

# Optimizing groundwater usage through DBT in electricity: Lessons from Punjab – Part I

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For decades, the Indian agricultural economy has depended on financial support in the form of subsidies provided by the Government of India. The power subsidy comprises one of the largest shares among the agricultural subsidies, with states spending nearly INR 90,000 crores (USD 11.8 billion)<sup>1</sup> directly every year. Indian state governments began providing farmers with subsidized power in the 1970s in a bid to boost agricultural productivity and facilitate the [green revolution](#).<sup>2,3</sup>

Farmers primarily use electricity to run tube wells<sup>4</sup> for irrigating crops using groundwater. As the number of tube wells increased during the 1970s, most energy providers stopped installing meters to save on the cost of metering and moved to flat tariffs. Soon the provision of subsidized power to farmers became a populist political choice and many states transitioned to providing free power. This plays a crucial role in enabling and sustaining agricultural production but at the same time compromises efficient energy accounting, increases the fiscal burdens of the states, and depletes groundwater. [The agriculture sector in India consumes approximately 22% of India's total electricity, yet generates only 8% of revenue for the utility companies.](#)

Because of the high subsidies on agricultural power, electricity to farmers is virtually free. They can extract groundwater without having to pay hefty electricity bills. Over the years, farmers in India have shifted toward water-intensive crops, such as rice and wheat due to the provision of the Minimum Support Price (MSP).<sup>5</sup> This has led to a decline in the water tables.

Today, India faces a complex “food-water-energy nexus” characterized by excessive production of water-intensive crops, overexploitation of groundwater, and high agriculture power subsidies. Groundwater overexploitation has reached a near-crisis level in states dominated by electric tube wells and cheap or free power.<sup>6</sup> The proportion of overexploited blocks<sup>7</sup>, that is, those with water tables below “critical”

levels, is the highest in states like [Punjab \(79%\), Rajasthan \(63%\), Haryana \(61%\), Himachal Pradesh \(50%\), and Tamil Nadu \(40%\)](#).

## The case of Punjab

The northern Indian state of Punjab leads in the production of wheat and rice in the country, and is known as the “bread basket of India”. Punjab accounts for nearly 18% of total wheat and 12% of the total rice produced in the country. Farmers in Punjab enjoy free and un-metered supplies of power for a restricted duration of eight hours per day. Free electricity creates the notion that water is free, which leads to overuse of groundwater for irrigation. This reflects in the sharp increase in the number of electric tube wells in the state, from nearly 0.3 million in the 1980s to 1.3 million in 2018-19.<sup>8</sup> The same period saw a gradual decline in the number of diesel-operated tube wells. Consequently, Punjab today has more than 1.35 million agriculture power consumers who avail of free and un-metered power.



1. [Report on the performance of state power utilities, PFC Ltd., 2017-18.](#)

2. The subsidy for agriculture power in most states is partly cross-subsidized, that is, other industries are charged higher rates, while the remainder is funded by the respective state ministry.

3. Those farmers who have a registered agriculture pump-set (AP) connection issued by the State Power Distribution Company receive subsidized power. One of the primary conditions for receiving a connection is ownership of agricultural land.

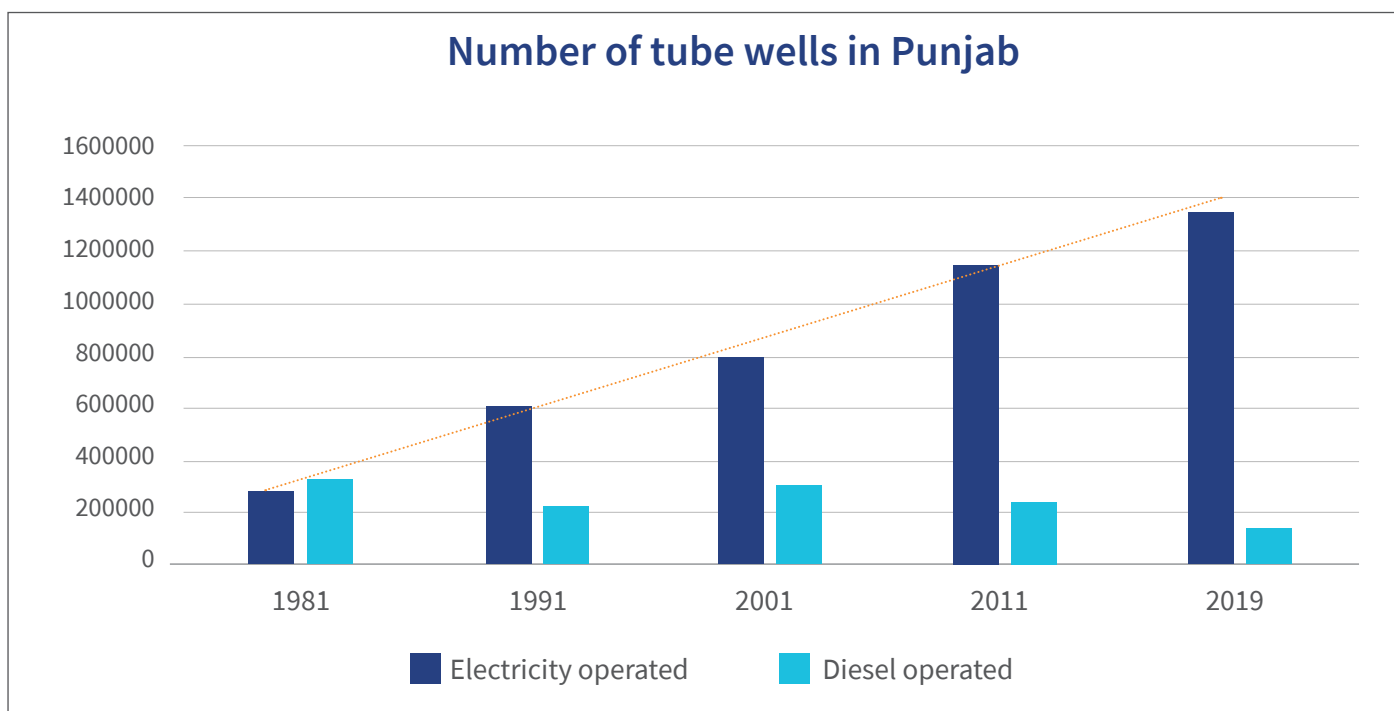
4. Tube well is a type of deep bore well that is used to pump water from underground aquifers.

5. The minimum support price (MSP) is a form of market intervention by the Government of India, under which it announces prices of certain crops, such as like rice and wheat, which it then purchases directly from the farmers.

6. The amount of subsidy provided for agriculture sector varies across states; in states like Punjab, Telangana farmers receive electricity for free as the state government subsidizes it completely.

7. Based on Indian administrative structure, a block is a subdivision of district and comprises a cluster of villages.

8. [Statistical Abstract Punjab, 2019](#)



With the increase in the number of tube wells, the water table in the state started to decline. Of the state’s net sown area, 72% is now irrigated through tube wells, with an average tube well consuming around 9,600 kWh of power annually. This consumption is 5% higher than the national average. At unsubsidized tariff rates, it would cost a farmer approximately INR 50,000 (USD 655) to consume this amount of electricity. [The state has the highest rate of groundwater extraction in the country, with 97% of the groundwater consumed solely for irrigation.](#)

Recognizing the issues at play, the Punjab government launched a Direct Benefit Transfer (DBT) program in electricity called *Paani Bachao, Paise Kamao* (Save water, earn money). This program addresses the issue of unmetered power supply by installing meters while providing monetary incentives to farmers for controlling their use of electricity, which consequently saves water.

#### About the *Paani Bachao, Paise Kamao* program

The design of *Paani Bachao, Paise Kamao* encourages farmers to save electricity, thereby reducing their use of groundwater. All farmers with agriculture pump-set (AP) connected to pilot feeders are eligible for the program, though participation is voluntary. Under the program, a beneficiary is allotted a fixed number of electricity units each month based on the motor capacity of their tube well.<sup>9</sup> At the end of every month,<sup>10</sup> beneficiaries who consume electricity below their allotted units are reimbursed at the rate of INR 4 (USD 0.05) for every unit saved. Consumption of electricity above the allotted units does not result in an

additional charge. Beneficiaries receive SMS notifications on how much electricity they have consumed, as well as the amount of benefit earned. The cumulative amount of incentive earned over two months is transferred directly to their bank accounts.

#### Program implementation

Phase I of the program launched in June, 2018 on a pilot basis in six agriculture feeders of Punjab<sup>11</sup> and covered approximately 940 farmers. Around 30% of these farmers enrolled in the program during the first year. MSC conducted a dipstick<sup>12</sup> study at two pilot feeders, Kharora and Sunderpura, to understand the demand-side implications of the program better.

Our assessment showed that most of the enrolled beneficiaries had a positive experience. They recounted on-time receipt of their incentive payments in their bank accounts every two months. On average, beneficiaries earned around INR 4,000 (USD 52) during the paddy season and INR 3,200 (USD 42) during the non-paddy season through the incentives.

Beneficiaries reported that they made conscious efforts to reduce the number of hours they ran their tube wells to save electricity and maximize their earnings. A few farmers reported maximizing the use of water from nearby canals<sup>13</sup> to irrigate their land parcels where feasible. Farmers with multiple AP connections enrolled one pump and minimized its usage while using other pumps to fulfill their irrigation needs. Most beneficiaries believed that their efforts were helping to save groundwater.

9. The Department of Power captures details of motor capacity during registration of AP connections. States have established specific guidelines for release of new AP connections. Farmers are not allowed to install tube wells on their farm without approval from the government.

10. The fixed electricity entitlement varies during paddy and non-paddy seasons.

11. Feeders are transmission points between the electricity generating station or substation and the distribution points.

12. A dipstick study is research conducted to gain a better understanding of an existing problem or situation. It focuses on gathering insights followed by collecting statistical data.

13. Irrigation canals are the artificial waterways that bring water from a source (river, reservoir) to the agricultural lands. It is a traditional source of irrigation. The government largely facilitates the construction and operation of canals in India.

Although farmers were initially hesitant to enroll, word of mouth and peer acceptance played an important role. The number of farmers interested in enrolling increased significantly after the release of the first series of payments. This was the case for Avtar Singh, as highlighted below

## Helping field staff spread the word



Avtar Singh is a farmer from Buchran village of Punjab. He owns around 24 acres of land jointly with his father and elder brother. His family had three AP connections in Kharora feeder, all in his father's name. After his fellow farmers earned benefits from the *Paani Bachao, Paise Kamao* program, he convinced his father to participate and enrolled one of the three connections.

After his father successfully received the initial payments in his account, Avtar Singh had a connection transferred to his name and enrolled in the program, as well. Having reaped the benefits, he suggests that his fellow farmers enrol. He now helps the government field staff increase program enrolment by sharing his experience.



DBT in Electricity (DBTE) in agriculture is undoubtedly a progressive initiative by the Punjab government. The design of the program incentivizes farmers to use electricity and groundwater efficiently despite receiving free power. In phase I of the program, [INR 1.54 million \(USD 20,243\)](#) subsidy was given to more than 200 farmers in pilot feeders for judicious use of water. In phase II, the Punjab government announced the expansion of the program from six feeders

to 250 feeders and plans to cover nearly 50,000 farmers. However, several challenges must be addressed before moving forward.

We will discuss these challenges in detail and possible recommendations to strengthen the design and implementation of the program in Part II of this publication. We will also advise how other states can design or replicate similar models base on lessons from Punjab.