

*This briefing note summarizes the preliminary case study findings for discussion and comment*

***Have cheap pumps, fuel subsidies and rural electrification made treadle pumps obsolete? Despite falling sales and increasing abandonment of the treadle pump, there are important lessons to be learned about technology adoption.***

### The Opportunity

During the 1980s and 1990s, treadle pumps enjoyed almost iconic status as an “appropriate” development technology for poor, smallholder farmers. They were cheap, (running costs were close to zero), pumps could be manufactured and repaired locally and easily transported between fragmented landholdings. The treadle pump’s positive impact on incomes and poverty reduction in Bangladesh, for example, were impressive. Several studies linked the adoption of the treadle pump to increased annual incomes varying from US\$50 to US\$500 per year and most smallholders were able to earn back their investment in less than a year. Building on the positive outcome in Bangladesh, IDE and other NGO’s started programs to disseminate treadle pumps in India from the mid-90s onwards in areas where shallow groundwater is abundant and easily accessible.

Fifteen years after the first introduction of treadle pumps in India, the socio-economic setting has changed considerably. Treadle pump sales have fallen off steadily since the early 2000s and many of existing owners have abandoned them for diesel and electric pumps, owned or rented. Research funded under the AgWater Solutions project revisits treadle pump technology and asks if, in their present settings, they are an appropriate technology choice for smallholders.

### The Research

The study was carried out in the Cooch Bihar district located in the state of West Bengal in India. The study area was chosen for several reasons. First, the district has a high number of marginal and smallholder farmers with an estimated 93% of the total 309,371 holdings below 2 hectares. Groundwater is abundant, easily accessible (the groundwater table is between 2-5 meters during pre-monsoon) and is the principal source of irrigation water in the district. Second, farmers in Cooch Bihar were among the earliest adopters of treadle pumps in India, illegally bringing pumps in from neighboring Bangladesh in the early 1990s. IDE-India has remained active in the area until now and has reported to have sold over 8000 pumps in Cooch Bihar district during the period 2005-2009. Third, in the 90s the district was one of the first areas to benefit from the influx of cheap, light-weight Chinese diesel pumping sets smuggled from Bangladesh and Nepal. More recently, electric pumps are becoming more popular as rural electrification extends its reach. Finally, the proliferation of electric and diesel pumping has led to the emergence of a thriving water and pump rental market. For these reasons, Cooch Bihar presents an ideal case study in the evolution of pumping technologies.

## TREADLE PUMPS IN COOCH BIHAR

*Based on a report by Ravinder P. S. Malik*



*Running costs are close to zero but treadle pumps are labor intensive.*

A survey was conducted using a random sample of 271 farmers and looked at treadle pump adoption over the period 1990-2010. The survey addressed questions on the adoption dynamics and farmers’ awareness as well as preferences for and opinions of various pumping technologies. In addition to the farmer survey, data was collected from observations during field visits, semi-structured discussions with key informants (lead farmers, agricultural equipment suppliers and sellers, grass root level officials, mechanics (mistris) and other stakeholders). Primary data was cross-checked and complemented from published and unpublished secondary data sources.

### Main Findings

Among the 271 respondents, 60 owned or previously owned a treadle pump; 120 owned or previously owned a motorized pump; and 91 have never owned any pumping equipment. Most treadle pump owners purchased their pump between 1995 and 2002. Only 16% of this group bought a treadle pump after 2003. Initially, farmers bought treadle pumps because of the low cost, easy operation and maintenance, and the relative portability of the equipment. At the time of the study, only 5 out of the 60 were still using their treadle pump. There were reportedly two main reasons for this: 1) the increased availability and affordability of diesel and electric

pumps along with a thriving rental market; and 2) the increased cost of labor which was cited more frequently. Nearly all of those who stopped using treadle pumps now access water by hiring motorized pumping equipment.

Reviewing the evolution of treadle pump adoption in Cooch Bihar district reveals several salient lessons relevant to development practitioners concerned with agricultural water management around the globe.

Technology adoption is a dynamic process. The success of a technology in one location at one point in time does not guarantee its uptake elsewhere, even if the physical and social environments are similar. Treadle pumps were hugely popular among smallholders in Bangladesh in the late 80s and 90s but rising wages and the increasing availability of alternative options made treadle pumps the least preferred option among smallholders in West Bengal 20 years later.

The adoption of irrigation technology does not necessarily follow a linear path from simple manual methods to advanced motorized technologies. This linear path is sometimes referred to as the 'technology ladder' and implies that hand watering with buckets followed by treadle pumps are necessary stepping stones in the adoption process of motor pumps because they allow smallholders to amass sufficient irrigation experience and money to be able to buy a motor pump. In our study we did not find evidence of the technology ladder nor was it demonstrated that treadle pumps are a 'stepping stone' technology.



*An old treadle pump has been recycled for priming a diesel engine.*

Ownership is not a necessary precondition for technology access. Even if motorized pumps are too expensive for smallholders, they can still have access to motorized pumping through rental markets that have emerged as a reaction to the demand from non-owners. More recently the evolving secondhand market for pumps and spares has further increased options for those who are not able to afford a new motor pump.

Low cost and affordability are not necessarily the determining factors that persuade smallholders to invest in a certain technology. Other aspects, such as the availability and accessibility of alternative options, play an equally important role. Our survey results showed that the majority of smallholders who could not afford to buy a motor pump did not invest in an inexpensive and affordable treadle pump, even though their adoption is highly profitable. Because of labor constraints and the high opportunity cost of labor, most prefer hiring equipment on available rental markets even though this may be slightly more expensive.

### Questions for Discussion

- In Cooch Bihar treadle pumps are no longer the preferred choice because of the abundance of alternative motorized pumping equipment. Where this is not the case, and fuel is relatively more expensive (as in many parts of SSA), will treadle pumps still have a role to play?
- Is it necessary for smallholder farmers to adopt treadle pumps before 'graduating' to motorized pumps, or would it be a better strategy to make motor pumps more accessible to smallholders?
- How might the rental and second hand markets for motorized pumps be increased and supported?
- What influences farmer's investment in irrigation technology? Is it information about technology, access to and availability of technology, or access to financial resources to invest in a technology?

These findings and recommendations are preliminary and are reproduced here for the purposes of discussion. The AgWater Solutions Project welcomes all comments and suggestions. These should be directed to [AWMSolutions@cgjar.org](mailto:AWMSolutions@cgjar.org), please write "India" in the subject line.