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# Running Out of Water, Walking Away from Farming

Groundwater tables are falling in India. What will happen when water actually runs out? This column analyses the impact of water scarcity on farmers in Gujarat. It finds that farmers are failing to or choosing not to adapt to the availability of less water. They are forced to shrink cultivation, leave farming or migrate to cities – thereby, reducing food production.

In many parts of India, water tables are falling. India's farmers are pumping more water out of aquifers<sup>1</sup> than is naturally restored by the filtration of rainwater. So much groundwater is lost per year from north-west India, that it is affecting the Earth's gravitational field. Satellite-based estimates suggest that between 2002 and 2008, about 100 cubic kilometers were lost – double the capacity of India's largest surface-water reservoir (Rodell et al 2009).

## How worried should we be about falling water tables?

Some think we should be very worried – after all, hundreds of millions of farmers in India are relying on groundwater for irrigating their crops (more than half the irrigated area in the country), and if they run out of water, what is going to happen to their livelihood? What is going happen to India's food production?

Others are less pessimistic. They feel that currently, India's farmers are not sufficiently incentivised to use groundwater more efficiently, and to implement existing technologies that produce 'more crop per drop'. It is easier to just chase the declining water tables by using more energy – especially electricity that, in most states, is provided to them at zero or highly subsidised costs. When scarcity starts to really bite, this will quickly change, and farmers will find ways to manage with less water.

This sort of debate is an instance of a broader argument that is at the heart of the question of sustainable development. To achieve sustainable development, should we enact policies to protect our natural resources, potentially harming economic productivity, or should we pursue 'business as usual' and hope that ingenuity and technology will enable farmers to adapt when resource scarcity starts to bite?

It is not easy to find evidence that can help us answer this question. In the case of India's groundwater problem, as in the case of many other environmental degradation processes, the impacts are still not sufficiently felt at a large enough scale to see what will actually happen.

But this is not true everywhere.

### **Water scarcity in North Gujarat**

Take some parts of North Gujarat, for example. For decades now, local farmers have been mining the region's aquifers to support a thriving agriculture, unimaginable without irrigation in this arid region. At any time of the year, even in the blistering summer, you will find lush green fields with potatoes, wheat, tobacco, castor, sorghum and millets. But this success has had its toll. The local aquifers receive very little natural recharge, and in some parts of Mahesana and Gandhinagar districts, water tables have been consistently falling at a staggering rate of 3 meters per year, and are now hundreds of feet deep (Columbia Water Center 2011). To chase the water table, farmers have increasingly deepened their wells and invested in ever more powerful pumps, often forming informal water cooperatives in order to be able to finance these expensive ventures. It is doubtful that there are many other places in India that use as much electricity per hectare of irrigated land.

In some pockets of this region, things have gone so far, though, that this may no longer be working and no viable amount of energy can help find new water. These pockets are really experiencing the bite of water scarcity like few other places in India do. They are well 'ahead' of other groundwater consuming parts of the country in their stage of depletion, and provide us with a rare opportunity to see what happens in these sorts of circumstances.

### **Analysing the impact on farmers**

The depletion of the local aquifers has taken place against a backdrop of rapid economic growth in the state, including in agriculture. But this does not mean that water scarcity has not had an effect. To assess its impacts, we compare the economic circumstances in places that differ only in terms of the severity of their water scarcity (Fishman et al 2013).

Our study compared villages in one particular area falling within Mahesana and Gandhinagar districts that differ in terms of certain deep-lying geological features that seem to accelerate the rate of water table decline. Our basic assumption is that if it weren't for the effects of this adverse geology, these villages would otherwise be quite similar today.

In October-December 2012, we surveyed about 1,500 farmers in these two types of villages, and our preliminary findings include the following. First, villages with the adverse geological feature are indeed more water scarce. Farmers report more frequent well failures, and they report cultivating smaller amounts of land in the dry seasons. Second, even though there seems to be some shifts to less water intensive crops, these are modest and occur only amongst crops that are already familiar to farmers. We did not find any evidence of shifts to new crops, or to usage of other water saving technologies like drip or sprinkler irrigation. Third, in more water scarce villages, there seem to be both higher rates of migration by young men to big cities, and an abandonment of farming by those remaining in the village. Fourth, there are hints in our data that villagers in

more hard hit villages report lower assets holdings, an indication of relatively lower wealth.

These findings are preliminary, and we should be careful about drawing sweeping conclusions from one small study area. But the findings do seem to be suggesting that at these advanced stages of groundwater depletion, farmers are failing to (or choosing not to) adapt their agriculture to manage with less water, and are forced to shrink the extent of cultivation. Instead, they are more likely to be sending their sons to work in cities or to leave farming.

### Implications for policy

Is that necessarily a cause for concern? Should we view migration and shifts from farming in a negative light? After all, these are considered by most economists to be natural parts of economic development. True, the fact that we see higher incidence of these decisions in the more hard-hit villages may suggest farmers are “pushed” to make these choices, rather than “pulled” by economic prospects, but even that doesn’t mean that the end result is necessarily negative.

We think there are, however, several reasons Indian policymakers should take note of these findings. First, the fact that there seem to be some negative implications for farmers’ asset holdings in more severely depleted villages suggests that these coping strategies are not fully effective in protecting welfare. Second, even if they were, food production is certainly reduced. This is a finding that should concern a government that is concerned about food security and self-sufficiency and is running low on groundwater.

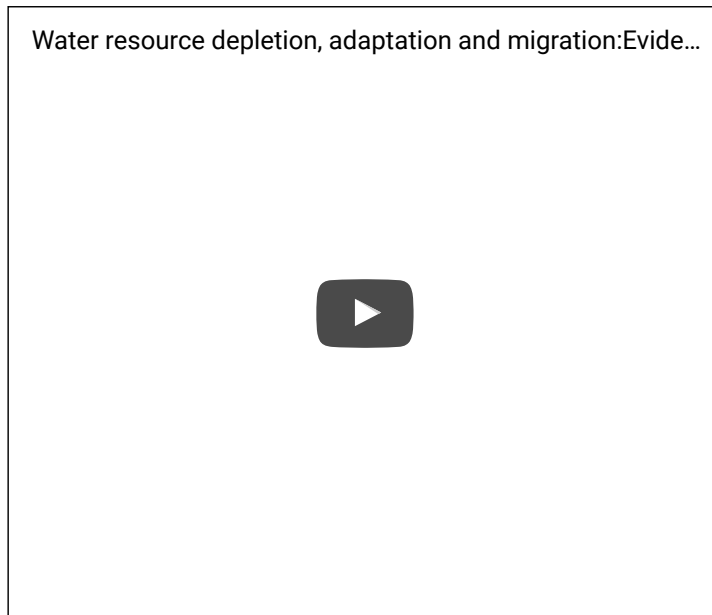
Why then are farmers not choosing to improve the ‘crop per drop’ and prefer to send their sons away from farming or from the village altogether? Agronomic experts would suggest a number of possible technologies that could help manage with less water. Their relative lack of adoption in more depleted villages is an indication that these water saving technologies are either not familiar to them, or perhaps too expensive. As India’s groundwater are depleted, it might be necessary to stimulate an agricultural extension system to start identifying and disseminating a range of appropriate water saving technologies, while also creating the incentives to make farmers adapt them before it is too late (for example, by pricing electricity for pumping differently – a recent pilot we conducted with the Columbia Water Center and the Government of Gujarat is interesting in this regard<sup>3</sup>). It seems that scarcity itself does not do the job well on its own. Sustainable development does not just happen by itself.

#### Notes:

1. An aquifer is an underground layer of water-bearing permeable rock or unconsolidated materials (gravel, sand, or silt) from which groundwater can be extracted using a water-well.
2. <http://water.columbia.edu/files/2011/11/Gujarat-WP.pdf>
3. Columbia Water Center Policy Brief: Towards Greater Accountability and Efficiency in Groundwater and Energy Use in Indian Agriculture Initial Report from a Field Pilot in Gujarat,

India (<http://water.columbia.edu/files/2012/12/Gujarat-Policy-Brief-9-28-12.pdf>)

*Watch a video of Ram Fishman presenting the underlying research at the 4th IGC ISI India Development Policy Conference (December 17-18, 2013, New Delhi)*



#### Further Reading

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