



Review

A comparative review of water management sustainability challenges in smallholder irrigation schemes in Africa and Asia



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ABSTRACT

This article reviews the performance, problems and challenges of water management sustainability of farmer-managed smallholder irrigation schemes in Africa. The review draws a comparison with the situation in Asian countries, highlighting the major obstacles to the sustainability of smallholder irrigation schemes. The objective is to show the differences in water management between Asia and Africa, highlighting best practices from the Asian experience from which African countries can learn to make their irrigation schemes more resilient. The aspects discussed include: the record of achievement, farmers' participation and involvement, capital cost recovery, reforms in the land tenure and water management; institutional management, traditional knowledge and management systems, water markets and adaptation to increasing water scarcity in the face of climate change.

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1. Introduction

Except in a few countries in northern Africa, such as Tunisia and Morocco, there are hardly any significant cases of successful and sustainable farmer-managed smallholder irrigation schemes in Africa, despite the importance of smallholder irrigation schemes for rural communities and heavy investment in the sector by different development agencies (World Bank, 2008; Mwendera and Chilonda, 2013; Kortenhorst et al., 2002). In some countries the community smallholder irrigation schemes have not only had negligible impact on the standard of living of the people but have increased their vulnerability to droughts and dependence on outside assistance. Contrary to the situation in Asia on the other hand, smallholder irrigation schemes have been in existence for centuries and despite daunting challenges, many of them have been generally successful. Today, over 70% of the world's irrigated land is in Asia (Mukherji, 2012). The facts behind the higher success rate for smallholder irrigation schemes in Asia appear to revolve round the use of traditional management systems, active farmers' participation, deliberate efforts by the respective governments to recover capital costs from the beneficiary farmers and positive efforts to reform software water management issues (Mukherji, 2012; Facon, 2013). Asia also has thriving water markets that are well connected to financial, input and output supply markets.

Farmers' involvement in smallholder irrigation schemes in Africa has been peripheral. Few African countries have attempted to recover capital costs from users as they have adopted welfarist approaches which compromise farmers' commitment and ownership and threaten the survival of water markets and the linkage of water markets to other markets that are so critical for sustainability of irrigation schemes. The exploration and utilisation of underground water has also been low in Africa due to high cost of drilling and low yielding aquifers (Ofosu, 2011; FAO, 2015). The dependence of irrigation schemes on surface water makes them vulnerable to climate change.

The aim of this article is to make a comparative assessment of water management sustainability challenges in smallholder irrigation schemes in Africa and Asia. The objective is to show the differences in the water management between Asia and Africa, highlighting best practices from the Asian experience from which African countries can learn to make their irrigation schemes more resilient.

The major aspects discussed include: the record of achievement, farmers' participation and involvement, capital cost recovery, reforms in the land tenure and water management; institutional management, traditional knowledge and management systems, water markets and adaptation to increasing water scarcity in the face of climate change. Information for this article was collected from secondary sources.

For the purposes of this article Smallholder irrigation scheme is considered as irrigation on small plots, in which farmers have the major controlling influence and using a level of technology which the farmers can effectively operate and maintain (Kedir and Alamirew, 2012, p. 3). Sustainability is taken to be "the ability of a system to continue into the future or maintain its productivity in spite of a major disturbance, such as is caused by intensive stress or a large perturbation" (Lien et al., 2006, p. 63). Resilience refers to the ability of an ecological or livelihood system to adapt or "bounce back" (FAO, 2004, p. 310) and Vulnerability is defined as, the degree to which a system is susceptible to, or unable to cope with both natural and economic shocks (Ikeme, 2003).

1.1. The record of achievement

Throughout Africa, there are hardly any significant cases of successful and sustainable farmer-managed smallholder irriga-

tion schemes, despite the importance of smallholder irrigation schemes for rural communities and heavy investment in the sector by governments and multilateral development agencies (World Bank, 2008; Mwendera and Chilonda, 2013). In many countries, the expected effectiveness and impact of such interventions has not been realised as the efficiency of the irrigation schemes has been less than 50% (Denison and Manona, 2007; Mwendera and Chilonda, 2013). The result has been poor performance and rapid deterioration of the irrigation infrastructure requiring recurrent investments in rehabilitation (Dittoh, 1991; Webb, 1991; Shah et al., 2002; Magingxa et al., 2006; Denison and Manona, 2007; Maliwichi et al., 2012; Mutambara et al., 2014b). Irrigation schemes in Northern Gambia have severely deteriorated or broken down completely in the past two decades due to insufficient maintenance (Webb, 1991). The water pumps used in irrigation schemes were leased to farmers by the Ministry of agriculture and the responsibility to repair and maintain the pumps was vested in the Ministry, not the farmers themselves (Webb, 1991). Most water pumps in Gambia were diesel powers and shortage of diesel compromised operations in the schemes (Webb, 1991). The canal structures and drainage systems for most irrigation schemes were poorly designed and always suffered leakages (Webb, 1991). In Ghana, irrigation capacity utilisation on smallholder schemes is very low (out of 1.9 million hectares of potentially irrigable area, less than 2% has been developed) (Namara et al., 2011). This has been mainly due to faulty designs, high water pumping costs (following the removal of government subsidies and high electricity costs), lack of repair of the irrigation infrastructure, farmers' lack of technical know-how, ineffective legal framework for the water abstraction and distribution rules and lack of political will (Kyei-Buffour and Ofori, 2006; Namara et al., 2011). The experience of irrigation schemes in Kenya's Arid and Semiarid Lands (ASAL) shows that the ability of smallholder irrigation to provide tangible solutions to dry land problems has tended to be exaggerated (Darkoh, 1990, 1992). Except for minor achievements, the development history of smallholder irrigation has been one of successive failures and their general impact has been far from promoting a viable rural livelihood and a sustainable environment. For example, in Turkana in northern Kenya, where NORAD had poured colossal sums of money in development assistance in the seventies for the establishment of several smallholder irrigation schemes, none of the irrigation schemes did manage to establish itself as a viable alternative to the traditional economic activities, such as pastoralism (NORAD, 1979; Helland, 1987; Sorbo et al., 1988; Darkoh, 1992). The population on the irrigation schemes were found to be worse off than their traditional counterparts—the pastoralists (Helland, 1987; Sorbo et al., 1988; Darkoh, 1992). There was heavy dependence on machinery and on direct management input of the Ministry of Agriculture. The irrigation schemes were rated cumbersome and too expensive to run with operating costs per hectare under irrigation being as high as three times the gross margin of the crops grown (Asmon et al., 1984). The operating expenses were unsustainable and this was partly blamed on improper design and inappropriate technical solutions. The lack of funds and continued technical problems with the technical design and lay-out of the schemes also contributed to embarrassingly low productivity on the irrigation schemes. Most of the irrigation schemes in Turkana had not only had negligible impact on the standard of living of the people but had increased their vulnerability to droughts and dependence on outside assistance (Helland, 1987; Darkoh, 1992), making them less resilient.

In Zimbabwe, both the pre-and post-independence governments prioritized irrigation agriculture. Before independence in 1980, the colonial government constructed dams and invested in irrigation infrastructure as a means of famine relief and as part of the resettlement program for the displaced black farmers (Alvord, 1933; Rukuni and Makadho, 1994; FAO, 1997). From 1980 onwards,

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