RIPARWIN
Raising Irrigation Productivity And Releasing Water for Intersectoral Needs
river basin management research in Tanzania

DFID Department for International Development

ODG DEV

IWMI International Water Management Institute

RIPARWIN- a study of river basin management

Introduction

RIPARWIN (*Raising Irrigation Productivity and Releasing Water for Intersectoral Needs)* is a four year action-research project located in Tanzania, (Fig 1) funded by the UK's Department for International Development (DFID). It is a study of river basin management in an environment typical of bi-seasonal sub-Saharan Africa where formal governance structures are relatively under-developed and where the challenge is to supply and allocate water between farmers, rural poor people, the environment and for electricity generation. The project is examining the commonly-held theory that if irrigation efficiency and productivity can be raised, this 'frees up' water to other farmers and sectors. The project is also testing the normative views that water should flow to the sector representing the highest economic benefit rather than protecting poor livelihoods in the interior of Tanzania.

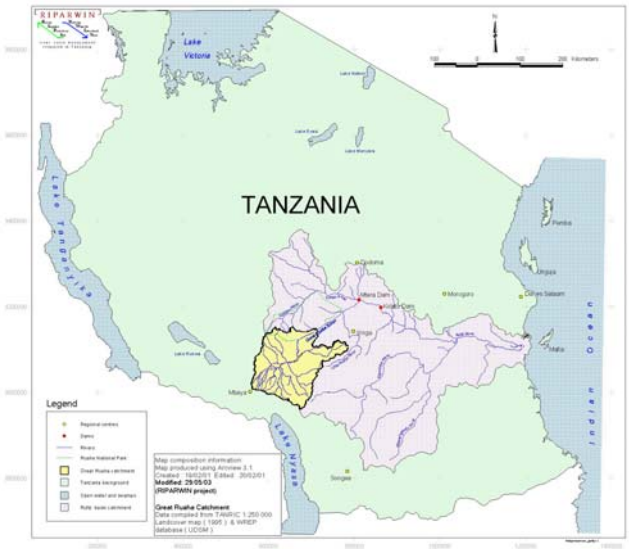
The project is implemented by 3 organisations; the Soil Water Management Research Group (SWMRG), the International Water Management Institute (IWMI) and the Overseas Development Group (ODG). The contract is between ODG and Knowledge and Research (KAR) of DFID.

The project is studying the upper part of the Great Ruaha River, from the Usangu Basin to the exit of the Mtera/Kidatu power-generating complex. A field office is located at Igurusi, in the buildings of the Ministry of Agriculture Training Institute for Irrigation (MATII). Here, six Research Associates work on various dimensions of the overall study, with the aim of contributing to relevant policy and decision-making tools institutions; technical issues, economics and livelihoods, two decision-aid tools and environmental and hydrological issues.

Background to the case study

The Great Ruaha case study is a good example of competition for water between upstream (and predominantly) rice irrigation, downstream environmental needs (wetlands and a National Park) and hydroelectric power generation. A particular feature is the national interest in a river that is perceived to be 'drying up' – the seasonal wetland has shrunk and in the Ruaha National Park, a once perennial river has become seasonal in the last 10 years. During the months October to December, the river dries up for between 3 to 10 weeks, depending on prevailing climatic conditions. Earlier studies under the SMUWC project found that the river was drying up due to abstractions into intakes during the dry season and not due to climate change, deforestation or wetland degradation.

Fig 1. Location of the Upper Part of Great Ruaha River Basin



Methods, results and outcomes

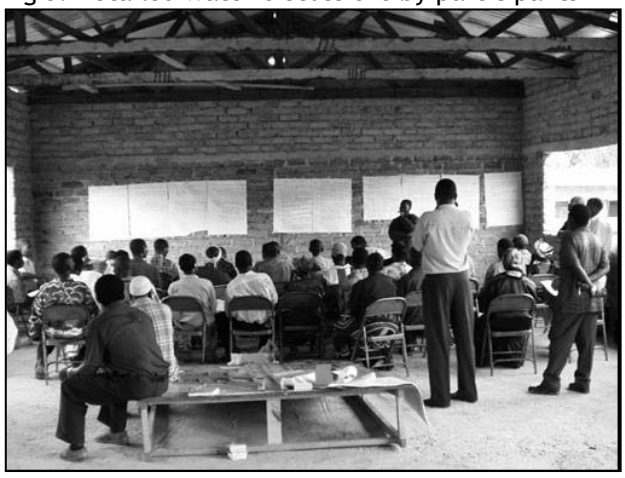
A process approach

Our approach is to work long-term alongside stakeholders so that various ideas and complexities of basin management at different scales can be better understood. We are particularly interested in working with villagers in one sub-catchment of the Great Ruaha River Basin, called the Mkoji, where significant problems regarding the sharing of water are found. We also are collaborating with other key institutions in the area, notably the Basin Water Office and WWF-Tanzania. Our action-orientated methodology includes attempting to reconcile differences in water allocation via various means.

Local decision-making & conflict resolution
The project has successfully developed a role-playing exercise called the river basin game, which can be played by local resource users or higher-level support agencies. The game is based on a physical representation of a catchment where upstream players are able to capture most or all of the water (glass marbles), leaving downstream players with none (Fig 2). The game is part of a two-day event that leads to detailed discussion (Fig 3) on how farmers might save water without lowering yields, so that water might be shared more equitably between them and other users.

Fig 2. Playing the river basin game

Fig 3. Detailed water discussions by participants



Irrigation efficiency and productivity
We have found out that the commonly-held view that "smallholder irrigation is 15% efficient" is very inaccurate. Efficiency of smallholder farmers is in range of 55% to 80%. This discrepancy is due to the fact that water is re-used by smallholders in a cascading fashion from field to field and from top-enders to tailenders. This phenomenon is missed in the conventional methodology that looks at losses in a stylised system with boundary conditions that end in a specific plot. The efficiency of irrigation of the large 'modern' formal schemes is lower (45%) because of lax in-field control. Our study also shows that the re-use and re-capture theory of irrigation productivity helps address this error, but should reflect local conditions. Yes, water does get re-used downstream, but less water arrives later because upstream management and in-field design is below potential. This delayed timeliness further reduces tailend yields as they coincide with the cooler part of the year. We believe that with improvements, total efficiency of both formal/informal irrigation could move towards an average of 75% or more.

The productivity is 0.18 kg of paddy per m3 of irrigation water) compares well with figures reported in many other developing countries (e.g., 0.19 - 0.22 kg/m3 for India). The productivity of rice in Sub-Saharan Africa ranges from 0.10 to 0.25 kg/m3. Elsewhere in the world, figures of up to 0.6 kg/m3 are found but with intensive management.

Reviewing formal water rights
The framework of formal water rights introduced on a pilot basis has been found to be seriously deficient. In effect, the new rights system is a rural tax on users to fund the Basin Water Office, and not, as the originators believed, to assist in improved basin management and lever efficient water use. However, objectively for this situation, volume-based payment is impossible; it cannot measure volumes allocated, let alone volumes used. Moreover, 'paying for water' did not result in water saving, as the originators had believed. On the contrary, it added legitimacy to claims of upstream users ("I paid for the water, so I can use it") to use even more water and further deprive downstream users. In combination with new intakes (see below), these two interventions are doing most to erode a catchment-wide reconciliation of water sharing.

Reviewing the impact of improved intakes
Figure 4 shows an intake recently upgraded by the Government as part of a donor-funded programme. Although farmers served by this intake appreciate the reduced labour now associated with the low maintenance of this intake, downstream users are subjected to extreme low flows in the dry season as a result of the 'blocking weir' automatically taking all the water below a certain threshold. In places, various design modifications have been used, however, these conventional types of intake aggravate a previously delicate situation where dry season flows of only 100-200 l/sec had to be shared between intakes and in-stream users.

A river basin decision-aid
We are completing a comprehensive computer-based decision-aid that will help the Basin Officers

manage water. It incorporates a hydrological model, GIS and an 'outcome' impact model so that "what-if" scenarios can be run to evaluate decisions regarding where the water can be used, and what effects this will have on hydrology, sectoral economics and people's livelihoods. The model can be used to determine the benefits of supply solutions (dams) to specific locations.

Fig 4. Improved irrigation intake in Usangu

Environmental and hydrological studies

Central to our approach is the appreciation that environmental water must be secured for wildlife, ecological, livestock and domestic purposes. We argue that the ability to ensure downstream minimum flows during difficult dry periods is a 'marker' of successful river basin management. We are reviewing the hydrological data in order to update our model and to determine key thresholds that relate to flow ceasing at the wetland exit.

Economics and livelihoods analyses

The waters of the Usangu produce some 14% of Tanzania's total domestic rice production, i.e., in the range 60-80000 tonnes, valued at $16 million, providing some 30,000 households with an estimated $3.12 dollars per day stretched over the year. This is vital in lifting many people out of poverty in this area, and is at the heart of supporting a total population of 750,000 people in the region. Consuming some 576 Mm^3 of water, value per cubic metre of water is estimated at US $ 0.027 per cubic meter. This can be compared later on to values obtained from electricity generation, values associated with the wetland, and to income from foreign tourists visiting the Ruaha National Park.

Ways forward...

The immediate and most significant challenge is to ensure downstream flows during the dry season to feed the wetland and the Great Ruaha River below the wetland. We are developing, with WWF, a Dialogue on Water, Food and the Environment with an action plan:

- Farmer workshops using the river basin game to discuss institutional and technical matters to save water.
- Technical support to reconsider shelved plans and develop new plans for dam construction, e.g. upstream of the Ruaha National Park, and community or household storage.
- Support given to sub-catchment committees to develop their own system of informal water rights that would be recognised alongside formal rights.
- Support by technical experts to assist in technical innovations to save water.
- Boreholes for domestic supply to reduce demand for canal water, the latter being many times gross the actual net need.

Parallel efforts are also required:

- A major review of formal water rights.
- Retuning intake infrastructure to enable proportional water division and downstream compensation flows.
- Alterations to in-field design of the large parastatal farms, currently leading to significant wastage.
- Discussions with farmers on cropping patterns (rice-fallow) that currently fit dry season livelihoods and save on water needs during the dry season. Over time, farmers may switch to more intensive cropping throughout the year and need more water.

Summary

We believe that the research has been successful in testing new ideas, creating sub-catchment user groups, assembling decision-aid tools that were developed with stakeholders' participation, exploring more appropriate ways of generating informal and formal water rights, and testing the prevailing questionable theories about the inefficiency of irrigation and of the principles behind allocation imperatives. Our intention is to ensure these ideas are built a more appropriate and supportive policy framework towards integrated basin management.

The case study indicates that the efficacy of river basin management might best be judged by an ability to attend to local and micro-scale issues that are normally below the 'radar' when compared to perceived macro inequities in supply.

More information (website: http://swmrg.suanet.ac.tz/Riparwin.htm)

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