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# Efficient use of Groundwater for Agriculture in Pakistan

Groundwater is a globally abundant but regionally scarce resource [1]. Its use has increased exponentially in various regions during the last few decades, mostly due to widespread policy support for the adoption of tubewells. The region comprising Pakistan, China, India, Bangladesh and Nepal extract about half of the world's annual total groundwater withdrawals [2].

In Pakistan, policy support for adoption of tubewells has primarily sought to control waterlogging and salinity in the Indus Basin and, additionally, to expand irrigated agriculture[3]. Inspired by its convenience, the possibility of conjunctive irrigation, and subsidies on installation and operation, millions of farmers have opted for tubewells [3, 4]. Currently, about 90% of the tubewells in Pakistan are used for irrigation[5]. Decades of 'open-access' groundwater use in the provinces of Punjab and Balochistan have depleted aquifers which is a serious threat to agricultural livelihoods[3,6].

Today, virtually every study on the subject suggests controlling the groundwater exploitation, sometimes through overly strict means, including introducing water pricing policies and curbing energy subsidies. Although supportive regulations exist (for example, in Balochistan), but so far no strict measure has been applied with any degree of success due to various political and social considerations[7]. In fact, any policymaker would certainly face a dilemma in responding to such calls, particularly when groundwater is the only source of irrigation and domestic water supply, and in a situation where majority of the farmers are engaged in subsistence farming.

Some researchers suggest soft measures for water conservation, such as using policies to promote water-saving irrigation practices to ensure long-term water security without compromising yields or areas under cultivation[8,9]. One of the highly-recommended technologies is drip irrigation. In general, a drip irrigation system has a transport system (like a hose or pipeline), emitters (for precise application), filters (to avoid clogging), and some types of pressure regulators (for smooth application)[10]. Such system helps apply water directly to plant roots (instead of entire land areas), reduce evaporation, wind effects, and other problems associated with flood irrigation[10]. However, despite its introduction decades ago, drip irrigation has hardly gone beyond pilot projects and field demonstrations. Apparently, farmers lack enthusiasm for it due to empirically unknown reasons.

## POLICY RECOMMENDATIONS

Drawing from what was learned in a large study[11] done on groundwater sustainability, this policy viewpoint recommends certain measures that if taken can help improve the efficiency in using groundwater in Pakistan. These are:

### Incentivising adoption of appropriate technology by farmers

Farmers need incentives to accept water-saving technologies. Among the key incentives, subsidized installation of the modern irrigation system, arrangements for operation and maintenance of these systems, and farmers' training are crucial. In the absence of these incentives, farmers will be less likely to welcome new technologies. It is also necessary to focus on the local availability and supply of the system and spare parts through a competitive market. Nevertheless, before offering any technological package, it is important to assess its economic impact in the form of reducing existing subsidies, assessing its technical viability in the region, addressing farmers' training needs, and evaluating its possible impacts on the local environment.

### Widening the available technological options

Besides promoting drip irrigation technology, farmers may be introduced to a larger set of viable technological options that include but are not limited to alternative cropping patterns, dryland farming, laser levelling, moisture monitoring, and irrigation scheduling. Each of these options may have its own set of barriers, including availability and affordability, which must be removed to make these viable for farmers. The key message here is to think beyond capital-intensive systems which farmers perceive as difficult to comprehend and afford.

## Making water conservation part of farmers' profit equation and/or a social obligation

Even if farmers adopt efficient irrigation technologies, the adoption is not an end unto itself and does not automatically translate into water-saving behaviour. Studies have shown, farmers who adopt new irrigation technologies may not share the water-saving vision that the policy promoters of such technologies have. Water-saving behaviour constantly evolves through time, and relatively quickly, if it becomes a part of the farmers' ultimate objective to improve yields.

Farmers could also be reluctant to adopt water-saving practices because of the tragedy of the commons.

Why would they invest in water-saving technologies when no one else is concerned about the depletion of the aquifer commons? The irrigation efficiency is difficult to achieve without bringing about fundamental changes in structures governing current practices in agriculture water use.

Policymakers may continue advocating water-saving technologies but only as a mandatory first step within a broad- based strategy aimed at nurturing water conservation values at the societal level, covering agricultural and non-agricultural uses.

## Water literacy is paramount

One of the most important water conservation efforts would be to enhance water literacy among farmers so that they may detect wastage inherent in the current irrigation practices and work through options to minimize it. Besides, continuous support through public extension services, media slogans, and awareness and community mobilization programs may help farmers conserve water as a collective social responsibility. Until the entire process is managed as a transition towards sustainable water conservation and management, any effort in this direction is doomed to fail.

## Policy need to directly focus on water

So far, subsidies on the energy (in groundwater regions) and infrastructure operation and maintenance (in canal regions) have been the major policy concerns. There is literally no concern on the true economic and ecosystem value of water. Water pricing may be one of the options but certainly not a silver bullet. Policymakers must bring a fundamental shift in the conception of the water problem, isolate it from energy and infrastructure subsides, and bring water at the centre of their policies.

## REFERENCES


1. Giordano, M., (2009). Global Groundwater? Issues and Solutions. Annual Review of Environment and Resources, 34: p. 153-178.
2. Shah, T., et al., (2003). Sustaining Asia's Groundwater Boom: An Overview of Issues and Evidence. Natural Resources Forum, 27(2): p. 130-141.
3. Qureshi, A.S., et al., (2010). Challenges and Prospects of Sustainable Groundwater Management in the Indus Basin, Pakistan. Water Resources Management, 24(8): p. 1551-1569.
4. Khair, S.M., et al., (2012). Groundwater Markets Under the Water Scarcity and Declining Watertable Conditions: The Upland Balochistan Region of Pakistan. Agricultural Systems, 107(0): p. 21-32.
5. Qureshi, A.S., et al., (2008). Managing Salinity and Waterlogging in the Indus Basin of Pakistan. Agricultural Water Management, 95(1): p. 1-10.
6. Chaudhry, S.A., (2010). Pakistan: Indus Basin Water Strategy--Past, Present and Future. Lahore Journal of Economics, 15(Special Edition): p. 187-211.
7. van Steenbergen, F., et al., (2015). A case of groundwater depletion in Balochistan, Pakistan: Enter into the void. Journal of Hydrology: Regional Studies, 4, Part A: p. 36-47.
8. Hussain, I., et al., (2008). Revitalizing a Traditional Dryland Water Supply System: the Karezes in Afghanistan, Iran, Pakistan and the Kingdom of Saudi Arabia. Water International, 33(3): p. 333-349.
9. Shah, N.A. (accessed 2013 September 29). Efficient Use of Limited Water Resources in Balochistan; Available from: http://www.parc.gov.pk/articles/water_resou_bolch.htm.
10. eFresh, (accessed 2017 March 19). Micro Irrigation Systems; Available from: http://www.efreshglobal.com/eFresh/Content/ta/misystem.html.
11. Memon, J. A., Alizai. Q. A., and Hussain, A., ((2017) Who will think outside the sink? Farmers' willingness to invest in technologies for groundwater sustainability in Pakistan. PIDE Working Paper Series, No.



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