

Unintended consequence of managing coupled humans and water in an arid landscape:  
irrigation efficiency paradox

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In the arid landscapes like northwestern China, water shortage is one of the most influencing factors to restrict the socio-economic development during its long history. Since 1990s, agricultural water-saving technology has been adopted as an effective long-term solution for severe water shortages. However, during 1998-2010, the irrigation water consumption experienced significant rising while irrigation efficiency increased evidently, which indicates the occurrence of so-called irrigation efficiency paradox (IEP). There exist a lot of studies which explore its economic side using theory of rebound effect. However, other sides like policy or institution, which could be more important to understand the interactions between humans and water, have not yet been explored. In this study, a long-term (1950-2010) agriculture development in Bayingolin is firstly analyzed to provide a general context of IEP occurring during 1998-2010 and to identity the key feedback loops between human and water. A conceptual socio-hydrological model has been developed aiming to capture the rebound effect of technology and adaptation effect of society. The model can be used to identify potentially sustainable policy for agricultural development and water management in arid landscapes.

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