

Final Progress Report
Sustainability Science Program, Harvard University
Term: September 1, 2010 – August 31, 2012
Submitted: July 2012

Name: Ram Fishman

Your field(s):

environmental economics, agricultural economics, agriculture and climate change

Your degree program, institution and graduation date:

PhD, Sustainable Development, Columbia University, 2011

Faculty host(s) at Harvard name and department:

Michael Kremer, Venkatesh Narayanamurti and Rohini Pande.

SSP-related research activity:

Title: Novel Approaches for Increased Efficiency in Agricultural Water and Energy Use in India

Abstract: The research project sought to develop and field test, in cooperation with a public utility in India, a novel reform in the pricing of electricity for pumping groundwater, and to evaluate its impacts on agricultural irrigation practices, energy usage and water saving technology uptake. As part of the pilot, farmers are facing the real marginal cost on energy usage for pumping and a public utility is metering consumers and administering bills on the basis of these meters' readings. If successful, the reform can be applied across the country and help address the severe groundwater-energy crisis in Indian agriculture and some of the ills of the public energy sector.

Identification of the problem you address:

The depletion of groundwater and intensive energy use in India's irrigated agriculture is a dramatic sustainability challenge that threatens the country's rural development by reducing water supply and choking the energy sector. Because of political dynamics, it has proven impossible to charge agricultural consumers (who use the energy to pump groundwater from their wells) on the basis of their usage, and this deadlock is blamed by most scholars for the inefficient and unsustainable usage of these resources.

Key question asked about the problem:

Will a marginal price on energy for pumping irrigation water lead to more efficient usage of energy and groundwater? Will farmers be willing to voluntarily join the program? Will the utility be able to administer it effectively?

The methods by which you answered that question:

I am monitoring farmers usage of energy and water in a group exposed to the incentive and a control group to assess impacts on irrigation methods, technology uptake and water prices in informal markets.

Principle literature upon which the research drew:

There are four strands of literature relevant to the topic: the first is mostly qualitative or anecdotal discussions in Indian policy journals. The second is the literature on the pricing of irrigation water. The third is the technical literature on water saving technologies in agriculture. The fourth is the development and agricultural economics literature on the adoption of new technologies in agriculture.

Empirical data acquisition description:

I am working with a group in India, Centers for International Projects Trust (CIPT), that is collecting data from farmers and from the utility company through surveys and technical instruments.

Geographical region studied:

Gujarat, India

Recommendations that might be relevant for your problem:

Preliminary findings indicate that the new mechanism is working quite well – farmers are being metered, they are interested in participating, and they are not tempering with the meters. The Utility is able to take meter readings regularly and administer the modified bills. This in itself is a breakthrough in policy discussions in India. However, we found no evidence that the incentive has led to changes in agricultural practices or energy usage.

A description of the final product(s) you have/are aiming to produce:

Policy paper and detailed report to be submitted to the government of Gujarat and the local utility (UGVCL), one or more drafts of peer-reviewed papers in academic journals, and research proposals for additional and expanded experiments.

Description of major other intellectual or professional advancement activity(ies) over the past academic year:

Fishman, Ram Mukul, Tobias Siegfried, Pradeep Raj, Vijay Modi, and Upmanu Lall. 2012. Over-extraction from shallow bedrock versus deep alluvial aquifers: Reliability versus sustainability considerations for India's groundwater irrigation. [*Water Resources Research* 48\(6\)](#), doi:10.1029/2011WR010617.

I have also produced a first complete draft of a working paper called “Climate Change, Rainfall Variability and Adaptation through Irrigation: Evidence from India”. This became my job market paper.

Please list citations for reports, papers, publications and presentations that built on your fellowship research:

Principal collaborators outside Harvard:

Vijay Modi and Upmanu Lall (Columbia University), and Centers for International Projects Trust (a research group in India).

List any awards or grants that you have received this year for the current or coming year.

If you are moving to a new position, please list your contact information there:

I am joining the Economics Department at George Washington University.