



Small private irrigation: A thriving but overlooked sector



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ABSTRACT

An increasing number of smallholder farmers engage in irrigation using their own resources. They buy or rent irrigation equipment and draw water from nearby sources without depending on or without interference from public agencies or water user associations. The individualization of Agricultural Water Management has been ongoing for several decades in South Asia where most irrigation now takes place from privately owned wells. Recently, small private irrigation is emerging also in sub-Saharan Africa. It is farmer-driven, responds to a genuine demand from smallholders and has substantial potential for poverty alleviation and rural development. In many countries the area under privately managed and owned irrigation is larger than under public irrigation schemes. However, the individualization of irrigation and its spontaneous, unchecked spread pose challenges to equitable access to and sustainable management of water resources. Irrigation investments and research efforts have largely focused on the underperforming public irrigation sector, ignoring small private irrigation. This special issue describes and analyzes this thriving but overlooked sector, drawing from examples from five countries in sub-Saharan Africa and two states in India. The authors explore ways to enhance the potential of small private irrigation for all, without jeopardizing the sustainability of the available water resources.

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1. Introduction

Small private irrigation differs from conventional irrigation schemes in several ways: (1) it is initiated and financed by farmers themselves; (2) it is operated and managed by individuals or in small self-initiated groups; (3) irrigated areas are small, typically less than 2 ha, and technologies are low-cost; (4) farmers cultivate high value crops for the market providing a much needed cash income during the dry season; and (5) it is a spontaneous and unregulated phenomenon.

Small private irrigation already dominates the irrigation landscape in South Asia, where smallholders with privately owned wells outnumber those relying on public irrigation facilities (Shah, 2009a). More recently, in sub-Saharan Africa the use of privately owned irrigation equipment and small structures is gaining importance (Abric et al., 2011; Takeshima et al., 2010). Simple design, relatively low cost, easy application and high profitability render small private irrigation an alternative to public schemes and an attractive option for smallholders. Private ownership of irrigation technologies and their individual operation and management avoid

problems with collective action often observed in public or communal village schemes (Abric et al., 2011).

This shift from public and community managed schemes toward individually owned and managed irrigation remains largely outside the view of policy makers, donors and the research community (Molle et al., 2003). Despite its rapid spread and far-reaching implications for water management, this trend is largely ignored in policy documents and national irrigation plans. Development projects typically target public or communal irrigation schemes (Faures et al., 2007; Turrall et al., 2010). Many countries do not have official statistics on individually owned irrigation equipment (notable exceptions are India and Bangladesh where regular censuses are held), and the literature on small private irrigation outside South Asia and francophone West Africa is limited.

Small, privately owned irrigation provides millions of smallholders with an income and plays a crucial role in poverty alleviation in South Asia (Shah, 2009a; Hossain, 2009). Yet, there are indications that the uncontrolled proliferation of individual irrigation, in particular the use of motor pumps, can lead to environmental damage (over-abstraction, resource degradation and pollution from agro-chemicals) and conflicts between water users (Shah, 2009a). Where water is limited, vulnerable groups may be harmed. Better-off farmers tend to have better access to water sources, information and technology than their poorer counterparts. Due to its popularity among smallholders and its spontaneous spread, the potential of individual irrigation

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technologies for reducing poverty is high, but without informed interventions, the risk of unchecked adverse effects is equally high.

Based on research in India and sub-Saharan Africa, this special issue describes the features and the pros and cons of the emerging sector of small private irrigation. The authors explore pathways to enhance this overlooked sector, maximizing its poverty alleviating potential while minimizing adverse environmental and social impacts. In this overview paper, we describe the importance of the small private irrigation sector, in terms of the number of farmers engaged and its potential for up-scaling (i.e., the uptake by an increased number of farmers). We also explore the potential impacts of the proliferation of small privately owned irrigation on gender, equity and the environment.

The research presented here was carried out under the Agricultural Water Management Solutions (AgWater Solutions) project with case studies in Burkina Faso, Ethiopia, Ghana, Tanzania, Zambia, and the Indian states of West Bengal and Madhya Pradesh. More than 30 case studies were implemented and some 20,000 farmers, government officials, technology dealers, community leaders and other key informants were interviewed. Additional information is available on the project website: <http://awm-solutions.iwmi.org/>.

2. Characteristics of small private irrigation

The emergence of small private irrigation is part of a larger trend toward the individualization of irrigation. Increasingly, smallholders engage in the production of high-value cash crops using individually owned (or sometimes shared) irrigation equipment. Using buckets, watering cans, manual pumps or small motorized pumps, farmers take water directly from nearby sources such as rivers, lakes, canals, reservoirs or wells. Operations are small and technologies are low cost and under full control of the individual or farmer group. In South Asia farmers primarily use small motorized pumps in privately owned wells to irrigate high value rice (*boro*) and vegetables. In sub-Saharan Africa smallholders engage in irrigated vegetable production during the dry season, mostly using buckets to obtain water from nearby surface water bodies.

Individual or household level irrigation as described above is sometimes referred to as 'informal irrigation' (e.g., Drechsel et al., 2006; Payen and Gillet, 2007) because it typically bypasses official entities such as ministries, irrigation departments and water user associations. Shah (2009a) coined the term 'atomistic' irrigation to contrast its individual character with large communally managed schemes in India. We use the more generic term 'small private irrigation' (used by Takeshima et al., 2010) to distinguish this development from the public sector and to emphasize the fact it is initiated, managed and financed by farmers themselves, mostly by individuals, but sometimes in small groups. Though less commonly used in English, in francophone literature the term '*petite irrigation privée*' is well established (e.g., Gabelle, 2002; Sally and Abernethy, 2002; Sonou and Abric, 2010).

2.1. A large group of smallholder beneficiaries

Small private irrigation is a widespread and growing phenomenon. In India, Pakistan and Bangladesh most of the irrigated areas depend on privately owned and managed wells. Some estimates put the number of privately owned wells in India at around 25 million, providing 70% of all irrigation water (Shah, 2009a). In Bangladesh 5.1 million of 6.2 million irrigated ha are under privately owned wells and 86% of the area is served by privately owned pumps (BBS, 2010). An estimated 1.3 million shallow tubewells owned by one-fifth of the farm households provide irrigation service to 10.2 million of 15 million farm households (Hossain, 2009). In Indonesia the number of privately owned motor

pumps used in irrigation increased from 1.17 million to 2.17 million between 1998 and 2002 (Government of Indonesia cited in Shah, 2009a). In Vietnam the number of privately owned irrigation pumps quintupled during the 1990s to 800,000 (Barker and Molle, 2004), while in Thailand there were 3 million privately owned irrigation pumps in the year 2000, up from 500,000 in 1985 (Molle et al., 2003).

There is evidence that a similar trend is emerging in much of sub-Saharan Africa (though systematic and reliable data are scarce). Small private irrigation represents 15% of irrigated area in Kenya, 55% in Niger and 75% in Nigeria (Abric et al., 2011). Takeshima et al. (2010) report that 95% of the irrigated area in Nigeria is under farmer managed systems. In Ghana nearly half a million smallholders irrigate 185,000 ha using buckets, watering cans and small pumps, compared to 11,000 farmers in the public irrigation schemes (Namara et al., 2011). In Burkina Faso we estimate that 170,000 farmers, mostly smallholders, are involved in off-season irrigated vegetable cultivation, using buckets, watering cans and small motor pumps. These farmers are contributing to a significant increase in the country's irrigated vegetable production, which has nearly tripled from 60,000 tons in 1996 to 160,000 tons in 2005 (DSA, 2005). In Tanzania, an estimated 600,000 farmers lift water from rivers and wells for irrigated vegetable cultivation, mainly by manual methods (Keraita, 2010). With the public irrigation sector underperforming in many countries (Tural et al., 2010), the spread of small private irrigation has been a driving force behind the expansion of irrigated land in much of sub-Saharan Africa (Takeshima et al., 2010).

2.2. A variety of water sources

In South Asia most of the water used by private irrigators is pumped from aquifers. In India more than 70% of the water in irrigation comes from groundwater. In Bangladesh this is 79% (AQUASTAT, 2010). Clearly groundwater is the water source of choice. Farms using groundwater tend to have higher returns than those using surface water. However, the trend toward individualization of irrigation in Asia is not necessarily linked to groundwater use. Shah (2009a) describes how the government in India tried to persuade water associations in the newly constructed Sardar Sarovar Irrigation Project to build water distribution structures below the outlets. However from the moment water began flowing in the canals, farmers installed tens of thousands of individual small pumps to draw water directly from canals and drains. In Madhya Pradesh farmers collect surface runoff in individually owned water harvesting ponds, which they use to provide water for irrigation in the dry season (Malik et al., 2013). In the Chao Phraya Delta in Thailand and the Mekong Delta, private pump owners also draw surface water (Molle et al., 2003).

In sub-Saharan Africa most irrigation water comes from surface water bodies. According to AQUASTAT statistics, less than 5% of the water used for irrigation comes from groundwater (FAOstat, 2010, estimate based on incomplete data) because it is difficult or costly to access groundwater, and it is a relatively unknown—hence underappreciated—resource (Masiyandima and Giordano, 2007). Except for some isolated pockets of shallow groundwater (for example in the coastal belt in Ghana and parts of Niger), smallholders use a variety of easily accessible water resources such as rivers, reservoirs, lakes and ponds. This implies that small private irrigation is limited in geographic scope to areas where water sources are nearby and easily accessible. Some farmers take the opportunity to benefit from existing but underutilized irrigation infrastructure. For example, in Ghana farmers pump from drains and abandoned canals. In Burkina Faso farmers draw water directly from small reservoirs instead of – or sometimes in addition to – using canals downstream (de Fraiture et al., 2013). In Zambia the

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