Enhancing Water Use Efficiency in Irrigation: Lessons from development research

Muhammad Mehmood Ul Hassan
Center for Development Research
University of Bonn

June 08, 2011
Water Use Efficiency (WUE)

WUE is broader in scope than most agronomic applications and must be considered on a watershed, basin, irrigation district, or catchment scale (Howell, 2001).
The causes for the relatively low water use efficiency in agriculture are numerous and complex, including agronomic, biological, engineering, management, social, and economic facets (Hsiao, et. al, 2007).
Three ways to enhance WUE

• Improving irrigation technologies (varieties, field level, system automation, rehabilitation)
• Right Pricing
• Management/ Governance Reforms
WUE enhancing technology

- Each irrigation technology suitable for specific group of crops, soil and weather condition
- Considering financial state of farmers in most developing countries, smart incentives for less capital intensive water saving techniques to start with

Source: Martius, Bekchanov and Damis (forthcoming)
Challenges

• **Adoption constraints**: Farmers with the most owned land, the highest number of acres and the most reliable water supplies are most likely to invest in more efficient irrigation systems during severe droughts (Schuck, et. al., 2005).

• As water becomes scarcer (and more unreliable), farmers tend to rely more on groundwater and conjunctive use - Groundwater is much difficult to price and manage

• The terminology for WUE debate is, poorly defined – often failing even to distinguish between consumptive and non-consumptive uses. In consequence, technical interventions have not always led to the expected, desirable outcomes, and the recommendations in many reports and papers are at best dubious, at worst simply wrong (Perry, 2007)

• ** Appropriateness of technologies**: need for transdisciplinarity approaches
A useful means for achieving efficient allocation of irrigation water is to put the right price tag on it. Various pricing methods differ in the amount and type of information, and the administrative cost, needed in their implementation. The water pricing methods are most pronounced through their effect on the cropping pattern—more so than through their effect on water demand for a given crop (Tsur and Dinar, 1997).

Pricing irrigation water can only happen when it directly relates to the level of consumption of water: A condition that can not be met in most irrigation systems in the developing world (Perry 2001).

Water markets work best in situations of water scarcity where agriculture and water rights are well developed (Jury and Vaux 2005).

The price that farmers pay for water in many world areas is much less than the value of that water, but the application of right pricing might be impossible in poor countries (Hussain et al. 2007).
Irrigation Reforms

The Pentagon Model

Source: Ul Hassan, 2011
<table>
<thead>
<tr>
<th>Country/Region</th>
<th>Leading Institutions</th>
<th>Key Intentions</th>
<th>Instruments</th>
<th>Implementation</th>
<th>Impact</th>
</tr>
</thead>
<tbody>
<tr>
<td>Central Asia</td>
<td>State actors, financing banks, rural elite involved</td>
<td>Diverse, not made clear, state dictated</td>
<td>Legal enactments and regulations only; contracts with self-declared WUAs</td>
<td>None to weak; left to donor projects or state administration</td>
<td>Negligible</td>
</tr>
<tr>
<td>India</td>
<td>State, and financing banks, farmers involved later Conflict with old institutions</td>
<td>Clear</td>
<td>Strong legal framework, rehabilitation subsidies, one sided contracts other instruments ignored</td>
<td>Mixed, half hearted (irrigation agency lacked enthusiasm)</td>
<td>Medium</td>
</tr>
<tr>
<td>Pakistan</td>
<td>State, financing Banks, opposition from irrigation agency and rural elite, landless ignored</td>
<td>Unclear, only by implication</td>
<td>Strong legal framework, but contradictory, one sided agreements, arrangements for social mobilization</td>
<td>Mixed, half hearted</td>
<td>Weak to medium</td>
</tr>
<tr>
<td>Sri Lanka</td>
<td>State, Financing Banks, Farmers, NGOs</td>
<td>Clear</td>
<td>Legal Framework, social mobilization, rehabilitation subsidies</td>
<td>Mixed, half hearted</td>
<td>Medium</td>
</tr>
<tr>
<td>Turkey</td>
<td>State, Financing Banks, Irrigation Agency, Local Leadership</td>
<td>Clear</td>
<td>Social Mobilization, Joint Management, Legal Framework (later), mutual accountability</td>
<td>Enthusiastic agency served as the reform champion, competition amongst regions triggered quick turnover of schemes</td>
<td>High</td>
</tr>
</tbody>
</table>
Key points

• To reduce conveyance losses, huge infrastructure projects have been implemented, but these tend to ignore the “soft” side of the equation.

• It is not that water users are not interested in enhancing WUE, they do it when it makes sense under their conditions. We need to understand their rationality—> need for appropriate innovations.

• Water pricing remains and will remain a political issue and therefore can not be used as an effective tool to enhance WUE under current circumstances in many countries—> Role for experimental economics to design, test and learn from smart incentives.

• Water reforms have generally been designed half heartedly in response to donor pressures, without much deep thinking behind and thus targeted lower tiers of irrigation systems more—> Focus on reforming water bureaucracies as well.

• “…it is not the nominal implementation of the reform that matters, but rather it is the creation of new management institutions that offer water managers (and users) monetary incentives that lead to water savings” (Wang, et. al., 2005)—> Rethink reforms design principles….do not just transfer the management and cost burden to farmers, give them voice and authority in decision making.

• Address concerns related to transparency, accountability, and inclusiveness.
2005 Cambridge University Press
12. doi:10.1017/S1355770X05002524