



A role playing game to address future water management issues in a large irrigated system: Experience from Mali



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ABSTRACT

This paper reports on an experiment undertaken in the *Office du Niger* irrigation scheme (100,000 ha) in Mali, where the unprecedented development of irrigation driven by large scale investors is dramatically increasing uncertainty surrounding future water management. Coping with future uncertainty in irrigated systems is essential but existing approaches based on scenarios and decision support systems are mainly expert-driven, making them difficult for local users to understand and use on their own. The aim of this study was to design a participatory approach to help local and national stakeholders understand the possible future consequences for water management of scenarios they had built themselves in previous workshops. A role playing game called FOWIS (Future of water in irrigated systems) was designed for this purpose. Two groups (decision makers and local actors) took part and played the roles of family farmers, large scale investors, or the manager of the irrigation scheme. Playing FOWIS increased the players' awareness of each others' strategies and of land development issues, crop choices, and water management. In the local actors' group, applying land development strategies and choosing crops while failing to account for the inevitable increase in water demand led to serious water crises: total demand exceeded water availability by 75%, and the indicator of adequacy dropped to 0.5 for many players. In the decision makers' group, applying a collective strategy to limit water demand, as stipulated in their best case scenario, resulted in an equitable water supply.

In this paper, we show how the game enabled participants to understand the interdependencies between future land development, crop choices, and water management, and, in addition, helped them design innovative strategies to limit water demand or to allocate water fairly. Indirectly, it also led them to question their current practices, choices and strategies that would have been impossible in the current context of open tensions concerning land and water allocation.

The FOWIS experiment also provided useful information for the further development of non-computer-assisted role playing games in highly uncertain contexts, which is the case of most irrigated systems in developing countries. RPGs that take place in a virtual world could increase stakeholders' capacities to take action with respect to real world issues.

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1. Introduction

Scenarios are increasingly used to address the future of irrigation (Fischer et al., 2007; De Fraiture and Wichelns (2010)) and to draw attention to the risk of a water crisis (Rosegrant et al.,

2002). Such scenarios usually depict the future at global or regional scales, whereas in irrigated systems, water management issues are addressed at field or watershed scales. Furthermore, foreseeing future water management issues in irrigated areas requires not only framing the future as stipulated in such scenarios (i.e. making general assumptions about land use or governance), but also analyzing the consequences of strategies and practices. For instance, extension of irrigated areas can alter the spatio-temporal patterns of water management by modifying the intensity of water uses (Mira da Silva et al., 2001), reallocating surface water among uses (Xu

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et al., 2008), or increasing uses of alternative resources including groundwater (Bouarfa and Kuper, 2012).

Decision support systems (DSS) are often used to analyze the consequences of scenarios at watershed level (De Nys et al., 2008; Burte et al., 2009; Biju et al., 2011). However, DSS are based on models that could be difficult for grassroots actors to understand, whereas these actors, who are involved in the daily operations of the system, should be part of the policy design (Pahl-Wostl, 2002). DSS also require numerous data (Mira da Silva et al., 2001; Biju et al., 2004) and generate precise outputs that limit their scope when the scenarios that make most sense to stakeholders are extreme (Bezold, 1999) and far from the assumptions underlying the design of DSS.

Role playing games (RPG) are useful tools to address water management issues in irrigation schemes (Kay, 1990) because they depict the real context in which the action takes place (Watson and Sharrock, 1990). The first RPGs (e.g. the Irrigation Management Game; Burton, 1989) were designed to train managers. More recently, RPGs were designed for use in river basins (Lankford et al., 2004; Rajabu, 2007; Magombeyi et al., 2008) and irrigated areas (Dionnet et al., 2008); they increasingly focus on the development of strategic visions and policies (Duke, 2000). The realism of RPGs make them very effective in exploring strategic changes (Green, 2002), especially in situations involving various types of stakeholders (Mayer et al., 2005). RPGs can target current issues (e.g. conflict resolution) or short-term issues (e.g. planning collective action). These applications have led to the hypothesis that RPGs can also be used to address long term issues in irrigated systems and to facilitate stakeholders' involvement in foresight methods (Loveridge, 2008).

Here, we present a RPG designed to help irrigation stakeholders explore the possible consequences of different development scenarios for water management. The game is based on an experiment conducted in the *Office du Niger* irrigation scheme in Mali. This paper is organized around three main questions: Did the RPG enable stakeholders to (i) Foresee the possible consequences of the scenarios? (ii) Define a suitable strategy for water management? (iii) Increase their awareness of each others' position and strategies?

2. The *Office du Niger* irrigation scheme

The *Office du Niger* irrigation scheme covers 100,000 hectares in Mali. About 40,000 family farmers grow rice in the wet season (July–December) and vegetables in the dry season (December–May). Water is diverted from the Niger River and transported by gravity. The network is based on three primary canals that water seven zones (Fig. 1). Water management has been partly transferred from the public institution “*Office du Niger*” to farmers (Aw and Diemer, 2005) through joint committees and user associations (Vandersypen et al., 2007).

The main changes occurred in 2005 when different investors negotiated access to areas of land ranging from 50 to 100,000 ha (Adamczewski et al., 2013), which could lead to a six-fold increase in the irrigated area (see “possible expansion projects” on Fig. 1).

Uncertainty about the future increased, as the motives and strategies of the new investors were frequently unknown, or quickly appeared to differ from what they originally announced. In addition, the newcomers were granted unprecedented freedom to dig supplementary canals, choose cropping systems without considering their water requirements, and many of them also negotiated with different authorities to obtain priority access to water (Hertzog et al., 2012). Their potential investment capacity could enable them to develop large areas for irrigation in the short term

(see “most likely expansion projects” on Fig. 1), and consequently to increase water demand.

Local and national stakeholders (from local chiefs up to the new Ministry in charge of the *Office du Niger* irrigation scheme), were involved in “behind-closed-doors” negotiations on land and water allocations (Hertzog et al., 2012).

Current stakeholders can be divided into three groups: (i) “local actors”, also referred to as “defenseless actors” by the stakeholders themselves. This group includes family farmers, livestock breeders, small and medium scale investors, farmers' organizations, and local authorities. (ii) “Decision makers” including officers from the *Office du Niger* headquarters, representatives of the Ministries, and large scale investors. (iii) “Influential actors” including donors, researchers, and consultants. These three groups have very different perceptions of the current situation and also different views of future challenges.

Here, we focus on local actors and decision makers who expressed the most interest in addressing future issues of water allocation and exploring contrasted situations. In previous workshops that were held separately in order to prevent conflicts due to power asymmetries between different types of stakeholders, each group designed long term (20 year) scenarios. Each group (local actors and decision makers) identified their preferred situation (best case scenario, S+) and the least desirable situation (worst case scenario, S–). These framework scenarios made assumptions about land and water management, cropping systems, governance, investments, and farmers' organizations (Hertzog et al., in press).

3. Methods

Scenarios built by the participants themselves in previous workshops were the bottom line for the game design, together with quantitative data about the functioning of the system (m³ of water, number of hectares, etc.). For this reason, FOWIS (Future of water in irrigated systems) can be considered as a contextualized game, like other role playing games developed in Senegal (D'Aquino et al., 2003) or Egypt (Hermans and Bots, 2003). This joint use of assumptions about the future and real data makes it possible to consider FOWIS as a “serious game”; a game that allows stakeholders to take a step back from reality (Daré, 2005) but that at the same time allows real conflicts to emerge when alternative water allocation strategies are proposed (Farolfi et al., 2010).

3.1. Setting up the game board

FOWIS is a role playing game derived from the generic Wat-A-Game platform (Abrami et al., 2012), designed for water and conflict management at river basin scale. In FOWIS, players have to develop land for irrigation and to cultivate it according to the available water resources. Its aim is to lead players to set up and discuss investments and rules that would allow them to adapt the expansion of irrigated areas to the available water resources.

As part of a foresight participatory approach, the design of FOWIS had to deal with two, sometimes conflicting, notions of seriousness (to fulfill the real expectations of stakeholders) and play (for the RPG to be used by grassroots actors or decision makers). This refers to the criterion of levity defined by Lankford and Watson (2007).

3.1.1. A realistic but simple representation of the *Office du Niger* irrigation scheme

In order to design a RPG that would allow local stakeholders to play with “no need for prior training” (Magombeyi et al., 2008), we interviewed different stakeholders to identify the most important characteristics of the *Office du Niger* irrigation scheme.

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