

Conjunctive use of Ground water and Surface water

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- Conjunctive use is harmonious combined use of ground water and surface water sources in a given irrigation command to maximize the economic and environmental effects of each and also to optimize the water demand and supply balance
- The evolution to more planned conjunctive use and management of groundwater and surface water resources offers great potential for increasing water-supply security and efficiency for both irrigated agriculture and urban water-supplies.
- Conjunctive management approach will in many areas be critical for the definition of realistic strategies for water-resource adaptation to the impacts of accelerated climate change – in which the frequency and severity of surface water droughts increase and are coupled with growing water demands associated with higher ambient temperatures.

Potential benefits of Conjunctive use of groundwater and surface water resources

- **Increased water security**
 - Expansion of irrigated area , within and around the canal command area
- **Increased precision of water delivery**
 - Investment in range of high value crops , requiring precision irrigation
- **Reduced water logging and soil salinisation**
 - Elimination of salinity problems in shallow aquifers
- **Increased buffer space in sub-soil**
 - Better capacity to buffer heavy rainfall and reduce flood run off

INCREASED AGRICULTURE PRODUCTIVITY

Extent of water logging and salinity in India

- Total 1701 irrigation commands (major and medium) covering 88.89 M ha (27.04% of the geographical area of the country) have been studied under this project.
- Number of major and medium irrigation commands are 429 and 1272, respectively.
- Total waterlogged areas based on remote sensing techniques for the year 2003-2005 within major and medium irrigation commands in the country is 1.72 M ha which is 1.93% of the command area
- Perennial water logging covers 0.17 M ha where as seasonal water logging covers 1.55 Mha.
- From ground water table rise point of view, 0.14% of the area under major and medium irrigation commands occupies most critical (upto 1 m) category in pre monsoon season which increased to 1.95% in post monsoon season.
- The critical category (1-2 m) which occupies 2.75% of command area during pre-monsoon increased to 12.35% in post monsoon.
- Salt affected area occupies 1.03 M ha which is 1.16% of major and medium command areas studied

(Source: India-Assessment of Water logging and Salt and / or Alkaline affected Soils in the Commands of all Major and Medium Irrigation Projects in the Country using Satellite Remote Sensing – Country Report-RRSC & CWC 2009)

CONJUNCTIVE USE OF SURFACE WATER & GROUNDWATER

The reality in major areas of irrigated agriculture

- **Conjunctive use widely practised on spontaneous basis – in response to inadequate irrigation canal-water availability both spatially and temporally**
- **Usually implemented unplanned and often in 'crisis mode' – in response to surface water drought in order to mitigate crop-losses**
- **Often results in groundwater providing a large proportion of total water-supply even in major irrigation canal commands – but with little investment on integrated management**

Main Impediments to Planned Conjunctive Use (contd...)

- Generally there is split responsibility for surface water and groundwater management, and this commonly results in a failure to identify and to engineer opportunities for planned conjunctive use.
- There is often considerable rigidity, and resistance to change, in the distribution of surface-water supply, whose rationalization is a necessary pre-condition and important instrument for promoting more efficient conjunctive use.
- This rigidity and resistance often relates to a narrow focus on surface-water delivery and canal-water rostering – with social groups holding tightly onto long-standing entitlements, rather than to absolute water-resource scarcity.

Main Impediments to Planned Conjunctive Use(contd...)

- Socio-political sensitivity and unwillingness of farmers in areas that are relatively well-endowed with surface water to reduce surface intakes and rights, and allow a greater proportion of available canal water to reach less endowed areas
- Inadequate understanding of conjunctive use and the potential role of groundwater by water resource planners, administrators and politicians.
- Inadequate knowledge of the degree to which private groundwater use by farmers is practiced especially in upper part of irrigation commands/ tail-end of commands and their benefits and results.
- Ineffective implementation of Participatory Irrigation Management (PIM)

Main Impediments to Planned Conjunctive Use(contd...)

- In some cases lack of rural electrification and reliable electricity supplies for groundwater pumping in major irrigation-canal command areas
- Inadequate water resource and supply charging systems with large cost differential (as felt by users) between groundwater and surface water for irrigation – because of traditional practice of providing canal water at very low-cost (often not even collecting the cost of operation and maintenance let alone capital cost recovery) – factors of x 10 to x 20 are commonplace, but vary according to whether diesel-engine pumps or subsidized rural electricity grid available, and on the depth to water-table, well yield potential, etc.

Overcoming the impediments to conjunctive use (...)

- A long-term campaign of education about the risks of water logging and salinization and collateral benefits of groundwater pumping.
- Design criteria and incentives for balanced groundwater use , since it is unlikely to be practically feasible to increase significantly the cost of canal-water supplies to users.
- Delegation, within a sustainable and transparent framework, of the issuing of groundwater and surface-water use rights on an integrated basis to appropriate irrigation water-user associations (IWUAs).
- Interestingly, the deterioration of surface-water delivery in canal commands during prolonged drought often results in a rise (**rather than a decline**) in agricultural productivity since it triggers more groundwater development and conjunctive use.

Overcoming the impediments to conjunctive use

- There will also need to be much more committed and enforced administration of available surface-water resources (through the IWUAs), **with attempts to incorporate groundwater-only users (those who have as yet no access to surface water) into existing IWUAs** – such that ground-water use policy and special administration requirements can become embedded there and represented in higher-level water resource stakeholder committees.

Institutional Requirements

- Significant strengthening (or some reform) of the institutional arrangements for water resource administration, enhanced coordination among the usually split irrigation, surface water and groundwater management agencies, and gradual institutional reform learning from carefully monitored pilot projects.
- A common need is for better information and communication on conjunctive use potential amongst all private and public stakeholders. Such an effort from the appropriate water resource agency would facilitate the social learning and institutional development process and lead to the promotion of attitude changes and the acceptance of implementable regulations.

Thanks for your
patience