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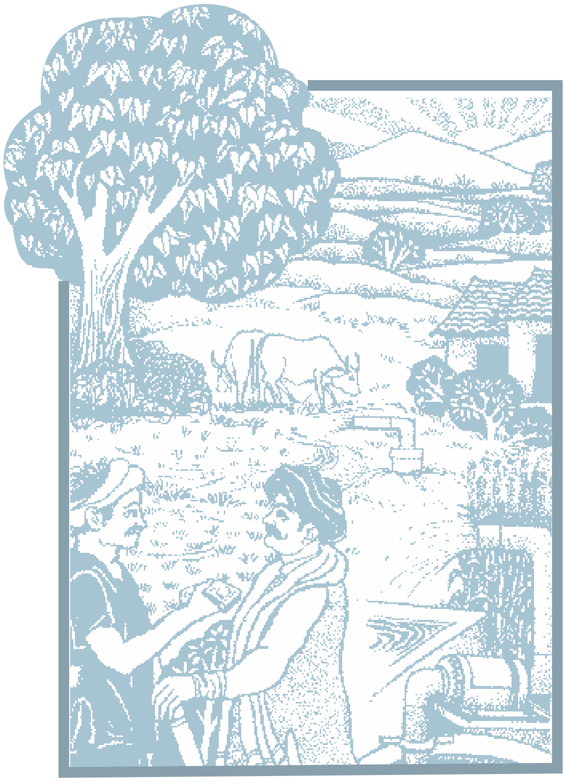

In July 2017, the IWMI-Tata Water Policy Program (ITP) launched an action research pilot in Monoharpur village of Birbhum district. At the heart of the field pilot is the hypothesis that tweaking farm power pricing policy can boost the local agrarian economy by creating pro-poor irrigation service markets. This second of three ITP Highlights reporting results from the Monoharpur pilot outlines the baseline conditions in the village; tracks the early response of pump owners and water buyers; and contemplates upcoming challenges for the study.

IWMI-TATA
Water Policy Program

Water Policy Research
HIGHLIGHT

Pro-Poor Farm Power Policy for West Bengal - II
Baseline conditions and early results

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Pro-Poor Farm Power Policy for West Bengal - II*†

Baseline conditions and early results

Research highlight based on Shah and Chowdhury (2017).

1. Context

Like majority of farmers across the country, especially since mid-1980s, farmers in West Bengal have come to depend heavily on groundwater for irrigation throughout the year. Water markets grew pervasively in the era of shallow tubewells with pump owners selling irrigation service to neighbours who were willing to cover the variable costs of energy (diesel or electricity) and make some contribution to the overheads. Mukherji (2007) found that smallholders benefitted in informal irrigation service markets not only as water buyers (WBs) but also, in several cases, as entrepreneurial pump owners. She found that, on an average, 77 per cent of all the water pumped and 69 per cent of area irrigated by any well was for the benefit of buyers. A restrictive system of groundwater permits introduced in 2005 led to a very slow rise in the density of electric tubewells. In 2011, the permit system was abolished and replaced by a much simpler and cheaper system of setting up new electric connections. However, the introduction of Time-of-Day (ToD) metering in 2008 nullified the benefit of increased pump density for water buyers. Under the earlier, flat-tariff regime, water buyers were able to use their bargaining power to secure favourable terms including competitive prices, deferred payment facilities and were able to resist leasing-in of their land by pump owners. Under the new regime of ToD metering, the irrigation service market turned oligopolistic and the bargaining power of buyers shrunk.

2. The Monoharpur Experiment

Shah and Chowdhury (2017) proposed that West Bengal can maximise the equity benefits of tubewell liberalisation by tweaking its electricity pricing policy and collecting a larger proportion of the annual cost- to-serve for a tube well connection through fixed charges rather than consumption-linked tariffs. This, they argued will incentivise tube well owners to compete harder in the irrigation service market to generate enough revenue to cover fixed costs. It will encourage them to offer water buyers better irrigation service at lower prices and reduce the incentive to pilfer power (see Shah *et al.* 2017). Based on this hypothesis, a pilot was set up in Monoharpur village of Birbhum district in West Bengal where 20 submersible pump owners participate in water selling. Kendradangal village in the same block was selected as comparison village. Since July 2017, a flat-cum-metered tariff structure has been proposed to the pump owners in Monoharpur wherein they will be paid 70 per cent of their monthly electricity bill in excess of a benchmark consumption level set for each month. The monthly benchmark has been calculated using electricity consumption data of the previous year and shall mimic a flat rate while the remaining consumption will effectively be charged at a low metered tariff (30 per cent of actual tariff).

3. Insights from the Baseline Survey

A census of irrigation service providers (ISPs) and water buyers (including sharecroppers and lessees) of Monoharpur was conducted as a baseline (in July 2017). A sample of 20 ISPs selected randomly and their 100 water buyers selected through snowball sampling from Kendradangal were also surveyed as control for the study. The entire village's farm economy has been mapped and the contribution of water trade estimated. The measurement variables selected are irrigation charges; number of renters; area irrigated per pump; payment mechanisms (cash, produce, leasing contracts); quality of irrigation service provided by private water sellers; cropping intensity; time-based pump-use pattern; and land productivity.

3.1 Landholding and Leasing Practices

The practice of leasing-in land is not new in the region and has increased in the last decade due to rising cost of irrigation and labour migration for alternative sources of income. Chowdhury (2015) found ISPs can earn only ₹1,500 by selling irrigation to one *bigha* (1 acre = 2.5 *bigha*) of land in *Boro* season but can make a net surplus of ₹4,225 – ₹10,425 by leasing-in land at ₹2,000 per *bigha* for the entire season. She found many pump owners committing *Amon* irrigation only on a condition that the buyer leases all or a part of his land to the seller for *Boro* paddy cultivation. Baseline data is consistent with her findings (Table 1), with crop sharing being the more popular contract type. 96 per cent of leased plots in *Amon* and 68 per cent in *Boro* season are leased on crop sharing basis in Monoharpur as per the baseline survey.

Data shows that ISPs do not lease-out their land in either *Amon* or *Boro* seasons while leasing-in almost half their

* This Highlight is based on research carried out under the IWMI-Tata Program (ITP) with additional support from the CGIAR Research Program on Water, Land and Ecosystems (WLE). It is not externally peer-reviewed and the views expressed are of the author/s alone and not of ITP or its funding partners.
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Table 1: Landholding and leasing data for Monoharpur and Kendradangal

Parameter	Irrigation Service Providers		Water Buyers	
	Monoharpur (20)*	Kendradangal (20)*	Monoharpur (240)*	Kendradangal (100)*
Own irrigated landholding	187.75	308.50	592.75	391.75
Total *Amon* Area	190	334	583.45	480
Total *Boro* Area	208.25	379	378.25	389.5
Total *Rabi* Area	6.00	4.50	27.58	7.00
% of owned area leased-in (Boro)	48%	28%	43%	25%
% of owned area leased-out (Boro)	0%	0%	25%	7%
% of owned area leased-in (Amon)	27%	12%	54%	28%
% of owned area leased-out (Amon)	0%	0%	18%	0%
Average size of plot	4.33	2.88	1.30	2.08
Average landholding of a household	10.90	14.70	2.47	3.95

Notes: All values in *bigha**: figures in parenthesis indicate sample size

operational holdings in *Boro*, expanding their *Boro* area by 48 per cent. Water buyers also engage in leasing-in land but only from fellow water buyers. ISPs have much bigger plots as well as higher average landholding vis-à-vis water buyers, supporting previous findings that water buyers are mostly small and marginal farmers whose dependence on ISPs for irrigation is high. The baseline cropping intensity of Monoharpur is 1.74, i.e. available arable land is not even double cropped.

3.2 Social Indicators

The average family size (proxy for availability of family labour) is higher for water sellers (ISPs) compared to water buyers (WBs) in both villages (Figure 1). In spite of the current context of labour shortage in many regions, especially for paddy cultivation, this could be a reason for sustained and even increased interest in leasing-in land by ISPs.

Credit access doe not stand out as a differentiating factor between ISPs and WBs, but credit through *Kisan Credit Cards* (KCC) appears to be available to more number of ISPs compared to WBs (Figure 2). Without a formal source of credit, the WBs are dependent on informal sources (moneylenders, *Arat*/farm input suppliers) with high interest rates, further squeezing their profits from paddy cultivation.

3.3 Water Trade and Pumping Behaviour of ISPs

18 of the 20 ISPs in Monoharpur have one 5 HP pump while the other two have two 5 HP pumps each. The oldest pump was installed in 1995 and 75 per cent have been installed after 2010; the newest one being installed in 2015. Only one ISP received subsidy on the pump through *gram panchayat*. 7 of them also have diesel pumps but do not use them for irrigating paddy any longer. Average water level reported by ISPs is 49 feet (~15 m) and declining water table has never been an issue in the village.

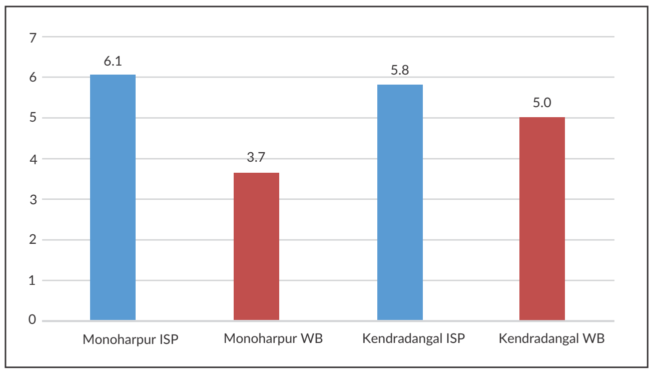

Figure 1: Average family size

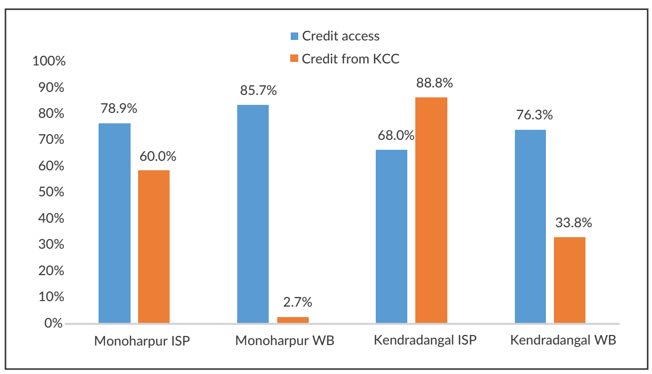

Figure 2: Comparison of access to credit from informal and formal sources

3.4 Time-based Pump Usage

The state's ToD metering policy was introduced to even-out the demand load by charging extremely high tariff during

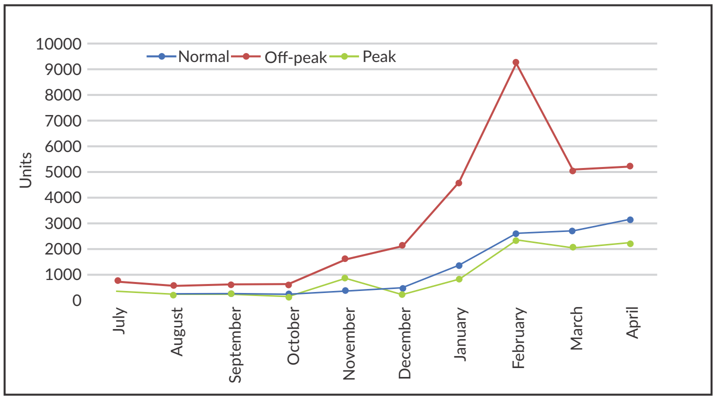

Figure 3: Monthly energy consumption pattern of ISPs of Monoharpur across three time windows, 2016-17

peak demand hours (₹ 7.48); lower tariff during normal hours (₹ 3.78); and very low tariffs during off-peak hours (₹ 2.42). Given the large difference in peak and off-peak prices, ISPs try to maximize their off-peak power consumption to minimize their electricity bill (Figure 3). There is, however, very less difference in their own consumption pattern between normal and peak hours. The ISPs reported that there is only a limit up to which they can use off-peak (night time) power because the pumps are located in the field and they risk getting a snake bite when they go to operate their pumps at night. Additionally, small plots mean that they cannot leave the water running all night long without risking water overflow to adjacent plots.

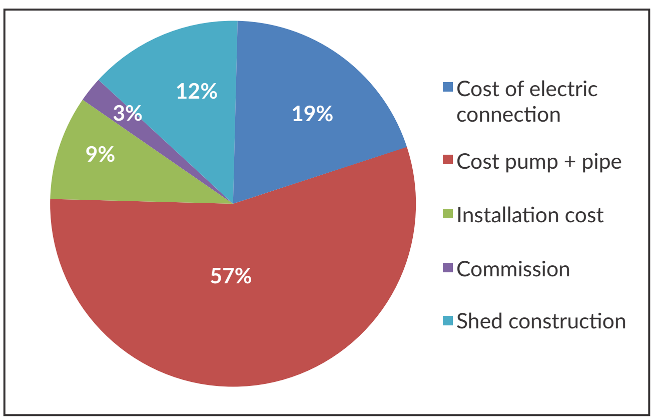

Figure 4: Break-up of cost of pump installation

3.5 Cost of Pump Installation

Average cost of pump installation has been calculated to be ₹88,173; see Figure 4 for cost break-up. ISPs have only been able to get the connection at affordable rates after 2011 policy change which had led to exponential increase in pump density in the state as cost was reduced and ease of getting a new connection increased.

3.6 Season-wise Pump Usage and Economics of Water Selling

Table 2 shows the season-wise pump usage and price charged per *bigha* of irrigation for entire season. The average area irrigated by an ISP annually is 54.6 *bigha* (21.8 acres). The gross income from selling water to the buyers is ₹38,150 in *Boro*, ₹9,963 in *Kharif* and ₹3,600 in *Rabi* – an aggregate of ₹51,713 annually. The ISPs reported an average annual maintenance cost of ₹9,781.

Data on power consumption in 2016-17 shows that the ISPs utilized an average of 3,503 units (kWh) of electricity in peak months of January to April, which roughly translates to ₹16,000 of bill paid. However, most ISPs have huge accumulated arrears and end up paying an even higher penalty. Most ISPs have underreported their pump sizes (5 HP instead of actual 6.5 HP pumps) due to restrictions imposed by the Groundwater Act of 2005[1]. Including their own landholding of 11 *bigha* (average for 20 ISPs), an ISP on an average irrigates 36 *bigha* in *Boro*, with each *bigha* requiring about 30 hours of irrigation. The total units supposed to be consumed by the pumps have been calculated in Table 3.

Given that ISPs are only billed for an average of 3,503 units, there appears to be a huge amount of power being drawn using illegal means to run the pumps and the electricity utility / DISCOM is losing almost 50 per cent of its potential revenue owing to “unaccounted” losses. The earnings of ISPs, on the other hand, are ₹38,150 in *Boro* season, solely from sale of irrigation service – significantly higher than the average electricity bill – indicating W/AC multiple greater than 1.

3.7 Water Buyers' Perspective

Consistent with findings of Chowdhury (2015), the values reported by buyers and sellers are slightly different even in this baseline survey. The ISPs reported 33 per cent lower

Table 2: Season-wise area irrigated by pumps, number of renters and rental charges reported by ISPs

Season	Rental charges reported by ISPs (₹/bigha)		Number of renters		Area irrigated (bigha)	
	Average	Maximum	Average	Maximum	Average	Maximum
Boro	1,526	2,000	21	50	25.0	50.0
Kharif	405	600	21	50	24.6	50.0
Rabi	600	700	6	8	6.0	8.0

[1] It exempted farmers located in 301 or so “safe” groundwater blocks and owning pumps of less than 5 horsepower (HP) and tube wells with discharge less than 30m^3/hour only from having to get permits for groundwater use from the State Water Investigation Directorate (SWID).

Table 3: Actual power consumed by pumps calculated based on area irrigated

Particulars	Amount
Total hours of pumping for irrigation (36 *bigha* * 30 hours per *bigha*)	1,080
Units consumed by 6.5 HP pump per hour	4.85
Total units consumed	5,238
Units consumed at 75% efficiency (assuming average age of pump at 8 years)	6,984
Value of power (at weighted average price of ₹4.55/kWh)	₹31,778

water prices in *Kharif* and 5 per cent lower in *Boro* during the survey. Buyers reported ₹605 and ₹1614 as price per *bigha* for irrigation service in *Kharif* and *Boro seasons* respectively. Of the total 545 plots owned by WBs, 514 are being serviced by 15 ISPs and remaining 5 ISPs only provide water to 22 plots, as they are located on the village boundaries. WBs have reported more instances of cash payment after harvesting with all of them paying by cash in *Kharif* and 97 per cent in *Boro*, for irrigating land cultivated by them. The buyers' survey also included questions on some qualitative aspects; responses are listed below.

Quality of Irrigation Services: We asked the buyers to rate the quality of irrigation service in 2011 and 2016 on a scale of 0 to 5, where 0 represents extremely poor service and 5 represents best service quality. The results (Figure 5) show a significant improvement in the quality of irrigation service – from a score of 1.97 to a score of 3.96 – with an increase in pump density in the village over the time period.

Ease of Water Purchase: 98 per cent of the buyers found it easy to purchase water at the time of need and only a few reported long waiting periods and delays during peak irrigation demand.

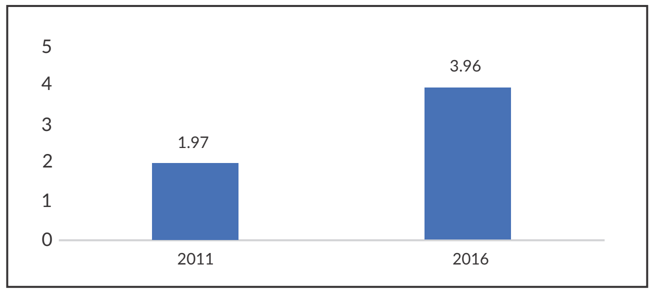

Figure 5: Quality of irrigation services, as rated by water buyers

Ease of Price Negotiation: 98 per cent of the buyers reported fixed prices and no room for negotiation in the terms offered by ISPs. The buyers are aware that the ISPs decide a common price at the beginning of the season and implement it strictly across the board. However, they do not attribute the high prices to monopolistic power of ISPs; rather they attribute it to high power tariffs and the difficulty in irrigating small plots. 97 per cent buyers reported no interest in investing in their own tube well as they have small landholdings and do not see water selling as a viable business venture for them.

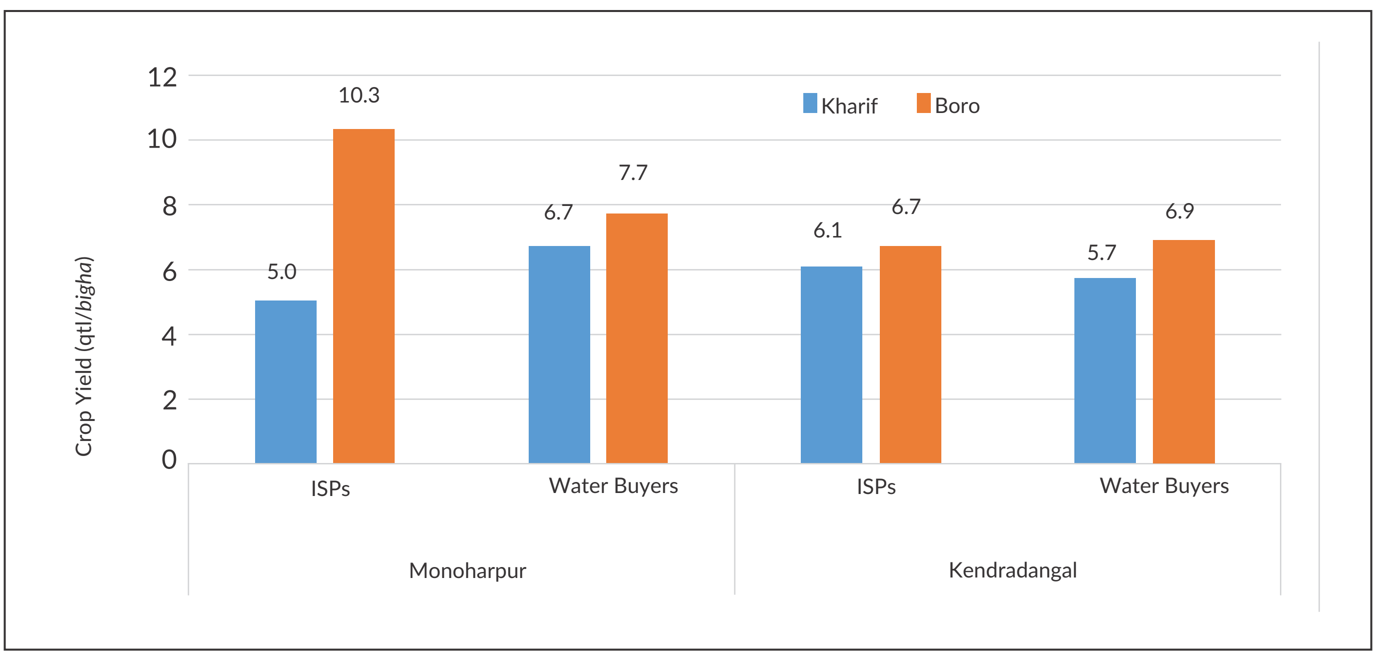

Figure 6: Crop yields of ISPs and water buyers in *Kharif* and *Boro* seasons in Monoharpur and Kendradangal

Picture 1: Monkeys attacking vegetable fields - a major reason for non-expansion of *Rabi* area

Picture 2: Kharif paddy destroyed by heavy showers before harvest

3.8 Paddy Yield

Data on crop yields from Monoharpur and Kendradangal shows that average paddy yield in *Kharif* is 6 quintal/*bigha* while in *Boro* it is 8 quintal/*bigha*. While the ISPs have slightly higher average yields vis-à-vis WBs in Monoharpur; the yields of the two groups are comparable in Kendradangal (Figure 6). One reason for this could be a new variety of paddy that some ISPs in Kendradangal have experimented with last year, which did not yield good results. Chowdhury (2015) reported similar paddy yield amongst ISPs and WBs of Kendradangal in *Kharif* but a higher yield (10 qtl/*bigha*) of ISPs in comparison with WBs (9.3 qtl/*bigha*) in *Boro*.

4. Observations at Midterm

The first round of payments was made (amounting to ₹22,542) to ISPs based on pumping data for the period August to October, 2017. 15 out of 20 ISPs qualified for 70 per cent subsidy on their electricity bills as promised under the experiment. The highest subsidy was paid in the month of September (₹14,357) as many ISPs used their pumps to irrigate *Kharif* paddy; irrigation demand was higher than usual owing to irregular showers; some ISPs also pumped to fill-up ponds for pisciculture. The ISP who received the highest subsidy (₹6,838 for three months) preponed the cultivation of his *Kharif* paddy by a few weeks in order to keep his pump available to serve peak demand; he also invested in surface pipes to ensure maximum pump utilization and irrigation coverage. An average increase of 75 hours of pump utilization (for three months) was calculated after surveying the ISPs; this suggests a positive impact of the flat-cum-metered tariff on pump utilization.

Focus Group Discussion (FGDs) with water buyers highlighted their accentuated efforts to negotiate irrigation service prices and also resisting leasing-in by ISPs in *Boro* season after learning about the experiment and the offer of subsidy to ISPs. Given a bad *Kharif* crop this year due to pest attack, this becomes even more crucial for water buyers, who are mainly small farmers and *Boro* paddy is their only way of ensuring household food security. Some farmers are increasing their *Rabi* area and growing vegetables but labour scarcity, attack by monkeys (see picture 1) and the importance of *Boro* paddy are major deterrents to expanding area under vegetables.

5. Potential Challenges

The cost of metering for the utility is ₹15 per meter reading; a huge cost that has given rise to the practice of lump-sum billing in most months and collecting actual meter readings only in some months. Given that we have set monthly benchmarks for subsidy, some ISPs may not qualify for subsidy in the months when their actual power consumption is not reflected in their monthly bill. This distorts data as well as the subsidy values actually received by ISPs. The practice of hooking on electricity lines to run pumps is still rampant and without a dedicated feeder at village level to calculate the difference between actual power consumed and billed, the study can only estimate the utility's losses by estimating actual power consumption based on area irrigated, using some assumptions (as done in Table 3).

Although the ISPs are planning to increase pump utilization to take maximum benefit of the subsidy offered under the experiment, there are some visible challenges to observe secondary impacts:

- ISPs have time and again complained of delayed payments or even defaulting on payments by WBs, especially after instances of crop failure or low yields. Expanding irrigated area and offering irrigation service to new WBs increases this risk. Not receiving timely payments also affects their ability to pay their electricity bills on time and they often end up paying large penalties.
- ISPs feel apprehensive about reducing the price of irrigation service to expand irrigation and take advantage of the subsidy offered. This is so because they fear that once the experiment is over and the subsidy is no longer available, WBs will continue to expect and demand lower prices.
- Heavy showers just before *Kharif* harvest in November led to poor yields for many farmers, including the ISPs. (see picture 2) This will now encourage them to lease-in more land to make up for *Kharif* losses. This tendency could nullify the positive effect of subsidized power on the land-lease market.

In spite of these challenges, the water buyers have made their intention to negotiate prices clear such that they also receive trickle-down benefits from the subsidy offered in the experiment. They plan to resist leasing-in of land by ISPs and stop them from digging furrows to pass water through their land if the irrigation service price is not reduced to account for the subsidy. ISPs who did not expand their irrigated area much earlier are now planning to sell more water; this has reduced the buyers' risk substantially. Certainly, subsidized power has provided some boost to the water buyers in present sellers' market. An attempt to quantify the effects of this alternative regime will be made through an end-line survey in May 2018 and communicated through a forthcoming IWMI-Tata Highlight.

Pictures 3 and 4: Discussion with ISPs (left) and water buyers (right) in Monoharpur

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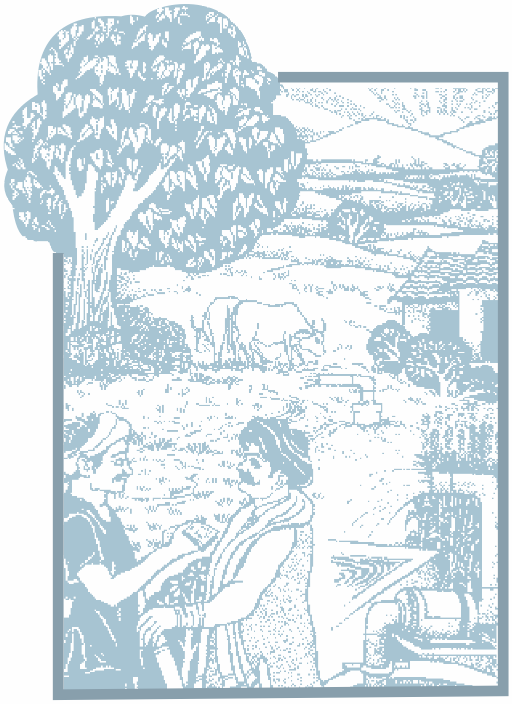

About the IWMI-Tata Program and Water Policy Highlights

The IWMI-Tata Water Policy Program (ITP) was launched in 2000 as a co-equal partnership between the International Water Management Institute (IWMI), Colombo and Sir Ratan Tata Trust (SRTT), Mumbai. The program presents new perspectives and practical solutions derived from the wealth of research done in India on water resource management. Its objective is to help policy makers at the central, state and local levels address their water challenges – in areas such as sustainable groundwater management, water scarcity, and rural poverty – by translating research findings into practical policy recommendations. Through this program, IWMI collaborates with a range of partners across India to identify, analyze and document relevant water management approaches and current practices. These practices are assessed and synthesized for maximum policy impact in the series on Water Policy Highlights and IWMI-Tata Comments.

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