



Using rewards and penalties to incentivize energy and water saving behaviour in agriculture – Evidence from a choice experiment in Punjab

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The policy of free electricity since 1997 is hugely popular with farmers in Punjab who are its biggest beneficiaries. Successive Governments have either lacked the courage or willingness to pursue market oriented electricity sector reforms even though the adverse consequences are increasingly visible. Over the past few decades, experts have expressed concern over the rapidly receding level of the water table and forecast of desertification, as well as the financial burden on the electricity distribution utility and government. Withdrawing free electricity and charging a price for electricity is a huge challenge. This research aims to estimate willingness to pay (WTP) for electricity and consider preferences for an annual free electricity limit with reward for meter installation and a novel incentive-penalty scheme designed to reward low consumption and discourage over-consumption.

This study examines willingness and interest of farmers to participate in an incentive scheme combined with a metering option based on a discrete choice experiment conducted with 859 farmers in Punjab in 2021-22. The major finding is that farmers are willing to voluntarily move away from unmetered consumption to meter installation with the inducement of cash incentive to save electricity combined with annual limit of free electricity sufficient to meet current irrigation requirements.

The random effects probit and conditional logit models applied in this study evaluate preference heterogeneity for electricity entitlement, economic incentive for saving electricity, and pricing electricity. This study highlights the acceptance of both carrot and stick policies for motivating behavioural change in Punjab. An annual limit of 1550 kWh/acre units of free electricity is acceptable by 84 percent of the sample farmers, when this is accompanied by a payment of Rs.3 / kWh for every kWh below the limit and Rs.1 kWh charge for every kWh above the limit.

The combined incentive-penalty based scheme is effective in inducing greater participation and acceptance of the entitlement as an alternative to disbursement of the current



electricity subsidy. The results show that lower rate of cash incentive (Rs.2/kWh) and the same electricity charge are acceptable to about 71 percent of the respondent

farmers. The preference for the incentive demonstrates the saving intention of farmers and shows that cash incentive can energize behaviour towards saving electricity. The results illustrate the acceptance of a variable electricity charge on consumption beyond the annual free limit. Further, the willingness to pay could be increased by offering a higher annual limit of free electricity. A variable charge on electricity above the limit is likely to make farmers aware of the real cost of power and water and induce them to economize on its use.

It is observed that farmers in Punjab's most fertile region, the Doaba region are more likely to accept an entitlement of free electricity and a cash incentive to adopt energy-saving behaviour. Educated farmers are more likely to value the annual free limit combined with an incentive for reducing consumption.

Imposing a cap on free electricity consumed by a large farmer who may be receiving 40 times the subsidy given to a marginal farmer has the substantial potential of reducing the burden of electricity subsidies and easing pressure on aquifers. The resultant savings in electricity subsidy could compensate for the additional costs incurred in financing rewards for adopting energy-saving behaviour. The results of this study can be taken as a reference for formulating future policies and programs such as raising education levels and disseminating information to increase uptake of meter installation.

This is the first stated preference choice experiment that has involved the direct elicitation of the preferences of Punjab farmers. The present study is valuable as these findings can translate to a promising intervention strategy to rationalize electricity consumption in Punjab agriculture. The econometric results serve as a first useful indicator of nudging farmers to more often choose a metered electricity option, which may not do away with subsidies, but can certainly complement efforts to contain electricity subsidies and groundwater extraction, and effectively introduce a positive price for electricity and for ground water pumping.

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