



Solar Irrigation for Agricultural Resilience (SoLAR) in South Asia Second Regional Forum

Pakistan Country Progress Update SoLAR Pakistan Team February 23rd, 2021

> Innovative water solutions for sustainable development Food · Climate · Growth

Key Achievements

- Situational Analysis Report SIP
 Outlook in Pakistan
- Data collection on SIP farmers
- MoUs signed with partners
- Solar behavioral study design and preliminary survey
- Precision surface irrigation trials coupled with SIP
- Trainings to students, faculty and farmers

- National webinar on "The potential of Solar irrigation for Pakistan: a critical inquiry"
- CPMC Meeting (2)



MoUs signed with Project Partners

- Federal Water Management Cell, Ministry of National Food Security and Research
- Khawaja Fareed University of Engineering and Information Technology (KFUEIT) RYK*.

 Pakistan Agricultural Research Council (PARC)



SAARC ENERGY CENTRE JOINS THE PROJECT STEERING COMMITTEE



Energy for Peace & Prosperity



Key features of Situational Analysis Report

- National outlook of Groundwater
 Private Sector use
 - Groundwater depth Groundwater fluctuations Groundwater quality Groundwater pumping

- engagement/services
- SIP related challenges
- SIP related opportunities

- Policies and legislations related to SIPs
- SIPs schemes by the **Government of Pakistan**



Behavioral Study Background – Massive growth in number of Tubewells in Pakistan



- Punjab the largest province by population has 78% of the total tubewells in Pakistan
- 83% of the total tubewells in the country are diesel operated
- Huge contribution towards carbon emissions and oil import bill In this backdrop – the SoLAR Project Pakistan Component addresses the key issues to provide policy recommendations to the Government



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Solar Behavioural Study

Purpose of Study

- Generating improved empirical evidence to support the development of climateresilient, gender-equitable, socially inclusive, and groundwater-responsive solar irrigation policies;
- Whether SIPs would lead to more groundwater pumping compared to diesel or electric pumps or not.
- Reasons for focusing on diesel pumps

Across the country, there are ~1.3 million tube wells of which 83% are diesel-powered; Current estimates state that diesel-powered tube wells are contributing almost 5.025 million metric tons of CO2 emissions annually (FAO, 2019).



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Target Population – Sampling Frame – Sampling Unit

- Target Population: all the farmers either using SIP or diesel pumps in Punjab, Pakistan.
- Sampling Frame: Based upon the data provided by Pakistan Agricultural Research Council (PARC) for The 1956 SIPs installed in 103 tehsils (30 districts of 8 divisions) of Punjab
- Basic Sampling Unit: Farmers within each of the 30 districts, either using SIP or diesel pumps, will be Basic Sampling Units



Sampling Frame

- This sampling design is based on Punjab Agriculture Department data of SIPs installed as a part of program, in which farmers were obligated to use drip irrigation system coupled with SIP.
- Anecdotal evidence shows that many farmers, using SIPs, have abandoned drip irrigation system.
- Probability sampling would allow us to select those SIP farmers that have abandoned use of drip irrigation system.
- This will help us disaggregate the effect of drip irrigation system on behavior of farmers using SIPs as compared to diesel pump farmers.





Sampling from 03 different zones of Punjab

Northern Zone Central Zone Southern Zone



Progress Update

- Pre-survey of SIP owners complete
- Rapid enumeration of Diesel and SIP farmers to start shortly in Northern, Central and Southern Punjab
- A random sample from the rapid enumeration will be chosen for detailed survey of diesel and SIP farmers along with in-situ instrumentation



Usage of Pumps



SIP Only Both SIP & Diesel Both SIP & Electric Diesel Only SIP | Diesel | Electric Electric Only Both Diesel & Electric No Pump



Source of Water for SIP

90% 84% 80% 67% 70% 59% 58% 58% 56% 60% 50% 44% 42% 42% 41% 40% 33% 30% 16% 20% 10% 0% Chakwal (16) Faisalabad (25) Jehlum (33) Lodhran (12) Toba tek singh (18) Total (104)

District-wise Source of Water for SIP - All SIP Farmers

groundwater pond



Source of Water in Pond

SIP used in combination with diesel/electric Source of water for pond

Majority fill the pond either through excess canal water or Electricity Tubewell



Method of Irrigation



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Method of Irrigation

Type of Produce







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Precision Surface Irrigation coupled with SIP Trials

Does precision surface irrigation coupled with solar irrigation pump merit investment or is the traditional approach of solar coupled with HEIS is the future?

Why is this important?

. . .

Farmers perceive investing in solar synonymous to installing HEIS system.

Need to break this mental barrier.

Precision surface irrigation can achieve comparable application efficiencies and distribution uniformities as that of HEIS systems – at a fraction of the cost.



Progress Update

- Analysis/Design for a field with precision surface irrigation.
- First trial underway on the field site of KFUEIT
- Two fields configured for winter (*rabi*) wheat
 - Control conventional practice
 - Treatment precision surface irrigation
- Control irrigated through traditional surface irrigation practices
- Treatment configured through laser grading using precision surface irrigation through border strips



What is precision surface irrigatio

- Surface irrigation where parameters that are in the control of the farmer are adjusted to maximize application uniformity.
- Uses complex/sophisticated computer model – WinSRFR developed by USDA to create a computer model of an irrigation field.
- Simulate numerous options and alternatives to obtain the optimum configuration.





About WinWRFR

Agricultural Research Service

<u>USDA</u> ARS Arid-Land Agricultural Research Center 21881 North Cardon Lane Maricopa, AZ 85238

Arid-Land Agricultural Research Center

When referencing this software, please use the following citation:

Bautista, E., Schlegel, J.L., and Strelkoff, T.S. WinSRFR 4.1 - User Manual. USDA-ARS Arid Land Agricultural Research Center. 21881 N. Cardon Lane, Maricopa, AZ, USA, September, 2012.

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Key inputs into a surface irrigation model









Trainings Provided to Students of KFUEIT Number of Students Trained = 32

- Soil Infiltration Tests
- Longitudinal Survey of Field and Laser Grading
- WinSRFR online Training on Design of Precision Surface Irrigation field using Solar Irrigation Pumps delivered on December 22 – 23, 2020





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National Webinar on the topic of "The Potential of Solar Irrigation for Pakistan: A critical Inquiry" February 4th, 2021

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Time Slot	Торіс	Facilitator	🔗 🤹 Recording	
2:30 pm to 2:35 pm	Background of the webinar	Mohsin Hafeez		
2:35 pm to 2:40 pm	Introduction of Speaker and Panelists	Mohsin Hafeez		
2:40 pm to 2:55 pm	Keynote Presentation Topic: The potential of Solar irrigation for Pakistan: a critical inquiry	Imran Khalid	Dr. Abbin Hafee: Dr. Azeem Shah	Por imran Khald
2:55 pm to 3:00 pm	Q&A on the presentation	Mohsin Hafeez		
3:00 pm to 3:02 pm	Opinion Poll Question		2 mi suidad Allined	Mansi Chopra
3:02 pm to 3:42 pm	 Panel Discussion Panelists: 1. Ms. Sara Hayat, Climate Change and Legal Expert, Pakistan 2. Dr. Sardar Mohazzam, NEECA, Ministry of Energy, Pakistan 3. Mr. Tahir Anwar, FWMC, Ministry of National Food Security and Research, Pakistan 4. Dr. Shoaib Ahmed, SAARC Energy Centre, Islamabad 5. Dr. Imran Khalid, SDPI, Islamabad 	Mohsin Hafeez	Recraig Image: Constant lattice Image: Constant lattice	Image: Second
3:42 –pm to 3:57 pm	Q&A to the Panelists from the audience	Mohsin Hafeez	Mansi Chopra	Muhammad Zai
3:57 pm to 4:00 pm	Concluding Remarks and vote of Thanks	Azeem Shah	المستقد من المراجع الم المستقد المراجع	

Key Takeaways from the national webinar

Takeaway 1:

-More finances need to be -Evidence needs to be dedicated for capacity building of farmers and other technical personnel so potential of SIPs could be realized. This will also address all the apprehensions of farmers; them formulate evidence thus, it will promote SIPs. backed policies.

Takeaway 2:

generated showing relationship between SIP use and groundwater extraction. This will help clarify apprehensions of the policy makers and help

Takeaway 3:

-Before moving forward, water accounting needs to be done. Therefore, areas suitable for promoting SIPs can be identified and targeted.



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• Thank you

Azeem Shah: Pakistan Lead (<u>a.shah@cgiar.org</u>)

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