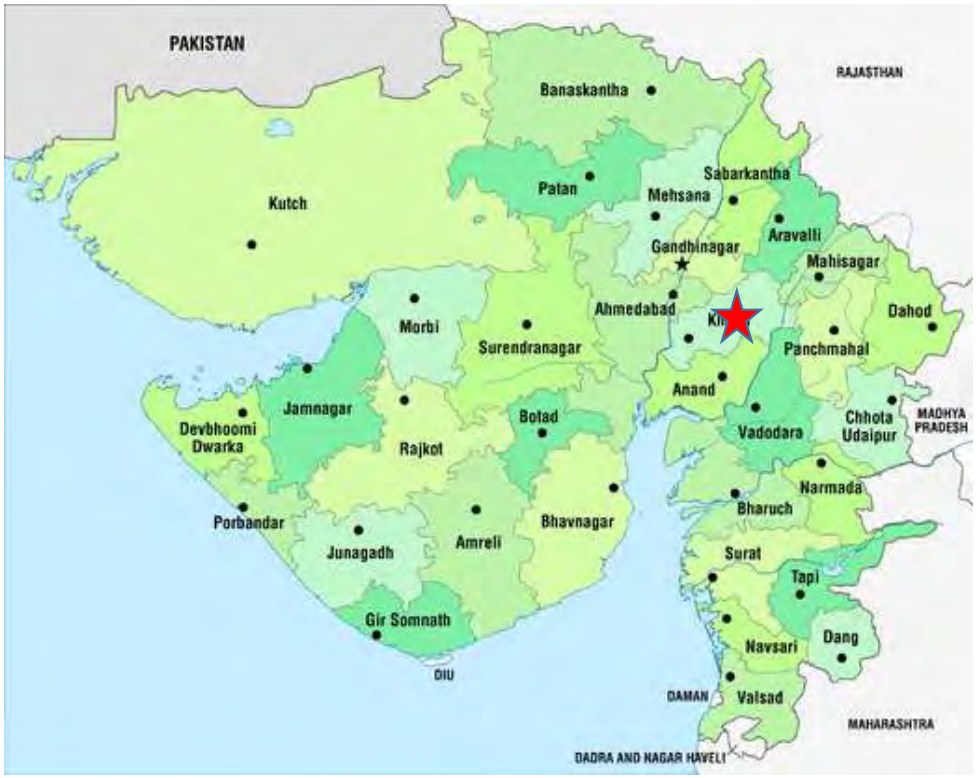
Innovative water solutions for sustainable development

Food · Climate · Growth

IWMI-TATA Water Policy Program

CGIAR RESEARCH PROGRAM ON Water, Land and Ecosystems

Dhundi Saur Urja Utpadak Sahakari Mandali



IWMI International Water Management Institute

Suryashakti Kisan Yojana

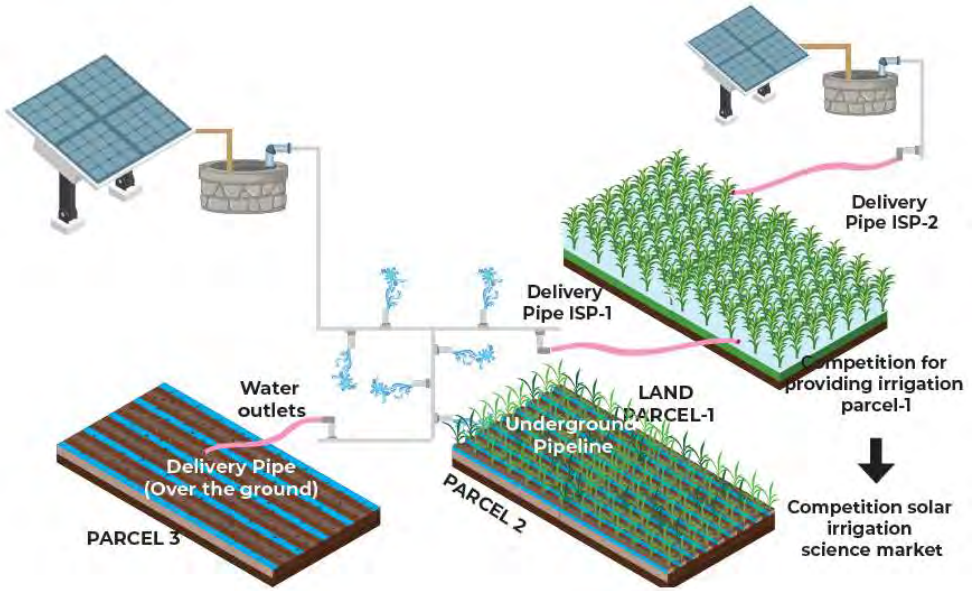
- State level Experiment to Solarise Irrigation ; 84 feeders have been solarised
- Financial Model 30 percent (MNRE Subsidy), 10 percent (farmers' upfront contribution), 60 percent farmers' loan taken by GoG on farmers' behalf
- FiT for Evacuated Electricity Rs 3.5/kWh**;** Evacuation Based Incentive – Rs 3.5/kWh for 1000 units/HP

Early Impressions

- *Improved farm power supply with no interruptions; zero low voltage incidence; shorter response time for repair and maintenance; and significantly lower maintenance expenditure*
- *The average solar energy generation per PV-capacity was only 1211 kWh per kWp*
- *The generation varied substantially across feeders and DISCOMs with it being highest in UGVCL*
- *Of the 1175 farmers whose data we analysed, 725 were expected to earn net income – even after repayment of SKY loan.*

IWMI International Water Management Institute

Catalysing Irrigation Service Markets in Bihar: Chakhaji Experiment



- Chakhaji Experiment
- 5 HP Solar Pump with 1000-1500 ft underground pipeline
- 50 percent Cap Subsidy
- 50 percent loan to be repaid in 4- annual instalments
- Started with 5 SIPs in the village, now 17

Cropping Calendar

Cost of Irrigation

Total Area Cultivated

GVA Increased

IWMI International Water Management Institute

Solar BLDC Pumpsets Scheme

Experience of Andhra Pradesh

Siddharth Goel, IISD

Solar BLDC pumpsets scheme (Andhra Pradesh)

- Implemented in 2018 by the Andhra Pradesh Eastern Power Distribution Company Limited (APEPDCL)
- 216 pumps were replaced by grid connected Brush Less Direct Current (BLDC) solar pumps in the Savaravilli feeder in Vizianagaram district
- Implemented on a 100% subsidy model with a cost-benefit analysis by APEPDCL estimating avoided subsidy of INR 50000 per 5 HP pump for a period of 10 years
- APEPCL hasn't scaled up the scheme as the state is instead focusing on centralized solar plants which may be integrated with Component A of the PM-KUSUM scheme

Project Snapshot

KEY OBJECTIVES

- Provide reliable daytime electricity supply to farmers
- Boost farmer incomes through higher productivity and net metering incentive
- Reduce the overexploitation of the district's groundwater resources
- Address APEPDCL's growing subsidy burden and reduce the load on the grid

UNIQUE FEATURES

- BLDC pumps efficiency is 20-25% higher than conventional AC pumps
- Selection criteria for feeder: Capacity of 5HP or below grid-connected pumps
- Feed-in tariff of INR 1.5 per unit of electricity sold by farmers
- Mixed agricultural and residential feeder

CHALLENGES

- Convincing farmers to switch from subsidized electricity power supply to solar BLDC pumps
- Convincing farmers to share their bank account details for net metering payment
- Technical challenges in absence of grid power

Main advantages of the BLDC pumps scheme

- The use of BLDC pumps prevents the withdrawal of electrical power from the grid, reducing the load on the grid
- Uninterrupted 8-10 hours daytime power supply provided to farmers
- Higher output for the same size of pump set
- 30-40% solar power generated was injected back to the grid by farmers
- Farmers earned an additional income in the range of INR 3000-6000 through the feed-in tariff incentive mechanism.
- Reduction in T&D losses for the DISCOM due to decentralized generation.
- BLDC pumps with 5HP capacity is effective for ground water depth of up to 150 feet
- The entire project cost (~10 crores) was estimated to be recovered in two years.

Solar Irrigation in Tribal Jharkhand and Odisha

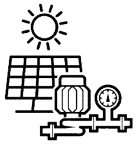
SUSTAIN+

FOUNDING PARTNERS

CInI

SOCIAL alpha

SLLCO FOUNDATION



Solar pumps

Keonjhar |Mayurbhanj| Hazaribag| Khunti|East Singhbhum| Deoghar| Gumla|Bokaro

Typology

- Income range
- 30% > INR 1.2 Lakh
- Average land holding (marginal farmer) 1 acre
- Ground water- Shallow, unconfined aquifer (30 ft.)
- Soil type- Red laterite
- Institution- 90% HHs in SHGs & PGs
- Market availability- Not nearby

Experience of implementation

	Planned (as per cash flow)
Average area (ac)	8 (0.2/ HH)
Drip and mulch (ac)	5
Average HHs	20
Average income/ season (INR 000)	20
Pay back period (yrs)	0.7

Packaging the complete product-leads to higher adoption

35% increase in area over diesel pump

200% increase in cropping intensity

Strategy for scale

Reduction of entry barrier- infra cost grant money

60% Grant, 35% -OLM/NBFC (Grant and loan), 5% CC

Establishing local presence of vendor

Vendors play role of active partner- bringing govt. subsidy, roping CSR funding

Outreach

1200

Pumps across covering 15 k HHs

| Tech enabled Agri production cluster

FEATURES

Land parcels of 8 to 10 acres
20-25 HHs engages round the year with cropping cycles
Early adopters of latest innovations in agriculture
Work across the value chain- pre production till
Market at farmgate for at least 120 days per year per HH
Entrepreneurs based services

GAPS

High recurring cost and drudgery – additional burden
Regular repair and maintenance of pump
Not moving the full potential of command area

Target and Output – PM-KUSUM

Target

Dissemination of 10,000 SWP under Component B of PM-KUSUM

Output

Farmers sensitized

Handhold 1500 farmers in applying under PM-KUSUM (6500 application received on date) and

Trained around 4000 farmers

Overall State: 4500 SWP installed

Focus on interdepartmental integration: Pumps and precision farming

Completion of target

Challenge of outside agency – delay in installation

Thank You...

Solar irrigation pumps in Chhattisgarh

Anas Rahman

IWMI-SDC-GIZ Webinar
02 February 2021

Saur Sujala Yojana

- **Scheme**
  - Off-grid solar pumps - 3 & 5 HP
  - 90-95% capital subsidy
  - Financed by NABARD's RIDF loan
    - Avoided grid extension cost
    - Recuring power subsidy
  - Annual Target: 20,000 pumps
- **Implementation**
  - Applications through Agriculture Department
  - Installation by CREDA after technical assessment
- **Achievement**
  - Started as 3 year program. Now it is a permanent scheme
  - More than 76000 pumps so far. To continue despite PM-KUSUM

Saur Sujala Yojana

- **Factors for success**
  - Political factors
    - Strong political backing
    - Solar pump targeted for tribal areas
  - Institutional credibility of CREDA
    - Previous experience with solar pumps
    - Known for innovating
  - Local System Integrators (SI)
    - Importance of System Integrators as demand aggregators
    - Start-up provision in tender.
    - 106 SIs registered in the state
  - Decentralised planning
    - District level committee

Saur Sujala Yojana

- **Targeting:** Special focus on tribal community
  - Differentiated subsidy
  - Higher allocations for tribal districts
  - More than 60% of beneficiaries from Tribal community
- **Drawbacks**
  - Subsidy heavy. Can't go beyond 20,000 a year
  - Mistargeting
  - No long term planning for sustainability
- **New pilots**
  - Community solar pump
  - Solar pump along with alternative livelihood activity
  - Solar micropumps

Thank you

ceew.in | @CEEWIndia

Asset Condition & Utilization of Solar Water Pumps in India

Initial results from survey of old solar water pumps in Rajasthan, Uttar Pradesh, Tamil Nadu and Odisha

IGEN-PSWP | Mandvi Singh | February 2, 2021

german cooperation
DEUTSCHE ZUSAMMENARBEIT

Implemented by

giz Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH

Solar water pump survey project: Details and status

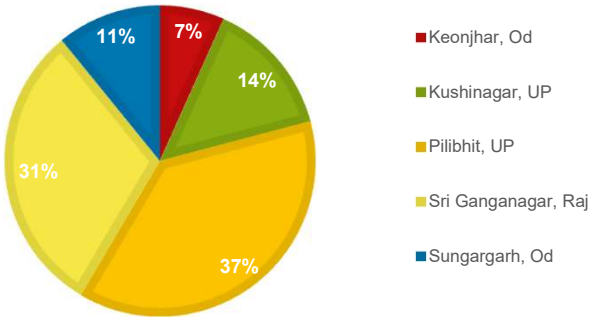
- Project to Ascertain Learnings from State Solar Water Pump Schemes, Focusing on Installed Asset Condition and Implementation Designs being undertaken by KPMG
- Survey and audit of 935 SWPs installed under MNRE's previous schemes in Rajasthan, UP, TN and Odisha to:
  - Analyse operational condition and utilization levels
  - Understand farmer feedback on application and installation process
  - Identify gaps and suggest policy solutions
- Initiated in October 2020; <50% of survey completed

State	District	Target	Status
Rajasthan	Sri Ganganagar, Jaipur	486	Ongoing (~200)
Uttar Pradesh	Pilibhit, Kushinagar	186	Completed
Tamil Nadu	Erode, Namakal, Thirupur	154	To be initiated
Odisha	Sundargarh, Keonjhar	110	Completed

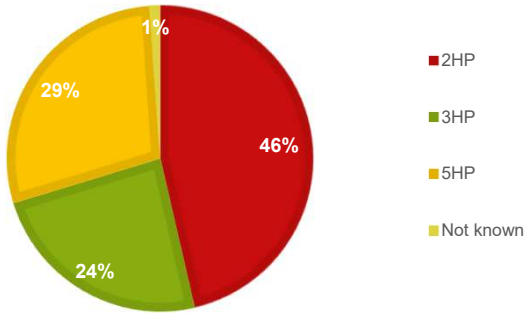
Key inquiry parameters
• Application and training process • Operational condition of solar pump • Quality of maintenance services • Overall satisfaction and usage • Impact of solar pumps – cropping patter, irrigation, income

Interim analysis based on interview of 360 beneficiaries

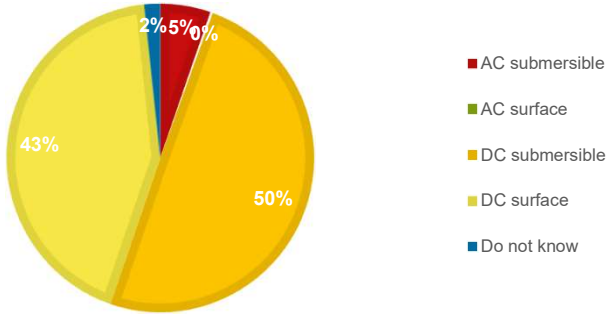
DISTRICT



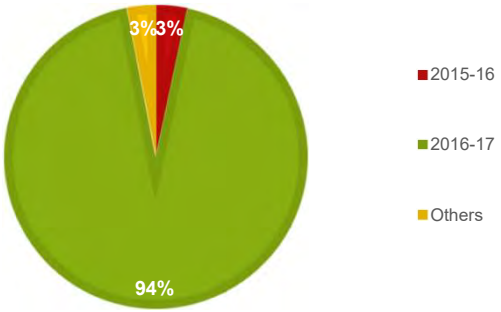
PUMP SIZE



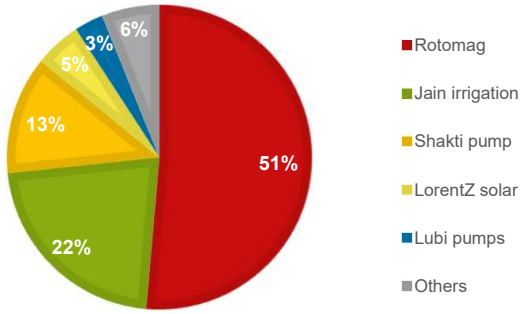
PUMP TYPE



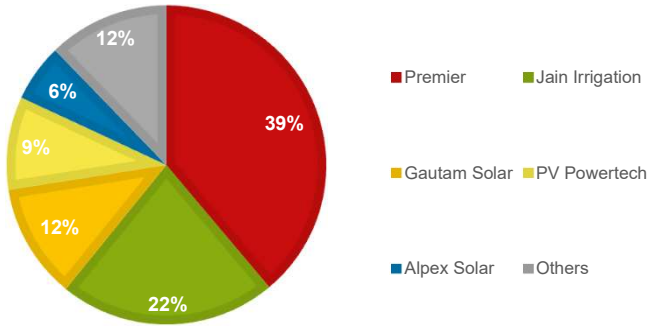
INSTALLATION YEAR



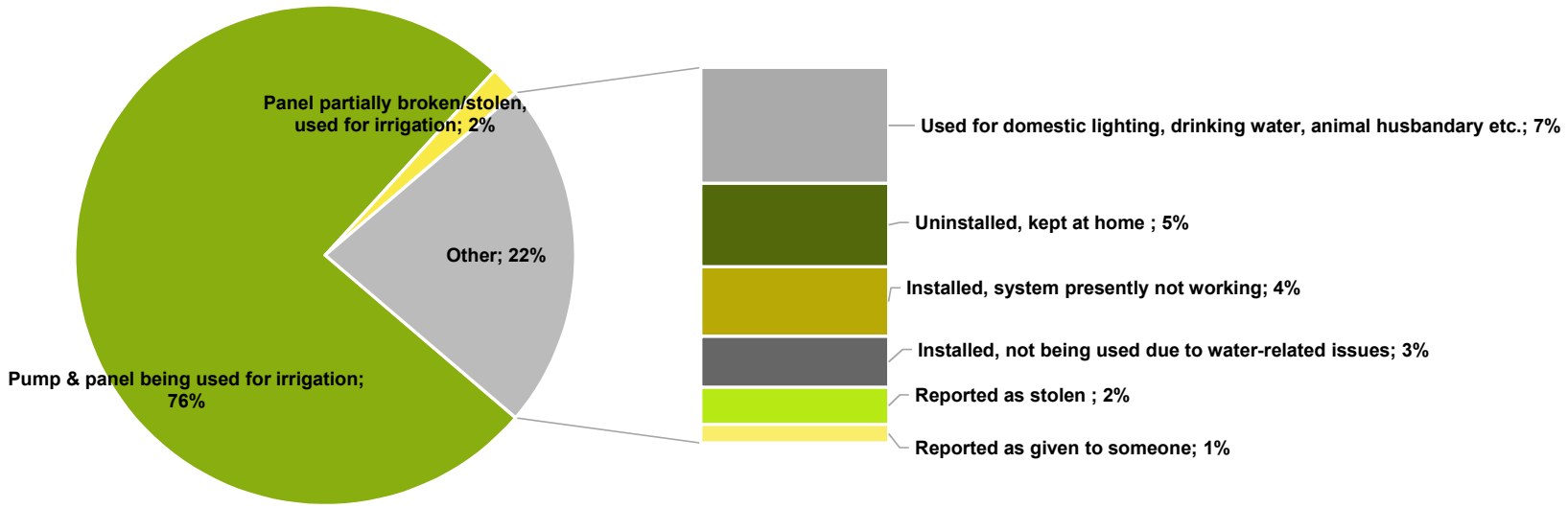
PUMP MAKE



PANEL MAKE



Status of Assets



78% of 360 surveyed solar pumps are currently being used for irrigation purposes

Survey results summary

Major gaps emerging in farmer awareness and maintenance services by vendors

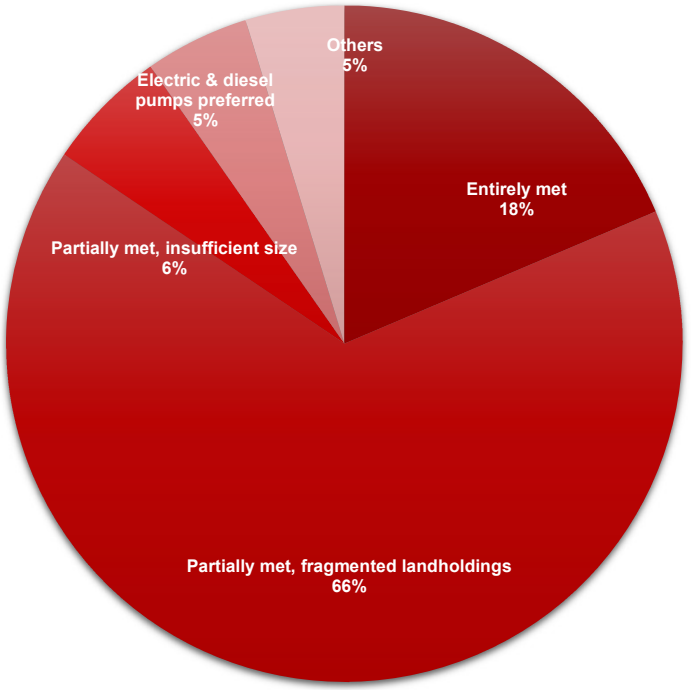
Operational condition	• 93% of installed SWPs found to be in shade free area • 32% of inspected pumps found to be properly maintained; 57% had minor incidences, and 5% major incidences • 56% SWPs being cleaned at least once in 2 weeks; 38% on monthly to yearly basis; 5% has never been cleaned
Breakdowns and aftersales experience	• 51% of SWPs have experienced breakdown since installation (including five times or more for 8%) – Common components to fail include controller circuit and motor • 85% of SWPs surveyed in Raj have experienced breakdowns, 87% of these due to motor failure • 82% of beneficiaries not aware of toll-free number; 54% not aware of any number to contact vendor • 44% of farmers not satisfied with vendor service – 49% not aware of service centre location – Service centre located <50 kms for 14% farmers (for 40% farmers in Raj) – 21% issues resolved in a week; 25% in 1-6 months; 3% beyond 6 months (70% of cases in Raj and Od took over <1 month to resolve) – 21% paid for repair, including 9% paying 1-10k and 1% >10k • 90% beneficiaries not aware of 5-year CMC • Scope for improved monitoring from SNAs in 85% installations

giz

Asset utilization

- Majority farmers find solar pumps easy to operate and maintain, however utilization is restricted by inadequate size, fragmented landholdings etc.
- Average hours of SWP operations highest in Sri Ganganagar, Raj (515 hrs in Kharif & 473 hrs in Rabi) and lowest in Keonjhar, Od (~40 hrs)
- SWPs have helped reduce diesel pump usage, but to variable extent – at an average of about 25% in Uttar Pradesh, 40% in Rajasthan and 75% in Odisha

Role of SWPs in meeting irrigation demand



Thank you.

Deutsche Gesellschaft für
Internationale Zusammenarbeit (GIZ) GmbH

Registered offices
Bonn and Eschborn

Friedrich-Ebert-Allee 36 + 40
53113 Bonn, Germany
T +49 228 44 60 - 0
F +49 228 44 60 - 17 66

Dag-Hammarskjöld-Weg 1 - 5
65760 Eschborn, Germany
T +49 61 96 79 - 0
F +49 61 96 79 - 11 15

E info@giz.de
I www.giz.de

giz Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH

International Water Management Institute

Panel Discussion

- Key Lessons for PM-KUSUM

Innovative water solutions for sustainable development

Food · Climate · Growth

Questions for Discussion…

- What lessons can PM-KUSUM draw from the experiences shared and presentations?
- What are the significant gaps that need to be addressed for effective delivery of PM-KUSUM?

Tushaar Shah
IWMI

Ganesh Neelam
Tata Trusts / CInI

Divya Kashyap
SDC India

Priya Jadhav
IIT Bombay

Nilanjan Ghose
GIZ India

Mohinder Gulati
World Bank

Schweizerische Eidgenossenschaft
Confédération suisse
Confederazione Svizzera
Confederaziun svizra

Swiss Agency for Development and Cooperation SDC

german cooperation
DEUTSCHE ZUSAMMENARBEIT

giz

SoLAR Webinar series: Upcoming webinars

	3rd February 2021 | 15.30 Dhaka Time	https://us02web.zoom.us/webinar/register/WN_WF3JXcGNT2aQq8PVPs_Ijg
	4th February 2021 | 10.00 Kathmandu Time	https://us02web.zoom.us/webinar/register/WN_ijjKJIQhQF6CqSEUSHVz-A
	4th February 2021 | 14.30 Islamabad Time	https://us02web.zoom.us/webinar/register/WN_5pqgk1xgRwahShHsP2y4Bg
	5th February 2021 | 15.00 New Delhi Time	https://us02web.zoom.us/webinar/register/WN_wZ1onaVdSvCiBdpmZdgv4w

https://www.iwmi.cgiar.org/events/solar-irrigation-for-agricultural-resilience-solar-webinar-week/