Review of solar pumping practices in the Punjab province for agriculture-water-energy reform

Stakeholder Consultation Workshop, Rahim Yar Khan

Summary Report

IWMI
International Water Management Institute

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Contents

Review of solar pumping practices in the Punjab province to inform agriculture-water-energy reform

The Government of Punjab is undertaking a legislative and policy shift towards improved groundwater management. This is illustrated by Government's Punjab Water Policy (2018), the Punjab Water Act 2019, and the Punjab Groundwater Management Plan (under preparation). As part of the World Bank's Programmatic Agriculture Sector Review (PASA - P175667) for Pakistan, this review study is carried out to estimate the economic, climatic, and environmental effects of solar groundwater extraction infrastructure, and identify the expected trade-offs in shifting from existing systems to lower-emissions and higher-sustainability systems.

The overall objective of this study is to provide the government of Punjab with actionable recommendations that can enable the continued and sustainable abstraction of groundwater for irrigated agriculture with lower GHG emissions and reduced harm to natural resources. This study will identify reforms and intervention designs that can pave the way to a low-carbon and sustainable groundwater use in agriculture, especially for downstream and more vulnerable areas and users. Current knowledge of changes in surface and groundwater interactions between upstream and downstream canal areas will also be leveraged to identify zones where higher levels of pumping are sustainable and are therefore appropriate for promotion of solar tube wells. It will also identify opportunities to align a potential tube well solarization program with the Government of Punjab's ongoing legislative and policy shift towards improved groundwater management.

Introduction to Stakeholder Consultation on Solar Irrigation

Stakeholder consultation on Solar Irrigation was conducted in collaboration with Khwaja Fareed University of Engineering and Information Technology (KFUEIT). Different stakeholders from academia, government, farmers, and industry participated in this event. The objective of this consultation was to conduct a stakeholder mapping to understand the policy and institutional landscape and the needs and motivations of different stakeholders. Additionally, this event helped in assessing how different stakeholders are affected by current water management and pumping practices. Lastly, this consultation along with other consultation events to be conducted in other district will help in paving the way for the government to promote solar technology resulting sustainable groundwater abstraction.

Dr Yasir Niaz (HoD – Agricultural Engineering Department) gave opening speech and presented some highlights about the activities and achievements of KFUEIT.

Session 1: Keynote Presentation

Topic: ***The potential of Solar irrigation for Pakistan***

Presenter: Dr. Azeem Ali Shah, International Water Management Institute (Pakistan)

Summary of the presentation

There are different points of view about solarizing the agriculture sector, on one hand Solar Irrigation Pumps (SIPs) can lead to decrease in carbon emissions while on the other hand it can lead to over abstraction of groundwater. There is no feed-in-tariff and farmers have not converted to net metering system in agriculture sector of Pakistan.

Salient features of pumping practices in Punjab include exponential increase in diesel tube wells overtime which has led to increase in carbon emissions, increase in cropping intensity that is supported by conjunctive use of groundwater with canal water. This has led to fall in groundwater

levels in many areas. Lack of implementation of groundwater management policies has resulted in unsustainable groundwater abstraction.

Models of solar irrigation implemented in India, Bangladesh and Nepal can be examined at three levels i.e., microscale, mesoscale, and macroscale. Microscale model of solar irrigation in India 5 to 8 KWH pumps given to union of farmers. In Pakistan, individual investment is more prevalent as compared to collective ownership of pump. Mesoscale model of solar irrigation includes 30 to 50 KWP SIPs. SIP farmers can distribute electricity back to grid. Macroscale model of solar irrigation include large SIPs grids.

While designing new subsidy scheme for SIPs government must decide on factors like models, approaches, risk & market development, and regulatory practices. Net metering and feed-in-tariff can help in extending vision of agri-solarization in Punjab in sustainable manner. Finally, we also need to think about coupling SIPs with HEIS irrigation systems (should not only stick to drip but sprinklers (rain guns), centre pivot systems also provide promising alternatives) and which areas and which types of crops are actually suitable for such systems.

Session 2: Panel Discussion

Lt. Col. Jamal from Salinity Control and Reclamation Project (Head SCARP)

Solar capacity is huge and should not be limited to drip irrigation. Electricity generated by SIPs can be used to operate fodder shredding machine, oil extracting machine or home fans. He gave an example of Israel being fruit basket of Europe, and it has been able to turn desert into productive land mainly through solarized groundwater pumping.

Syed Mazhar ul Haq (Chairman: Kissan Bachao Tehreek)

Meaning full change will occur when small farmer can increase their income using technology so small farmers should be the target audience for any upcoming scheme. Small farmers are facing difficulties in affording fertilizers because of high prices, it is unimaginable for them to buy solar pumps.

Salman Sarwar (Agricultural engineer – farmer using drip)

10HP SIP can fulfil requirements of small farmers. For small farmers in winters, SIP can meet irrigation requirements in 2 to 4 hours per day and when crop does not require much irrigation SIP are used as low as 2-4 hours per week. In periods of low use electricity generated by SIP can be used to operate flour mill and oil extraction machine, 10HP SIP will be sufficient for these purposes. In desert areas where agriculture land is above canal level, SIPs are especially useful. Other use of SIP can be that water from canal can be stored in pond, and SIP can be used to pump pond water into the fields.

Proper crop selection is one of the main factors in successfully using drip with SIP, crops with high water requirements are difficult to sustain drip use with SIP. Drips have only proved successful where farmers have used those for orchards or in desert areas.

Representative of All trade union

SIPs can be utilized in many ways and SIP along with drip can save water. SIP price has been raised due to recent increase in taxes. To keep SIPs in affordable range, SIP should be kept tax free. Along with tax exemption, net metering will be beneficial for the farmers to supplement their income.

Muhammad Muzammil (Buraq Integrated Solutions)

Last subsidy program has been misused. Large farmers made multiple registries for their land i.e., farmer owning 800-1000 acre made 16 registries; thus, installed many SIPs. It is also noticed that SIPs are installed with capacity greater than what is required. Future subsidy program should be designed in a way that these things could be avoided.

To avoid groundwater abuse through SIPs, SIPs can be metered to restrict water use beyond crop needs. For areas with higher gradient hydra ram pumps can be used to efficiently pump water high than its source. Weather forecast equipment can be installed at micro level so accurate weather information can be available to farmers and water can be saved in case rain is expected.

Zahid Shabbir (farmer near KFUEIT)

In PACCA area groundwater is saline so only option is canal water irrespective of the fact what is crop's water requirement. I cultivated wheat on raised bed and noticed 50 percent of water saving. Most of water is required on first irrigation and even then, that first irrigation water is less than the water required on first irrigation of normal method of field design.

According to him, if SIP farmers grow wheat on raised bed, they will be selling water as their SIPs would be sitting idle most of the time.

M Yousaf (Field Engineer – NESPAC)

Baluchistan experience shows us that SIPs installed on sweet groundwater has resulted in declining level of water table. SIPs should be installed after specific gaps to avoid over exhaustion of sweet groundwater pockets. Ground water 1978 ordinance needs revision to tackle these problems with groundwater abstraction.

Dilshad Riaz (MSc. Agriculture – Farmer SIP with Drip)

I have 15 acres of orchards with guava, citrus, and beri trees. SIP was installed in 2018 and pond of 176m by 155m with 6' depth was built. SIP is used with drip only and one diesel pump is used once a month to fill pond with canal water. Crop selection is pivotal for drip to succeed with SIP i.e., I am growing citrus trees which can be water stressed for 4 months.

Shahzad Abrari (Kissan Chairman)

I am a farmer in Pakka area. Crop selection is important for drip to succeed i.e., 1 sugarcane irrigation is equivalent to 7 cotton irrigations, lesser the water requirements of crop better the drip works. I have installed SIP with drip on 12.5 acres and my diesel costs are zero now. When I installed SIP, government's subsidy program was 80 percent subsidy and 20 percent was farmer's contribution. For 11 KW SIP total cost was 1.5 million rupees whereas privately from the market same capacity SIP was available for less than 1 million rupees. Subsidy price should be controlled as it seems to be over-priced.

Drip system needs regular maintenance, and it should be treated with acid after 6 months to improve its results. Drip parts are expensive and should be made available at reasonable price.

Khalid Waseem (District Agriculture Engineer)

There is continuous depletion of groundwater with time. Groundwater depletion needs to be controlled through implementation of laws. Sugarcane has negatively effected groundwater especially in Sadiqabad region.

To use groundwater efficiently submersible pumps should replace turbines, ponds to save rainwater and unused canal water should be built. Main aim of government subsidy scheme was to promote drip irrigation system and SIP was made part of the scheme to make the scheme attractive for farmers. Unfortunately, governments subsidy scheme failed to effectively promote drip system, and this was the reason that government had to stop subsidy on SIP because farmers were more interested in SIPs rather than drip.

For drip, maintenance is pivotal and main reason of abandoning drip by the farmers is lack of maintenance. Especially in areas with saline water, water can't be used in drip in long term without appropriately treating it i.e., reverse osmosis. In water strained and saline water areas, detailed groundwater analysis is needed to identify sweet water pockets; these services are provided by my department.

Atiq-ur-Rehman (Fatima Fertilizer – Horticulture)

In Fatima fertilizers, 70% – 80% area is on HEIS and 95% water used is wastewater. We are conducting trial for HEIS with cotton crop.

In areas with brackish water, SIPs can be promoted for fisheries and agro-forestry. Agro-forestry can help in fulfilling timber requirements. SIPs should be promoted with reservoir ponds in both kaccha and pakka areas, so canal water is not wasted.

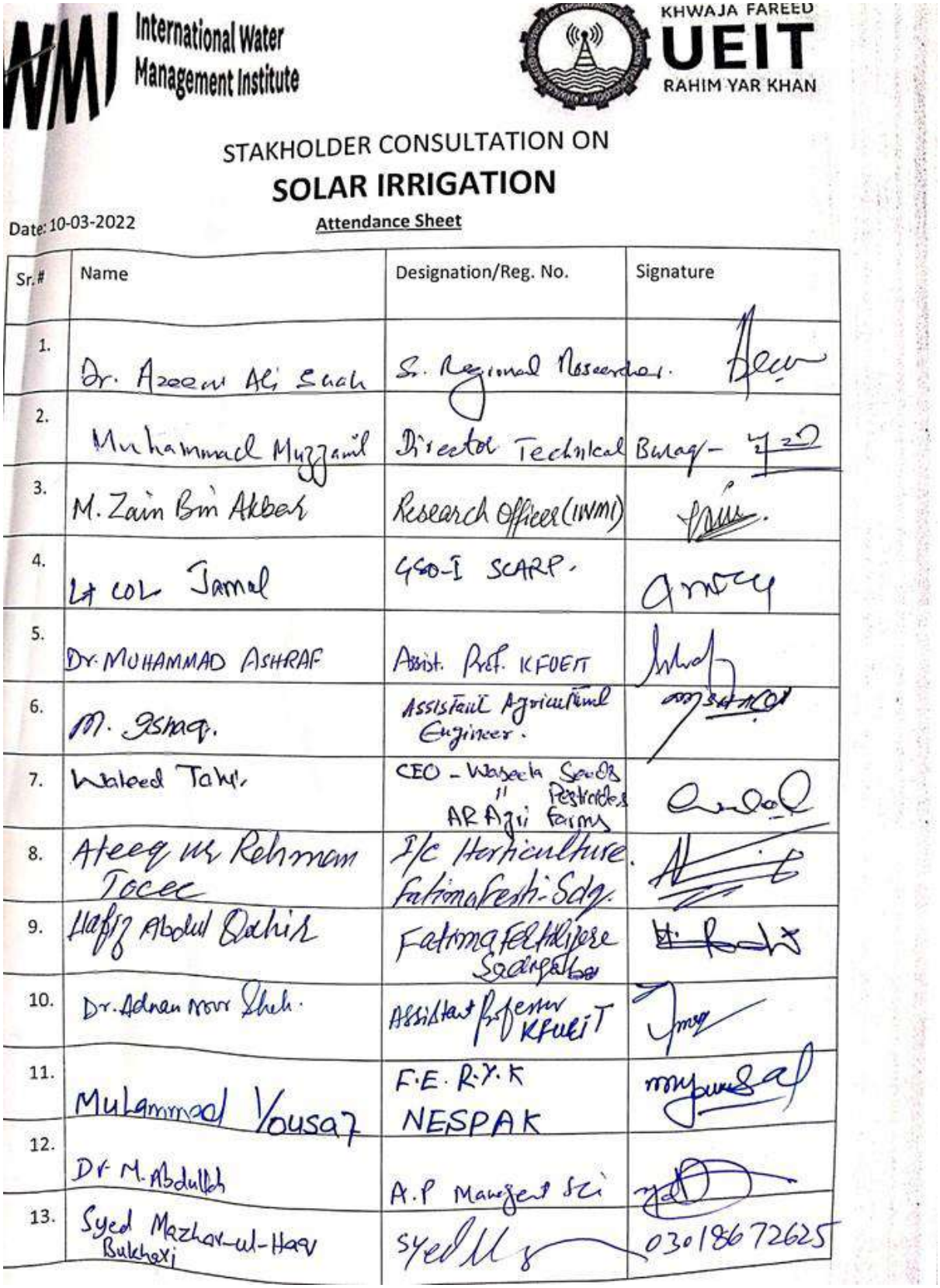
Dr. Ashraf (KFUEIT)

Coupling drip with SIP means that farmer is going for high value crops because SIP with drip is not seen to be successful for conventional crops.

Key Takeaways

- In times of low water requirement for crops, use of SIPs for non-irrigation purposes should be promoted i.e., to operate fodder shredding machine, oil extracting machine and household fans.
- To successfully promote drip irrigation with SIP, selection of crops is very important i.e., orchards and high value vegetables are more suitable for drip irrigation as compared to conventional crops. Even within fruits and vegetables such varieties are more successful that need less water than others. In areas with brackish water SIPs can be promoted for fisheries and agroforestry.
- Regular maintenance vital for operating the drip irrigation systems efficiently in the long run.

Appendix A: List of Participants



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KHWAJA FAREED UEIT RAHIM YAR KHAN

STAKHOLDER CONSULTATION ON

SOLAR IRRIGATION

Date: 10-03-2022

Attendance Sheet

Sr.#	Name	Designation/Reg. No.	Signature
1.	Dr. Azeem Ali Shah	S. Regional Researcher.	
2.	Muhammad Muzzamil	Director Technical Buraq-	
3.	M. Zain Bin Akbar	Research Officer (IWMI)	
4.	Lt COL Jamal	GSO-I SCARP.	
5.	Dr. MUHAMMAD ASHRAF	Assist. Prof. KFUEIT	
6.	M. Ishaq.	Assistant Agricultural Engineer.	
7.	Waleed Tahir.	CEO - Waseela Seeds Pesticides AR Agri Farms	
8.	Ateeq ur Rehman Tocec	I/C Horticulture. Fatimafesti-Sdg.	
9.	Hafiz Abdul Qadir	Fatima Fertilizers Sargodha	
10.	Dr. Adnan Noor Shah.	Assistant Professor KFUEIT	
11.	Muhammad Yousaf	F.E. R.Y.K NESPAK	
12.	Dr M. Abdullah	A.P Manager Sci	
13.	Syed Mazhar-ul-Haq Bukhari	Syed M	03018672625

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14.	Dr-M-Farhan J. Chughtai.	Head of Department, Food Scam & Tech.	
15.	Dr. NOMAN ALI	A.P Agricultural Engineering	
16.	Engr. Faizan Shabir	AGEN	
17.	Abbas Ali	AGEN	
18.	Khalid Waseem.	MPhil Agen. NON. AGEN	
19.	SHAHZAD ABRAR SALEEMI 03008671244	FARMER	
20.	Rana Tanveer 03009672101	FARMER	
21.	ذاکر شریف مہر	جنرل سیکرٹری کسان اتحاد تحصیل زیتون	
22.	Abdul Kor Tousseef	ch. No. 78/P	
23.	Dilshad Nabi Riaz	Chak 139/P-A Rty. Khan (Farmer)	
24.	M. Mustafa Ali		
25.	0305-8724313 M. MUSTAFA Ali	SETUP (DAIC Solar)	
26.	0301-8724709 Salman Sarwar	Farmer	
27.	Dr. Habib Ali	Assistant Professor Agriculture Engineering	
28.	Engr. Dr. Kamran I Khan	A.P.(AGEN)	

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29.	Dr. Adnan Bodla	A.P (AGEN)	
30.	Dr. Mohsin Waqar	A.P (AGEN)	
31.	Dr. M. Saqlain Zaheer	A.P (AGEN)	
32.	Noman Zubair	Pak Solars	
33.	Rashid Ali	Photographer	
34.	Usman Tariq	ICT	
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Appendix B: Photo Gallery

Speakers at the workshop

Participants at the sessions

Dr. Azeem Ali Shah, Country Lead, SoLAR-Pakistan with workshop participants

Image Credit: IWMI SoLAR-Pakistan.

Appendix C: Media Coverage

CONSULTATION: A consultation on solar irrigation was conducted on Monday at Khwaja Fareed University of Engineering and Information Technology (KFUEIT) with the collaboration of IWMI-Pakistan under a project funded by the World Bank.

A press release said, the representatives from the SCARP, Nespak, Fatima Fertiliser, solar industry, farmers associations participated in the consultation.

The session was addressed by Dr Azeem Ali Shah, Senior Regional Researcher at IWMI-Pakistan Col Jamal Rauf (SCARP), Syed Mazharul Haq Bukhari, the president Kissan Bachao Tehreek, Tariq Shahzad, the assistant agriculture engineer, M Mustafa Ali, the president of solar association, Ateequr Rehman and Hafiz A. Qahir (Fatima Fertilizer Company), Engr Yousaf, the field engineer Nespak and the farmers.

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Stakeholder consultation on Solar Irrigation conducted at KFUEIT

RAHIM YAR KHAN, March 10: The stakeholder consultation on Solar Irrigation was conducted at KhwajaFareed University of Engineering & IT-RYK with the collaboration of IWMI-Pakistan funded by the World Bank project. The representatives from SCARP, Well drilling, NESPAK, Fatima Fertilizer, solar industry, presidents of multiple farmers associations, and farmers from Rahim Yar Khan District participated in the consultation session. The session was led by Dr. Azeem Ali Shah, Senior Regional Researcher at IWMI-Pakistan. Col. Jamal Rauf (SCARP), Syed Mazhar-ul-HaqBukhari (President Kissan-BachaoTehreek), Tariq Shahzad, (Assistant Agriculture Engineer-RYK), M. Mustafa Ali (president solar association RYK), Mr. Ateeq-ur-Rehman and Hafiz A. Qahir (Fatima Fertilizer Company), Engr. Yousaf (Field Engineer, NESPAK) and the farmers from the district provided valuable suggestions on the solar irrigation system. The suggestions will be helpful for the potential utilization of proposed World Bank funding to the provincial government department regarding installation of solar irrigation systems. Engr. YasirNiaz-Head of Agricultural Engineering and Engr. Muhammad Ashraf-Assistant Professor from KFUEIT, RYK thanked the participants. PR

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Media Coverage by National Herald Tribune