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BRIEFING NOTE

Balancing State, Utility and Social Needs in Agricultural Electricity Supply

The case for a holistic approach to reform

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Table of Contents

1.0 Introduction

At the time of independence, India inherited a nascent electricity sector, largely organized around small private companies and concentrated in a few urban pockets. Following the global trend, and with a desire to bridge the rural-urban gap, the nation chose the path of public electrification. Electricity was progressively put under government control and state governments were authorized to set electricity prices. State-owned utilities and public electrification produced good results during the initial few decades. However, the outcomes also included some lock-in effects and perverse governance structures.

Subsidized electricity for the agricultural sector is one such outcome that has become a powerful political tool in subnational politics. Since the late 1960s, with the objective to garner the support of farmers, political parties have endorsed agricultural electricity supply at highly subsidized rates, sometimes free and mostly unmeasured. While these subsidies have been pursued in large part as a political patronage, they have been marketed as developmental policies seeking to ensure food security and improve rural livelihood (Swain, 2006).

Although the damaging impacts were well recognized, there was hardly any attempt at reform until the early 1990s. With the advent of liberalization, agricultural electricity pricing came under scrutiny for its economic inefficiencies. In response, some state governments have attempted to reform the subsidies by rationalizing electricity tariffs for farmers. While the outcomes vary across states, the reforms have been strongly resisted by the farmers and, consequently, have stalled.

The approach adopted so far has focused narrowly on economic efficiency, while ignoring the social and political dimensions of the problem. However, agricultural electricity subsidies in India are closely linked with food security, poverty alleviation, state finance, water scarcity and, increasingly, climate change. Such a complex issue requires an embedded and inclusive approach, with careful consideration given to social, political, economic and environmental aspects. Drawing on empirical evidence and analyzing socioeconomic-political and environmental dimensions, this paper makes a case for a broader approach to the reform of agricultural electricity subsidies.

2.0 Institutionalization of Agricultural Electricity Subsidies

The literature on agricultural electricity subsidies has emphasized the populist nature of the policy pursued by regional political parties. Some claim that there was an organized lobby from the farmers demanding subsidized agricultural inputs, including electricity. Emerging regional political parties, who had a support base among the organized farmers, responded favourably to these demands (Dubash & Rajan, 2001; Gulati & Narayanan, 2003; Birner, Gupta, Sharma, & Palaniswamy, 2007). The political success of these parties is alleged to have fuelled intensification of subsidies over time (Badiani & Jessoe, 2011). However, this narrative is limited and undercuts the prevailing political-economic context under which the subsidy policies were introduced. While there has been political appropriation of the policy in due course, it must not be ignored that the policies also had a justifiable developmental rationale. This section looks into the political economy of post-independence India and its influence on agricultural policies, particularly subsidized electricity for farmers.

During the mid-1960s, the Indian economy was in dire straits, with historical lows in per-capita income, high unemployment and a severe food crisis. Consequently, India was forced to import food grains from the United States at a high political price. The food procurement arrangement was unreliable as there was no guarantee that the surplus countries would be able to continue to cater to the needs of the food-deficient countries (Dasgupta, 1977).

To address its food scarcity, India introduced the so-called Green Revolution, which involved agricultural intensification through high-yielding seeds and modern technologies. Although food security was the primary driver, the new agricultural policy was expected to have spin-off effects like better employment, income and livelihood in rural India. The outcome was encouraging: India became self-sufficient in food production in 1975. The Green Revolution received extensive support from various influential interests.

However, the productivity gains of high-yielding seeds have been highly dependent on the availability of additional inputs, particularly irrigation water and chemical fertilizer. Being input-dependent, the Green Revolution required long-term state subsidies and planning. In response, the state governments have obliged farmers with subsidized inputs, especially fertilizer and electricity.

Although the high-yielding seeds and subsidized inputs were initially introduced in selected areas of a few states with generally favourable agricultural conditions, the initial success encouraged other farmers to demand similar treatment. When the states failed to meet the steeply rising water demand from surface sources, groundwater use was promoted to compensate. That is when electricity came onto the scene and agricultural electricity connection and consumption increased. Until that point, the agricultural electricity tariff was close to the average cost of supply and based on actual consumption (Swain, 2006).

With the increase in water consumption, electricity bills ballooned for groundwater-dependent farmers, while the surface-irrigated farmers incurred much smaller water bills. Yet, both received the same prices for their produce in the market. In response, groundwater-dependent farmers in some parts of India organized themselves to demand subsidized electricity. In the prevailing political context, subsidized electricity emerged as an effective political tool for winning the support of farmers and creating secure "vote banks" (Dubash & Rajan, 2001). Both regional and national political parties have used this opportunity, increasingly offering electricity subsidies in state after state (Swain, 2006).

The electricity subsidies were combined with unmeasured supply to farmlands, and thus not calculated on an economic basis. Though the subsidy policy was designed and implemented by state governments, there was passive support from the national government as it facilitated wider national goals like food security, poverty alleviation and political stability. For a long period, the rising cost of these subsidies was borne by the respective state governments; nonetheless, the political parties gained continued political support from farmers.

At their inception, there was hardly any realization that agricultural electricity subsidies would be such a problem. Rather, they were introduced as part of a solution package for the larger problem of food scarcity. The policy produced desired economic goals until it was politically appropriated. In that sense, agricultural electricity subsidies can be claimed as a well-intentioned economic policy that was politically misapplied.

3.0 Impacts and Implications

Though the prevailing discourse acknowledges the social and political benefits accrued through subsidies and the Green Revolution, it emphasizes the resulting economic inefficiencies. The political roots of the subsidy policy and failure to measure the supply have severe economic implications for farmers, utilities and state governments.

The availability of cheap electricity promotes overuse of electricity and water in Indian agriculture (Planning Commission, 2006; Badiani & Jessoe, 2011) and is a factor for both India's groundwater and electricity crises. While agriculture consumes about one quarter of total electricity, its revenue contribution is as low as 7 per cent, leaving the utilities in financial distress (Power Finance Corporation, 2013). Though part of the revenue gap is covered through cross-subsidization from industries and commercial consumers, the remaining gap is nonetheless a burden on state finances.[1]

Current subsidized electricity policies also result in damaging impacts on farmers. By prompting overuse of water, it is indirectly responsible for soil degradation, soil nutrient imbalance and groundwater depletion, all of which have affected agricultural yield and income. Due to high demand and the low-paying capacity of the sector, the utilities inevitably prioritize high-return consumers over the agricultural load. Farmers have to bear poor quality electricity, including limited hours of supply, inadequate voltage and frequent breakdowns, which lead to indirect costs for the farmers due to the unavailability of water at the time of irrigation peaks, investment in backup arrangements and frequent pump burnouts.

Finally, subsidized electricity to farmers is "regressive" in that the benefits accrue disproportionately to wealthier farmers (Sant & Dixit, 1996; World Bank, 2001; Howes & Murgai, 2003).

4.0 The Favoured Approach: Get the Price Right

Building on the above claims, the policy debate in India has largely been concerned with electricity pricing. During the last two decades, the favoured solution has been to "get the price right." In other words, the focus has been on the need to raise agricultural tariffs to the level of cost of supply and charge based on actual consumption.

However, while finance-linked reforms had some takers in the 1990s, these states have struggled to fully implement the reforms. For instance, the reformist government of Andhra Pradesh, under the leadership of Chandrababu Naidu, made attempts to raise agricultural electricity tariffs in the face of strong opposition by farmers. Subsequently, the party was thrown out of power in the 2004 election and the Congress Party was elected on the promise of free power; a promise that was quickly fulfilled (Swain, 2006).

Gradually, state governments have come to believe that agricultural electricity pricing reform is politically infeasible. Subsequently, many states have sought to adopt politically feasible reform measures. In this section, we discuss two such reform initiatives and their implications for states, utilities and farmers.

[1] To fill the revenue gap, industrial consumers are charged more even when the marginal cost of supply to them is substantially low. While industries consume less than one third of total electricity, they contribute about 45 per cent of total revenue. The remaining revenue gap is sought from the respective state governments; in 2011–2012, the total amount of subsidy booked by electric utilities was INR302 billion, which was about 12.5 per cent of total revenue of electric utilities (Power Finance Corporation, 2013) and about 15 per cent of the gross fiscal deficit of states.

4.1 Rationing Agricultural Electricity Supply in Gujarat

Rural load segregation reduces the agricultural load and improves rural electricity supply by connecting rural non-agricultural and agricultural consumers to separate feeders. About eight states have initiated such rural load segregation schemes. However, Gujarat is the only case where the scheme is implemented throughout the state and has been touted as a success.

In response to the groundwater and power crises in 2003, the Gujarat government introduced *Jyotigram Yojana* (Lighted Village Scheme) to improve rural electricity supply. The scheme segregated the rural non-agricultural load from the agricultural load with the objective of ensuring better and differentiated quality of supply. These feeders were also metered to ensure accuracy in energy accounting (World Bank, 2013). The scheme resulted in a parallel rural transmission network across the state, at a cost of INR12.9 billion.

The scheme resulted in two significant improvements: (a) non-agricultural consumers received 24 hours of electricity supply for domestic use and for schools, hospitals, market places and village industries, and (b) farmers received limited hours of electricity supply,[2] but what they received was good quality. The scheme has also benefited the utilities by reducing losses, thefts and agricultural consumption; thus, it has improved peak load management and better revenue realization in proportion to consumption. But the nominal financial gain, in lieu of reduced consumption, is not enough to meet the required return on the large investments made in the scheme (World Bank, 2013). The state has, however, benefited from reduced subsidy burden. From a groundwater perspective, rationing the electricity supply has put a cap on the collective extraction of groundwater and contributed to groundwater conservation (Swain & Charnoz, 2012).

Though farmers appreciate the improvement in quality, they are not unreservedly happy with the scheme, particularly the rationed supply. Farmers in the water-abundant areas of central and southern Gujarat, who used to operate their pumps for 18–20 hours a day and sell water to small and marginal farmers, have lost an additional source of income. However, water buyers are worst hit, as the groundwater markets[3] have shrunk and water prices have increased from 40 to 60 per cent. As a result, irrigation access for the small and marginal farmers has declined, pushing many out of irrigated farming and thus reasonable livelihood. Landless labourers are also affected by reduced opportunities for farm work as total irrigated area has declined. These farmers claim that *Jyotigram Yojana* has adversely affected their agricultural yield and income (Swain & Charnoz, 2012).

4.2 Metering Agricultural Electricity Supply in West Bengal

The removal of meters for agricultural connection was arguably the biggest blunder in the process of institutionalizing agricultural electricity subsidies. Reinstallation of meters to measure the actual consumption is therefore a prerequisite for reforms. While few states have taken initiatives in this direction, West Bengal successfully metered agricultural connections.

[2] Though the farmers are promised eight hours of supply, they actually receive six to seven hours of supply per day during day or night on a weekly rotation schedule. This schedule is preannounced to farmers to ensure reliability.

[3] The high cost of irrigation pump installation and small size of landholdings have resulted in the emergence of informal groundwater markets, where small and marginal farmers and sharecroppers meet their irrigation needs by buying water from pump-owning farmers. In the absence of a formal governance structure, these informal markets are regulated through social negotiation and bargaining. As the primary operating cost, electricity tariff is the crucial element for determining a legitimate and acceptable water price. Such informal groundwater markets exist in most parts of India in varying sizes and norms are based on the local social, economic and ecological contexts. Dubash (2002) and Mukherji (2007) offer detailed analyses of water markets in Gujarat and West Bengal respectively.

While agricultural electricity subsidy is an insignificant part of the state budget and a negligible share of state fiscal deficit in West Bengal, it is well covered through cross-subsidization. However, utilities blame subsidies for their deteriorating finances. In response, the state has initiated mandatory metering of agricultural electricity connections. Beginning in 2007, the initiative involves installation of cellular-based meters that can record consumption on a time-of-day basis. This high-tech metering enables the utility to charge the farmers on the basis of actual load and time of consumption. The goals are to better manage agricultural load, reduce agricultural subsidy, improve revenue realization and phase out cross-subsidization from industrial consumers (Swain & Charnoz, 2012).

One major outcome of the metering reforms in West Bengal is a new incentive structure within the groundwater market. As the new arrangement requires that pump owners pay only for the amount of electricity consumed, they no longer have the same incentive to sell water. As a result, the water buyers have lost bargaining power. The pump owners therefore increased water price by 30–50 per cent after the reforms, even though the annual electricity bill has actually gone down. This price adjustment has helped the wealthier farmers by reducing their electricity bills and increasing their profit from selling water (Mukherji, Shah, & Verma, 2010). Meanwhile, the water buyers face problems like advance payment and unavailability of water at desired times, which impairs the equity of access to water. The implications for the utility have been mixed; while the utility has gained through reduced peak load and loss, it faces a short-term reduction in revenue (Mukherji et al., 2009). In the long run, the groundwater market might be significantly transformed, marked by an increase in pump ownership, as the cost of electricity comes down. While the reform measure has some positive implications for efficiency gain, it has short-term negative impacts on equity of irrigation water access and does not have any significant implications for electricity and water conservation.[4]

5.0 The Need for a Wider Approach to Reform: Balancing State, Utility and Social Needs

As noted, subsidized electricity for agricultural users has been largely interpreted as a problem that leads to economic inefficiencies affecting farmers, utilities and state governments. Consequently, the proposed solutions have focused on revising the price and/or improving pumping efficiency. However, agricultural electricity pricing is a multi-dimensional issue and is linked with groundwater scarcity, rural poverty and food insecurity. A broader approach to reform is therefore required.

While multiple dimensions of the problem are recognized, there is a tendency to treat them as independent problems rather than as a complex network. For example, the proposed solution for energy inefficiency does not consider water-use efficiency. Similarly, the suggested solution for subsidized electricity prices does not adequately consider rural poverty. Unequal importance and pursuance of these policies have often led to improvement in one dimension at the cost of another. Moreover, taking a narrow approach to reforms may have damaging impacts on the poorest among the intended beneficiaries. As discussed in the previous section, while rationing and metering the agricultural electricity supply carry significant economic gains and are essential, these reform measures come at a cost for the water buyers—poorer farmers who cannot afford to own irrigation pumps. As such, India needs to reorient its

[4] As an immediate effect, there has been a reduction in agricultural electricity and water consumption. However, the reduction could be short-lived. Under a new pricing arrangement, farmers are paying only for the amount they consume and the price is substantially cheaper during off-peak hours. Combined with the lower cost of pump installation, owing to a shallow water table in the region, this may spur rapid irrigation pump installation. Though the time-of-day tariff offers an incentive to use pumps during off-peak hours, there is no incentive to conserve water. Over time, if the pump installation increases, agricultural electricity load may outgrow off-peak availability.

agricultural development policy and strategy, weighing its social, political, economic and environmental settings directly against each other, instead of thinking of them as separable.

This calls for a broader and embedded approach to agricultural electricity pricing reforms that considers the social, economic, political and environmental dimensions simultaneously. There is a strong need to bundle policies together so that they can produce better outcomes. Policy bundling can internalize steep reform transaction costs by neutralizing the policy costs for end-users. The major reform objectives in India are to improve resource-use efficiency (water and energy) and improve cost realization within the agriculture sector. Raising electricity prices as a motivation for end-use efficiency has not worked well. Instead, a combination of price rationalization, promoting incentives for organic manure (as an alternative to chemical fertilizers that require more water) and better price support to resource-efficient and organic crops could succeed, supported by available methods of crop certification. This bundling approach raises the utility revenue through higher price, encourages resource efficiency through alternatives and raises farmers' capability to pay.

In the following section, we make a number of suggestions for a broader approach to the problem. Rather than focusing on pumps as the only source of efficiency, these measures need to be taken at multiple levels, as suggested in Figure 1.

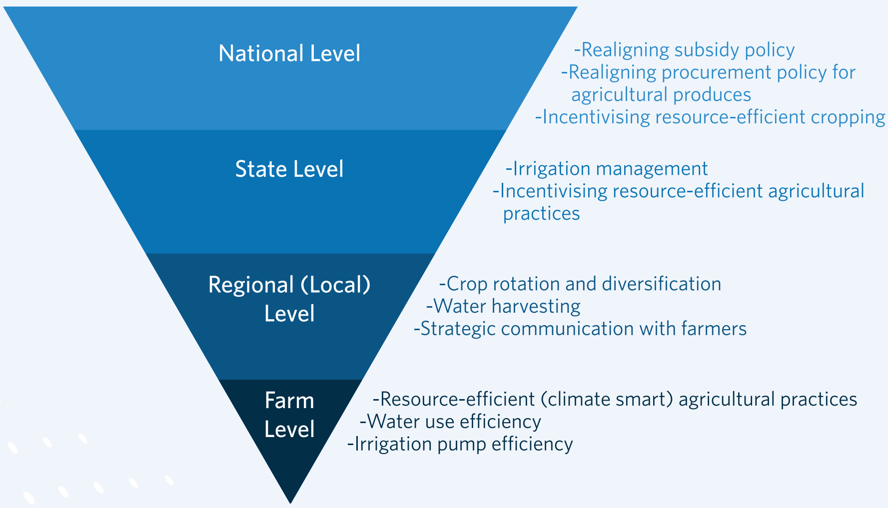

FIGURE 1: A MULTI-LEVEL WIDER APPROACH TO ADDRESS AGRICULTURAL ELECTRICITY PRICING

5.1 Improving Irrigation Management

Although improved irrigation featured as a key development agenda for independent India and has received sustained public spending, only one third of the irrigated lands in the country have access to surface water. Unsurprisingly, the remaining two thirds have to extract groundwater for irrigation, resulting in not only much faster development of the groundwater potential, but also heavy reliance on electricity for pumping.

Expansion of a surface irrigation system therefore emerges as an important part of the solution and prerequisite to tame agricultural electricity and groundwater consumption. With good monsoon rainfall and water sources like Himalayan glaciers and a wide network of rivers, India has huge untapped potential. India needs to revitalize the existing network of canals to reduce dependence on groundwater and thus on electricity.

On the other hand, over-extraction of groundwater and a lack of initiatives to recharge the water table has caused fast and continuous depletion of water tables. As the water table goes down, pump capacity needs to be upgraded. Each addition of horsepower means an increase in electricity consumption. In that light, sustained groundwater table recharge can have a significant impact on agricultural electricity consumption. While India receives a good amount of rainfall that can recharge these tables, much of it is wasted or discharged into the sea. There is a need to promote innovative schemes to recharge them. While the farmers can do a lot individually and as a community through water harvesting and storage, states need to promote awareness and incentivize such initiatives.

Simultaneously, alternative and more efficient irrigation technologies can be useful to tame water and electricity demand. To date, the most popular method is flood irrigation. However, alternative and more efficient methods have been developed that can reduce water demands. Drip irrigation is most water efficient, allowing water to drip slowly to the roots of plants. It is more suitable for horticulture and currently being tested for use in water-intensive crops like rice and sugarcane. Sprinklers are another efficient technology that disperses water like rainfall. They are more suitable for crops that require a moist climate. While both technologies are available commercially, their high cost has been a barrier for popular adoption (Swain & Charnoz, 2012). The state can facilitate expedited use of these technologies through effective marketing, subsidizing the cost and incentivizing the subsequent resource conservation.

As we can see in Figure 1, irrigation management is a multi-level activity and involves various stakeholders. Development of surface irrigation has to be taken up by the state governments; water harvesting is a community- or local-level activity; and water-use efficiency through modern technologies is a farm-level initiative. Yet, at each level, the state has to assume the role of facilitator.

5.2 Modifying Agricultural Practices

Agricultural production can become more water and electricity efficient by adopting some easy and inexpensive practices at the farm level. For example, land levelling is a traditional practice that not only reduces water need, but also reduces the time required for seeding, increases yield and reduces weeds. Similarly, mulching enhances the moisture-retention capacity of the land, reduces water requirements, reduces erosion, provides nutrients, suppresses weeds and increases fertility. Crop residues, both field and process, can be used as mulch, as burning them in the field reduces soil moisture content. Whether to avoid extra labour or due to a lack of awareness pertaining to their benefits, farmers seldom adopt these inexpensive and efficient practices. States may take initiatives to reintroduce these practices in Indian agriculture through an incentive structure.

Likewise, crop diversification is one more rational and cost-effective methods to improve resource-use efficiency in agriculture. Indian farmers tend to grow a specific variety of crop and are often cautious in adopting new varieties. However, shifting from the dominance of a single crop or variety to multiple crop rotation can be resource efficient. It improves soil health, balances soil nutrition and maintains the agro-ecosystem's dynamic equilibrium. Simultaneously, farmers can save water and electricity by farming less water-intensive crops or choosing less water-intensive variants of the same crop. Though India has developed less water-intensive variants of wheat and rice, adoption of such varieties is low. The state can facilitate adoption with pilot demonstrations, awareness campaigns, effective distribution of seeds and incentives, while supporting further research on new crop varieties.

5.3 Realigning Wider Agricultural Policy

States can also facilitate crop and variety diversification by realigning food procurement policy. Until now, India's agricultural product procurement policy has been biased toward water-intensive crops by ensuring a higher minimum support price, which means a better and more secure market price. Hence, farmers have little incentive to go for less water- and electricity-intensive crops that cannot fetch them a similar return. As such, resource-efficient cropping can be promoted by offering better price incentives.[5]

In addition, fertilizer subsidies are also substantially responsible for increasing water and electricity consumption. Farmers have a perception that higher use of chemical fertilizers can fetch better yields. Subsidized fertilizers encourage farmers to use them more, resulting in higher demand for irrigation water.[6] States may facilitate a transition from chemical fertilizers to organic manure by shifting the subsidy incentive.

Finally, agricultural electricity pricing reforms could be useful, but only after taming the water demand through the measures discussed above. Once the water and electricity demand has gone down, raising tariffs would be affordable to farmers, which in turn would foster social acceptance. At the same time, electricity subsidies need to be redesigned with a focus on conservation. For instance, offering stronger price incentives (low tariffs) to low-consuming farmers and lower price incentives (high tariff) to high-consuming farmers could be effective. However, there is a need to devise tools for targeted transfer of subsidies to needy farmers. Moreover, it would require measuring electricity supply to agricultural consumers.

6.0 Conclusion

Electricity pricing reforms are necessary, but not enough. They need to be supported with wider changes to make them politically feasible. Many of the suggested initiatives require that states play a greater role, while seeking contributions from individual farmers. Further, states must ensure strategic communication with the stakeholders to gain their support and acceptance. Engaging with civil society, farmers' organizations and local institutions of governance is crucial for success. The agricultural electricity subsidy has been institutionalized over a long period, so there is no immediate solution for it. Addressing solutions over a medium term by creating right context is the most effective way forward.

[5] The national government seems to be taking this approach. In 2013 the government raised the minimum support price (MSP) for maize by 11 per cent to bring it on a par with the MSP for paddy at IDR1,310 per quintal, while the MSP for the latter was raised by 5 per cent (Mukherjee, 2013). Paddy is a more resource-intensive crop and has a better market value than maize. Considering the recent revisions in MSP, the government may intend to signal better price incentives for resource-efficient crops.

[6] Use of chemical fertilizers is correlated with tubewell installations, as marginal fertilizer productivity is higher in fields that have adequate irrigation (Food and Agriculture Organization, 2002). Chemical fertilizers accelerate nitrogen uptake of plants and distress their carbon/nitrogen balance, resulting in metabolic problems to which the plants react by consuming extra water (Shiva, 1991).

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