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Pirates or pioneers? Unplanned irrigation around small reservoirs in Burkina Faso

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ABSTRACT

Small reservoirs in Burkina Faso are constructed for many purposes such as domestic water uses, livestock watering and irrigated rice production downstream of the dam. Increasingly farmers use individually owned motorized pumps to draw water directly from the reservoir and irrigate vegetables upstream of the dam. This practice, while tolerated, is unauthorized and referred to as 'irrigation pirate' in French. Upstream vegetable cultivation is successful because it is more profitable than downstream rice cultivation. Often, the 'unofficial' irrigated area around the reservoir is much larger than the official command area below the dam. However, in the absence of an overarching authority to manage the water source, this may lead to conflicts and resource degradation. We take the example of the Korsimoro reservoir in Burkina Faso to illustrate the positive and negative impacts of spontaneous individual irrigation around communally managed water bodies.

1. Introduction

Small reservoirs capturing local runoff play a significant role in rural livelihoods and agricultural production. Wisser et al. (2010) estimate that water stored in small reservoirs around the globe could increase global cereal production by 35% through supplemental irrigation. In India there are some 208,000 small reservoirs (called 'tanks') irrigating 2.3 million ha (Palanisami et al., 2010). In South India where geology is less favorable for groundwater storage, groundwater abstraction is costly and rivers are seasonal, irrigation from small reservoirs produces 4.2 million tons of rice. In Sri Lanka tank irrigation is the predominant form of irrigation, with the oldest reservoir dating back more than one thousand years (Sakthivadivel et al., 1997). In Zimbabwe, Zambia and Mozambique there are more than 9000, 2000 and 600 small reservoirs respectively (AgWater Solutions, 2011). In Burkina Faso there are more than 1300 small reservoirs (Cecchi et al., 2009; Leemhuis et al., 2009) and at least 900 in Ghana (Annor et al., 2009; Venot and Cecchi, 2011).

In villages without easy access to other water sources, small reservoirs play a vital role in supplying water for many uses such as domestic purposes, bathing, washing, watering cattle and cottage industries, such as brick making (Faulkner et al., 2008; Boelee et al., 2009; Lautze et al., 2008). More recently, governments and donors in West Africa have been promoting small reservoirs to enhance irrigated cereal production downstream from the reservoirs (Venot et al., 2012; Venot and Krishnan, 2011). Small reservoirs support many water uses including crop production, livestock watering, fisheries, domestic and small business water use, and handicraft activities and thus are vital assets in people's livelihood. Governments, donors, non-governmental organizations (NGOs) and communities have made (and are still making) significant investments in small reservoirs (AgWater Solutions, 2011).

However, the investments in small reservoirs have been questioned by some for their high costs, low performance, low levels of community participation, and the collective action required to operate and maintain irrigation infrastructure. Tank irrigation in India has been in decline for decades. The area irrigated declined by 32% between 2001 and 2008 due to lack of technical skills, excessive sedimentation due to catchment degradation, and difficulties in mobilizing sufficient resources for maintenance (Palanisami et al., 2010). The performance of irrigated areas below small reservoirs in West Africa is mixed (Birner et al., 2010; Mdemu et al., 2009; Venot et al., 2011). Problems with communal management and mobilization of village resources for the maintenance and operation are common (Birner et al., 2010; Sally et al., 2011).

The irrigation potential of small reservoirs is underutilized, despite substantial investments in infrastructure and in the training of water user associations by governments and donors. For example, between 2003 and 2007, IFAD invested some $26 million in rehabilitation and provision of irrigation infrastructure below small dams in Ghana, with disappointing results (Johnston and

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McCartney, 2010). The Ministry of Agriculture and Water in Burkina Faso (2006) estimates that of the 32,000 ha developed, only 20,000 ha are actually used (MAHRH, 2006). In addition to technical difficulties and poor construction quality, problems relate to the management of common property (Birner et al., 2010; Sally et al., 2011).

Ostrom and Gardner (1993) provide several successful examples of self-organization in which irrigation systems have avoided the pitfalls of common property management. This tends to occur when certain conditions are met (Ostrom, 1990; Agrawal, 2001). Collective resource boundaries and user rights need to be clearly defined; the external environment needs to be favorable; user groups must be more or less homogeneous (or at least willing to cooperate); and local institutional arrangements – often informal – facilitate collective action (Meinzen-Dick et al., 2002). To enhance collective action and resource mobilization for the management of small reservoirs, some governments and donors call for the formation or strengthening of water user associations (Palanisami et al., 2008, 2010; Anbumozhi et al., 2001; Birner et al., 2010). Some donors even regard the presence of well-functioning water user associations – or similar structures – as a prerequisite to further interventions (IFAD, 2009). However, Venot et al. (2012) warn that top-down approaches to WUA formation are not always appropriate. A uniform approach disregards many formal and informal institutions and local collective action initiatives which already are involved in the governance of small reservoirs.[1] Further, water user associations often focus primarily on management of water for irrigation, such that other water users including fishermen and cattle herders are under-represented or not represented at all.

Some observers question the common notion that small reservoirs are under-performing. Actual performance measures are narrowly defined in terms of area under irrigation, crop production, and crop water productivity. Multiple benefits, such as livestock watering, domestic uses, small enterprises and groundwater recharge account for an additional 12% of the value of benefits derived from water stored in small reservoirs (Palanisami et al., 2011). Venot et al. (2012) find that extension workers who base their judgment on the state of the infrastructure, agricultural outputs, and functionality of the officially recognized water user association, rate the performance of reservoirs much lower than villagers who consider many benefits and social values when making their judgment.

In this paper we argue that debates about investments in small reservoirs should account for the growing trend of irrigation development upstream of the dams. Increasingly, farmers use small – mostly individually owned – motorized pumps to draw water directly from reservoirs and irrigate vegetables upstream of the dam (Ki et al., 2010; Ndanga-Kouali, 2011; Payen and Gillet, 2007). This highly profitable activity is spreading, particularly in Burkina Faso. Often, the area under irrigated vegetables upstream is several times larger than the area under rice downstream (Sally et al., 2011). Overall, this trend has a positive impact on the local economy and boosts the cost–benefit ratios of otherwise low yielding irrigation investments in small reservoirs.

Irrigation on the banks of small reservoirs in Burkina Faso is not a new phenomenon. Already in the early 1990s Abernethy (1994) reported vegetable cultivation around several reservoirs. Recently, however, the scale of this activity has expanded rapidly, with the import of affordable and portable motorpumps from China and India. Government subsidies and development projects also have spurred the recent increase in private irrigation upstream of small reservoirs. No statistics exist regarding upstream use of reservoirs, but based on field observations and Google Earth imagery, we estimate that most of the small reservoirs in Burkina Faso support irrigation upstream of the dam. In 2005 about 170,000 smallholders produced $32 million worth of vegetables on 8900 ha of irrigated land (DSA, 2005). An estimated 94% of the produce was sold on local markets. It is likely that most of these vegetables were irrigated informally from reservoirs, as official irrigation schemes are dedicated to rice, and irrigation from rivers and lakes is not common in Burkina Faso.

The uncontrolled proliferation of small pumps for vegetable cultivation upstream of reservoirs can lead to environmental problems such as over-abstraction, resource degradation and pollution from agricultural chemicals. Also, it is a source of conflict between competing groups of water users around the reservoir, such as households, fishermen, rice farmers and pastoralists (Sally et al., 2011; Ndanga-Kouali, 2010). We chose the Korsimoro site as an illustration of a small reservoir that is relied on by many competing users, and where the 'informal' area irrigated by pumping directly from the reservoir is 8 times larger than the official command area irrigated by canals downstream of the dam. Sally et al. (2011) and Mvondo-Ayissi (2010) describe other reservoirs in Burkina Faso where similar trends are observed. Field observations and scrutiny of Google Earth imagery provide evidence that these are not isolated cases.

We examine the positive and negative impacts of small, private irrigation upstream of the Korsimoro reservoir and we describe the ensuing dilemmas for water management and governance. On one hand, this private irrigation adds substantial value to the benefits derived from water stored in small reservoirs and needs to be incorporated in performance measures. It also provides examples of the farmer-led emergence of institutions for the management of irrigation infrastructure and distribution of water. On the other hand, it adds to difficulties related to communally managed water resources and conflicts over water resources.

2. Study site and data

The Korsimoro reservoir is located 70 km northeast of Ouagadougou, the capital of Burkina Faso, along the main road to Kaya. The reservoir was built in 1984 and equipped with irrigation infrastructure in 1987 (Ndanga-Kouali, 2011). With an estimated volume of 4.7 million m^3, the reservoir is used intensively for many purposes such as washing, bathing, fisheries, livestock watering, brick making and 32 ha of irrigated rice cultivation (BRL, 2001). The area under vegetable cultivation upstream of the reservoir is estimated at 230 ha (Fig. 1). The Korsimoro village, with some 14,000 residents, is situated a few km from the dam. Market access is good and public services such as agricultural extension services, telecom, hospitals and schools are well represented.

We obtained our data through process documentation and structured questionnaires among 126 farmers involved in rice cultivation, irrigation of vegetables, fishing, livestock and other activities around the Korsimoro reservoir, implemented during three months of research at the field site. We conducted semi-structured interviews with office bearers from farmers' organizations, local government and other relevant institutions. We measured the efficiency of several pumps in farmers' fields, and we developed maps using Google Earth, GPS measurements in the field, and verification by key informants among farmer groups and pump owners. At the end of the fieldwork we shared our results with those interviewed in a village meeting attended by 23 men and 8 women. Feedback from attendees was used to verify findings and refine our observations. Further, we vetted our findings in a meeting at the Department of Irrigation at the national level. Secondary data were obtained from project reports available from the

[1] Cleaver (2000) coined the term 'institutional bricolage'.