REFLECTIONS ON THE RIVER BASIN GAME: ROLE-PLAYING FACILITATION OF SURFACE WATER ALLOCATION IN CONTESTED ENVIRONMENTS

(The river basin game)

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ABSTRACT

This paper reflects on a role-playing game designed to assist water users that share small river catchments in Tanzania in both understanding the factors that affect productivity of water and in better appreciating their mutual inter-dependence on water. The paper describes the preparation, objectives, schedule and outcomes of the role-playing event, and comments on the benefits and limitations of this tool in assisting stakeholders in resolving water conflicts and sharing water more equitably. The case study is the Mkoji sub-catchment in the Ruaha Basin where many, relatively poor users share limited amounts of water for various purposes including surface irrigation from multiple intakes (uppermost get most of the water during the dry season), domestic use, cattle-keeping and fishing using in-stream water. Further downstream there are also wetland, wildlife and hydropower calls on water. This game supports a river basin management research project working in the area called RIPARWIN (Raising Irrigation Productivity and Releasing Water for Intersectoral Needs). The two-day workshop during which the game was played was found to be a great success and will be repeated soon by request, although not enough time has elapsed to comment on its longer-term impact. The game probably has application to Mediterranean catchments where surface water is shared by users in an upstream-to-downstream order dictated by gravity, and where upstream users have primary call over water to the detriment of downstream users.

Key words

Role-playing, conflict resolution, facilitation, water re-allocation, irrigation management, community

RESUME

Le présent document décrit un jeu de rôle conçu pour assister les usagers de l'eau situés en Tanzanie et partageant de petits bassins versants. Le jeu doit aider les usagers dans la compréhension des facteurs affectant la productivité de l'eau et une meilleure appréciation de leur interdépendance vis a vis de la ressource. Ce papier décrit la préparation, les objectifs, la planification ainsi que les résultats du jeu de rôle. Les apports et limites de cet outil pour assister les acteurs dans la résolution des conflits sur la ressource en eau et pour un partage plus équitable de la ressource sont aussi exposé. L'étude porte sur le sub-bassin Mkoji ,appartenant au bassin Ruaha, bassin comprenant des usagers de l'eau pauvres partageant une ressource en eau limitée. En amont, la ressource est partagée entre l'irrigation de surface (les irrigants situés le plus à l'amont du bassin obtiennent pratiquement toute l'eau durant la saison sèche), l'utilisation pour l'eau domestique, ainsi que l'eau pour le bétail et la pêche. En aval, les zones humides, la faune sauvage et les centrales hydrauliques nécessitent la présence d'eau. Ce jeu de rôle soutient un projet de recherche en gestion de l'eau appelé RIPARWIN (Raising Irrigation Productivity and Releasing Water for Intersectoral Needs - Augmenter la Productivité de l'Irrigation et Relacher de l'Eau pour les Besoins Intersectoraux.). Le jeu a été appliqué avec

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succès durant une session de travail de deux jours. Le manque de temps n'a pas permis d'évaluer son impact à long terme mais, pour répondre à la demande, une nouvelle session a été prévue. Le jeu semble pouvoir être appliqué dans les bassins versants de la Méditerranée où l'eau de surface est partagée de façon gravitaire entre l'amont et l'aval, favorisant ainsi les usagers amonts au détriment des usagers avals.

Mots clefs
Jeu de rôle, résolution de conflits, facilitation, re-allocation de l'eau, gestion de l'irrigation, communauté

INTRODUCTION

It is widely acknowledged that public decision-making, consultation and participation in watershed management is seen as good practice (WWF, 2001; Chave, 2001). Such participatory practices help "to define problems, set priorities, select technologies and policies, and monitor and evaluate impacts and in doing so is expected to improve performance" (Johnson et al, 2001). The value of these deliberative processes (that aim to solicit public debate) over other forms of decision-making is argued by Collentine et al 2001: "If the primary reason for including citizens in the process is to legitimize allocation decisions, then models for participation which increase legitimacy, such as deliberative democracy with its emphasis on public debate as an important part of the deliberation process, should be preferred over models such as surveys, which reduce the scope for participation to either single values (contingent valuation) or acceptance/rejection modes of participation".

Although the case for participation is strong, as Johnson et al (2001) make clear, the most appropriate style and format of public participation requires further research since there are many options available and not all will be suitable. This caution is echoed in a recent journal editorial: "Finding mechanisms to identify relevant stakeholders (including users and non-users of resources, both inside and outside the watershed) and to facilitate exchange of information, mediation of conflicts and negotiation of mutually acceptable land management options is not an easy task" (Water Policy, 2001).

Role-playing is a well-known tool in participatory rural appraisal, community empowerment and facilitation of natural resource management (Forester, 1999). Furthermore, role-playing is also seen as a legitimate tool for qualitative social research (Bloor, 2001; Mikkelsen, 1995; Nichols, 1991; Pratt and Loizos, 1992) though it does need to be carefully managed and encapsulated within formal validation, feedback and follow-up activities. Recognising these positive and cautious dimensions of role-playing and gaming as a part of generating greater exposure to deliberative inclusionary decision-making, the authors undertook to test the advantages and disadvantages that a physical-based board game might have in such processes.

BACKGROUND TO THE GAME

The Mkoji subcatchment is located in the Usangu Plains of the Great Ruaha River basin in the Southern Highlands of Tanzania. The Usangu Plains has been the location of a number of studies regarding hydrological and environmental change associated with water utilisation and competition between sectors within the Ruaha Basin, most notably between irrigation, a major wetland and hydroelectricity production. These changes and their context are well documented in recent papers (Baur et al., 2000; Lankford and Franks, 2000; Franks and Lankford, 2002; Lankford and van Koppen, 2002) stemming from analyses conducted by a project funded by the UK Department for International Development (DFID, 1998).

The Mkoji subcatchment (area 2500 km^2, GPS easting 575000, northing 9025000) is the name of seven smaller streams that feed into the Mkoji confluence. Inhabitants are mostly poor to very poor rural people and in the last twenty years population growth (the catchment is close to the large town of Mbeya) has resulted in increases in water demand principally from rice grown during

the wet season and maize and beans grown during the dry season. Approximately 110 irrigation intakes have been developed supplying approximately 4000 ha and 12,000 ha in the dry and wet seasons respectively. Domestic needs have also increased, plus there has been a realisation that environmental water should be safeguarded to provide for fish, wildlife and related livelihoods. During the dry season, or during dry years, when individual stream flows are in the order of 0.5 to 1.5 cumecs, upstream irrigation intakes and farmers tend to abstract most of the water leaving little for lower intakes and downstream environmental/livelihood needs. These differences in access have been exacerbated by the replacement of 'leaky' traditional irrigation intakes constructed of soil and stones that allow water to bypass downstream, with modern concrete intakes funded by irrigation improvement programmes that block river flow more efficiently (Lankford and Gillingham, 2001). Surveys found that discord exists during low flow periods resulting in individual, group and village level disputes. It is only during the rainy season when streams exceed 2-5 cumecs are all needs met and conflict decreases.

As a part of another DFID funded research programme 'Raising Irrigation Productivity and Releasing Water for Intersectoral Needs' (RIPARWIN) a river basin game was designed to facilitate community decision-making on water management and allocation at the sub-catchment level. Our message was to show that could encourage participants, using local and outsider knowledge, to consider ways of maintaining agricultural productivity whilst at the same time reducing water abstraction. This productivity gain could then enable the release of water downstream to meet critical livelihood and environmental needs.

SETTING UP THE GAME

The river basin game was originally developed as a teaching tool at the University of East Anglia, UK for undergraduate students. In Tanzania, a local village carpenter reproduced the game, which centres on a physical representation of a catchment. Figures 1 to 3 show that the game is a sloping board on which marbles run down a centre channel from the top, a watershed, to the bottom, a wetland. From this channel, marbles are captured into side channels that run into irrigating farms. Capturing marbles is done by players using sticks or rods of different sizes which represent irrigation intakes. If no sticks or few of them or very small sticks (leaky traditional intakes) are employed then a good proportion of marbles end up at the bottom wetland, indicating equity in sharing. If many or larger sticks (so called modernised intakes) are used the most marbles are captured upstream and the wetland ends up with few or no marbles indicating inequity of supply. Inside the farms are fields each with a boundary and holes into which are placed marbles. The number of holes in each field represents the crop water requirement. After marbles flow down the board, observations are made about where the marbles end up and which fields get too many marbles and which fields get nothing. A number of individual and collective strategies can be demonstrated, as given in Table 1.

Before playing an appropriate list of participants should be drawn up. A main facilitator, familiar with institutional/social issues, who has helped design the day and chosen the participants should be present, assisted by two assistants who know about water management and act as note keepers. A video operator is optional. About 30-35 water users are chosen from different parts of the sub-catchment; farmers, top-enders, tail-enders, domestic users, pastoralists and fisherpeople. More can be observers, but the maximum number that can play is about 35. Some of these should be local village leaders or water committee executives. Stakeholder observers should be invited – with a particular emphasis on those responsible for assisting water users, such as; irrigation training specialists, staff and officers from Ministries of Agriculture and Water, the Zonal Irrigation Office, the River Basin Water Office and the local District.

PLAYING THE GAME

The workshop centred around the game but also included discussion sessions and ranking exercises. The whole workshop lasted two days. Day one had 4 phases, described below and in boxes 1 to 4. The first phase was an introduction, and the next two phases employed the board to recreate what

was observed in the subcatchment, including swapped tail-and top enders around to elicit greater empathy regarding downstream shortages. The fourth phase on the first day was working in break-out groups to discuss existing and alternative institutions to manage water according to the vision devised by farmers in the third phase.

The second day had six sessions (box 5) to go into more detail on the technical water management and institutional issues required to save water within irrigation fields and farms so that upstream farmers could reduce their water use without experiencing an excessive drop in productivity. This day did not use conventional "how to irrigate" teaching, but instead built upon farmer observations of crop and field responses seen during different types of water management practices, and of different techniques to distribute water carefully and judiciously. The farmers were asked to discuss helpful and hindering institutions or to suggest new institutions to support and strengthen agreed resolutions.

The first phase on day 1 lasted one hour, though timings are approximate as time should be allowed for thorough understanding and repetition where necessary. Firstly, a welcome session was given covering the aim of the day and game. Farmers appreciated being 'contextualised' within global water problems regarding intersectoral allocation, water productivity, conflict management, the increasing water needs of many sectors and distinguishing between needs and wants so that we can ask 'how do we meet the needs of the poorest in the sub-catchment?' This introduction reminded participants that to poor tailenders a small amount of water has very great value to their livelihoods, whereas to a top-ender rich in water, giving up that small amount of water will probably not make a difference or even be noticeable. We refer to other donor, district and NGO projects that have tackled water in the area and introduced a map of the whole basin to locate the Mkoji subcatchment, asking participants to locate and name users such as; domestic, cattle, rice, non-rice, wetlands, fisheries, wildlife, the Great Ruaha National Park, tourists, and the electricity generating Mtera/Kidatu reservoirs. Although a formal map was first provided, the facilitator then encouraged hand-drawing of a map so that all could refer to it. Since the board game was not an accurate representation, there were many features (canals, intakes, drains) that were added to a map.

Basic rules and agreements (listening, asking questions) of the game were explained. The participants were informed what they would see, that they would conduct a 'round' and that the facilitator would explain what they had seen. Although it was important to let the game have a natural flow, it was necessary to steer the game to achieve certain results. Discussion was allowed between water users before each round so they 'got into the game' – at which point the facilitator should not to dominate proceedings.

Phases two (see Box 2) and three (Box 3) provided an interesting contrast in water management. Phase two's objective was to allow the 'current status' to be recreated; that the consequences of individual action resulted in marked inequity between water users. Phase three aimed at collective action, demonstrating that individuals and communities can choose to use water wisely to ensure that peoples' needs are met, and that water can be re-allocated leading to higher efficiency of water use and greater benefits all round, including meeting environmental, domestic and livestock needs downstream.

OUTCOMES OF THE GAME

The authors were concerned the game would not be taken seriously. However, the reaction of the participants from about the first half-hour onwards was inspiring, rewarding and thought-provoking. One could see the game being quickly being adopted as being "realistic", and it became difficult to stop the discussion in order to break for lunch. Exclamations of "yes, this is how it is" were heard as discussions about coping strategies started without additional prompting, and heated arguments broke out between role-playing top-enders and tail-enders. Some of the key outcomes of the workshop are described below.

Regarding individual strategies, it was agreed that the upstream farmers normally get more water that the their downstream counterparts. The former were "more happy, well-off and satisfied than the latter", and "sometimes they have too much water than what they actually need". Water

users raised several reasons as to why one would retain water well above actual need; "selfishness and jealousy; holding water as a sign of prestige; lack of/little knowledge on water use; some farmers think that too much water means more harvest." Water users also noted the problems caused by modernised intakes which allowed all the water during low-flow periods to be abstracted. Farmers also said that the game revealed well the links between water availability and the need for livelihood security and money.

When the collective/group approach was compared to the individual approach players noted that some water users, especially in the middle catchment had started initiatives to allocate water between and within irrigation systems. In Inyala and Imezu villages, for example, it was reported that there were WUA and canal committees responsible for allocation, management and control of water within one irrigation scheme. However, it was noted that water allocation within irrigation schemes was easier to manage than the inter-system water allocation. In the present institutional set-up, participants felt that there was little direct connection between upstream water users and their downstream counterparts, observing "there is a need to form a joint river wide organ that would draw all these users together to form a joint sub catchment". Other suggestions included; more workshops on water management so that many people may understand how best to manage water; agreement on water management bye-laws; and more agronomic information about the catchment and its microclimate, and what seeds to plant at what time.

Various ideas were suggested on how to save water while maintaining or increasing production. Firstly, farmers felt that current calendars for field activities were too relaxed, and that irrigation systems "had no exact time frame for start and end of field irrigation activities" allowing upstream farmers to start very early and downstream farmers to plant as late as May as water became available on their fields – which leads to low yields due to cooler growing conditions during the winter. Nearly all farmers were in favour of a fixed November-February time frame (start and end of transplanting) and any farmer transplanting after this date "should not complain when the irrigation water is stopped during the harvesting period". The use of short season varieties worried farmers due to poor palatability, prices and market predictability. Farmers cited an example of sesame, once promoted by the Government. It was well received by farmers but at harvest there was nowhere to sell the crop. Farmers wished for research on different varieties of rice in terms of their ripening duration, taste and performance in different locations of the Usangu plains.

It was agreed that a restriction on area cultivated could be applied in the Mkoji sub-catchment for dry season irrigated crops and during the start of wet season when the demand of water for rice establishment and transplanting is very high. Farmers reported one experience from part of the Mkoji subcatchment where farmers were allowed to cultivate only 0.5 acre and the water distribution timetable only supplied this area. Many farmers who cultivated larger areas than this had to lose their crops and new farmers who rented plots were notified of the existing regulation prior to farming. In general, the villagers have been very successful in managing water by following these regulations.

Regarding in-field and canal control water management, the use of raised bunds to create small basins (approximately 100 m^2) was cited as a major means to control water. The problem with this method was the construction of deep bunds that stored too much water, denying downstream users. Farmers acknowledged the need for appropriate bunds to retain the required amount of water while allowing excess water to flow to neighbours. Most smallholder farmers practiced canal cleaning, but problems were noted when upstream users did not cooperate once the canals had been cleaned up to their fields. Furthermore, the introduction of a more extensive network of field canals to supply water without waiting until the upstream farmers had irrigated their fields was agreed to be an improvement on system control of water.

CONCLUSIONS

With respect to participatory processes, Johnson et al (2001) argue that; "There is a need for both workable methodologies and systematic evaluation of the experience with existing methods and

tools". Towards that, we conducted a preliminary appraisal of the game, which had the following attributes: Players benefited from having two days and a highly structured and organised schedule to explore in detail various issues: In a relatively safe and sociable environment, the game demonstrated various dimensions of irrigation, water-based livelihoods and river basin management at the local level: The game elicited many suggestions regarding solutions and revealed to users that they held the key to managing water rather than relying on external agents and solutions (although timely suggestions from attendant technical experts were well received by participants): The workshop enabled support organisations to observe various representations of conflicts and solutions, allowing them to work with rather than against local ideas: The two days provided material for researchers triangulating results derived from other methodologies so that survey, subject and participant biases could be carefully addressed.

Notable disadvantages included not being able to include more than about 35 players, though by allowing local user observers the total exposure might be increased to 50-60. Thus, without replicating the board, or playing more frequently, widespread displays of the game will be limited. There may be problems if the game is played in more sophisticated catchments were pipe networks reticulate water, where groundwater is the major source, or where water quality is an important issue. There will also be limitations if users are brought together from different parts of very large basins since the community-based resolutions that this game attempts to generate are unlikely to be institutionally sustainable given the distances involved.

The game might have application to Mediterranean countries where conflict exists between users in relatively small catchments utilising surface water and where access to water favours upstream abstracters over downstream users largely dictated by gravity flow. Most likely contenders are catchments found in Southern Spain, Greece, parts of Italy, the Balkans and Morocco. The game probably will not find application in larger basins such as the Po, Rhine and Ebro or in dry North Africa or where basins are highly developed in terms of reticulated piped networks. That said, the game had excellent learning outcomes with University students, and could be applied to a wide variety of circumstances as a teaching tool on water.

Although a longer-term evaluation of the game has not been possible due to lack of elapsed time, the authors are optimistic that this workshop design can be taken forward as one conflict-mediation approach in the region. There is interest from key support groups; for example our observer from the District Council hopes to show the game to the newly established Advisory Team on Irrigated Agriculture. In addition, the game will be reviewed as a part of curriculum overhaul for irrigation diplomas, and we believe it can be a part of a Dialogue Initiative with IWMI, WWF and the Ministries of Water and Agriculture (some ministry staff have requested future invitations). Moving on from this 'trial' workshop, we will be inviting representation by other water users in the catchment and from those institutions obliged to assist water users in the area (e.g. Ward leaders, District Council, Zonal Irrigation Office and the River Basin sub-office). These invitees are arguably part of the structures and factors that foster long-term sustainability of the agreements made by farmers, although the lack of external support was explored by the farmers ("its up to us", as one said).

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REFERENCES

Baur P., Mandeville N., Lankford B. and Boake R. 2000. Upstream/downstream competition for water in the Usangu Basin, Tanzania., British Hydrological Symposium, Seventh National Hydrology Symposium. BHS National Hydrology Symposium Series, University of Newcastle.

Bloor M. 2001. Focus groups in social research. London: Sage.

Chave P. 2001. The EU Water Framework Directive: An Introduction. IWA Publishing, London.

Collentine D., Forsman A., Galaz V., Bastviken SK. and Stahl-Delbanco A. 2002. CATCH: decision support for stakeholders in catchment areas. Water Policy, 4(5): 447-463.

DFID. 1998. Sustainable Management of the Usangu Wetland and its Catchment (SMUWC); for the River Basin Management and Smallholder Irrigation Improvement Project (RBMSIIP) and Ministry of Water, Government of Tanzania, Department for International Development, London.

Forester J. 1999. The deliberative practitioner: Encouraging participatory planning processes. Cambridge, MA: MIT Press.

Franks T. and Lankford B. 2002. Managing Water in the Usangu Basin, Tanzania. Paper for Question 51.1 Montreal ICID Congress, Montreal, Canada, 2002.

Johnson N., Ravnborg HM., Westermann O., Probst K. 2001. User participation in watershed management and research. Water Policy 3: 507–520

Lankford BA. and van Koppen B. 2002. Critical analysis of River basin management in the Great Ruaha, Tanzania. GWP No. 121. Global Water Partnership Toolbox.

Lankford BA. and Franks T. 2000. The Sustainable Coexistence of Wetlands and Rice Irrigation: A Case Study From Tanzania. Journal of Environment & Development, 9(2): 119-137.

Lankford BA. and Gillingham P. 2001. The Impacts of Irrigation Improvement Programmes, Proceedings of the 1st National Irrigation Conference, Morogoro, Tanzania, 20th to 22nd March, 2001. Funded by DANIDA/JICA. Department of Irrigation, Ministry of Agriculture, Dar es Salaam, Tanzania.

Mikkelsen B. 1995. Methods for Development Work and Research: A Guide for Practitioners, Sage Publications, London.

Nichols P. 1991. Social Survey Methods. A fieldguide for Development Workers. Development Guidelines No. 6. Oxfam Publications, Oxford.

Pratt B. and Loizos P. 1992. Choosing Research Methods. Oxfam Publications, Oxford.

Water Policy. 2001. Editorial: Working with people for watershed management. Water Policy 3: 449-455

WWF. 2001. Elements of good practice in integrated river basin management: A practical resource for implementing the EU Water Framework Directive. Brussels: World Wide Fund for Nature, Geneva.

Table 1. Demonstrating real water sharing situations by playing the river basin game

What is being shown	How	What happens
Simple introduction scenarios		
No intakes	No rods are sticking into the river	Water goes down to the bottom
Few intakes	One or two sticks are installed (can be modern or traditional)	Some water is captured by rice systems, much water flows to the wetland
Many intakes	All sticks are put in	All water is captured, little water (few marbles) end up in the downstream wetland
Dry year or dry season	Few marbles are used	Water tends to be used in upstream plots, with little water going downstream
Wet year or wet season	Many marbles are used	Water meets everyone's needs
Change of traditional to improved modern intakes	Change in design from small sticks that partially stick into river to large sticks that block whole river	More water is captured by modern intakes – less water flows downstream and inequity increases.
Individual person and individual intake strategies		
Upstream/downstream inequity of supply	Using modern intakes	More water into top intakes
Livelihood searches	Farmers move upstream	Farmers rent land higher up or take jobs where water is or move out and do other jobs
Excess water use	Too many marbles per plot	Each plot has more marbles than holes for the marbles showing that upstream farmers tend to take more water than they need
Insufficient water	Too few marbles per plot, or no marbles per plot	Farmers are left with no water, out-migrate, walk further for domestic water, etc.
Community person and whole-river sharing strategies		
Agreeing sharing of water between intakes	Adjust intakes to let water through to downstream intakes	Water is shared amongst the different intakes, and so each farm gets some water
Agreeing sharing of water between fields	Share out marbles so that each plot gets correct number	One marble per hole – and equal between plots so that each plot might be minus one marble

Box 1. Schedule for day 1, phase 1: Introduction and initial demonstration of the game

0-20 mins – Introduction, explained above.

20- 25 mins - Explanation and demonstration of flow of marbles down the river in four situations; without any intakes, with many intakes, high flow (wet year) and low flow (dry year). Each demonstration is a 'round'. Collect all marbles at the end of each round so that the game starts anew and the results of the previous round do not confuse the next.

25-30 mins - Divide participants into groups and play of a simple scenario using sticks that represent traditional intakes (i.e. those that let water pass by).

30-35 mins - Second play using a change of intakes upstream to modern intakes, these are larger sticks that capture all or most of the marbles.

35-45 mins - Discussion. Who is happy? Who got water? Who is short of water? Why? Who took lots of water, perhaps too much for their needs? Allow this discussion to be relatively unstructured and free-flowing, but listen to what is being said. When something interesting is said, tell the others so that all can know of the point.

45 - 55 mins - Recap. Summary of what happened. Ratio of land to water – the fact that there is more land than water. Variability in rainfall and riverflow (wet years and dry years, wet and dry seasons). The desire for rice and water. The growth of irrigation over last 20 years. The difficulties of supplying the downstream wetland.

Box 2. Schedule for day 1, phase 2: Individual action and coping surrounding water shortages

0-10 mins - Introduction to this phase and objective: That each individual seeks a solution to their water shortage. This means the game seeks no or very little community action and demonstrates that individuals can sometimes acquire more water than they need leading to lower efficiency of water use. What needs to happen? What do people do?

10-15 mins - Participants think about their options prior to the release of the new season's flow of marbles. Asking the question – "how can I get water?"

20-35 mins - Various rounds are played so that farmers can situate themselves most advantageously to get water, and think about solutions that meet their individual needs.

35-45 mins - In the second part, fake money was handed out so that participants could rent or buy plots, hire labour, etc. This worked very well. But it can also work with no money. Now farmers ask the question – "how can I get an income?"

45-60 mins - Recap. Summary of individual actions taken to secure a livelihood. Livelihood lessons in water management. Ask the farmers if they see some of the same things happening along their river. Allow discussion.

Box 3. Schedule for day 1, phase 3: Collective action and community decision-making

0-20 mins – Introduction: that individuals should attempt to work collectively to share water and reduce tension and disputes.

10-20 mins - Players collectively discuss their options prior to the release of the new season's flow of marbles. This means that all the farmers around the table discuss a group solution to the division of water. What should they aim for?

20-35 - Various rounds are played so that communities are able to optimise allocation of water between different irrigation systems and users and therefore allocate water over the whole catchment. Each round is used to fine-tune the allocation of water so that it is fairly shared out in accordance with needs.

35-50 mins - Recap of what happened. The collective or group approach compared to the individual approach.

Box 4. Schedule for day 1, phase 4, final session: Group discussion

0-5 mins. Introduction to final session. Objective: that farmers must discuss lessons learnt, how they will apply any lessons, whether and why this has been useful, what assistance do they require. The farmer groups should appoint someone, a secretary, to report on their discussions.

5-35 mins – Water users break out groups. Suggest about three groups in total. Grouped participants then discuss the game; lessons learnt, needs, institutional support required. Secretaries make notes.

35-55 mins - Reporting back by group secretaries.

55-75 mins - Conclusion and discussion. Ensure that a list is made of main points, lessons learnt, solutions that seem appropriate. Introduction to evening and social events, including if possible videos on water management.

Box 5. Schedule for day 2: exploring technical and institutional agreements

Session 1 [15 mins] is to summarise the previous day, outcomes and intentions, and then to introduce this day. The aim being to bring all users together to discuss what means can be agreed to share water whilst maintaining productivity – e.g. crop choice, planting schedules, bye-laws, institutional arrangements, etc.

Session 2 [1-2 hours] is to allow participants to completely brainstorm all the different methods they think work to maintain income while saving water. What have they seen while growing rice? What practices save water but do not harm rice growing? Remember, the farmers already know what is required to save water, and to share water more equitably between them and other users. During this session outside experts should add to the suggestions that then need to be discussed in relation to local ideas.

Session 3 [30-45 mins] is to prioritise these methods by a system of voting or ranking. One method includes giving each participant five votes for their preferred option. The most popular solutions gain the highest number of votes.

Session 4 [30 mins] is to summarise and analyse the results of the voting and to validate this list back to them, giving them the option to change it again. What were the final technical options listed in order of importance?

Session 5 [1-3 hours] is to discuss the institutional arrangements to implement the technical solutions. Here the objective is for them to identify helpful and hindering institutions. In other words, what institutions do they turn to (or should turn to) to assist them in water saving and sharing, and what institutions do not help them (and that also they either ignore or disagree with). Here consider establishing new institutions if necessary e.g. a sub-catchment management committee. By asking observers from other institutions (e.g. RBWO, Mbarali District), try to get all parties to work together in more effective ways. Thus, were all institutional observers represented? What other institutions need to be involved? Were all the institutional ways and bye-laws listed and discussed that could be possibly done? What do the formal institutions need to do? How can we increase exposure to other farmers? Were all the users represented? Are there more influential people in your village/subcatchment that should come?

Session 6 [0.5-1.5 hours] is set aside for final evaluation from the farmers: Was the game too long, too short? Can the farmers propose how the two-day programme might be improved? How might

the wooden board game itself be improved? What would the farmers like to see? Were the instructions clear? Did the farmers need preparation before coming to the day? During this period a video of the discussions can be played back to the participants. It is also possible for the main facilitator to self-reflect: Did anything unexpected occur and did this mean anything? Did everyone get a chance to speak? Is there anything immediate that the facilitator needs to see to or to follow up on? What longer-term monitoring and support is required here?

Figure 1. Detail of the top part of the river basin game, showing main channel, abstraction points, intake design, farms and fields, marbles used to depict water and holes in fields to depict irrigation need.

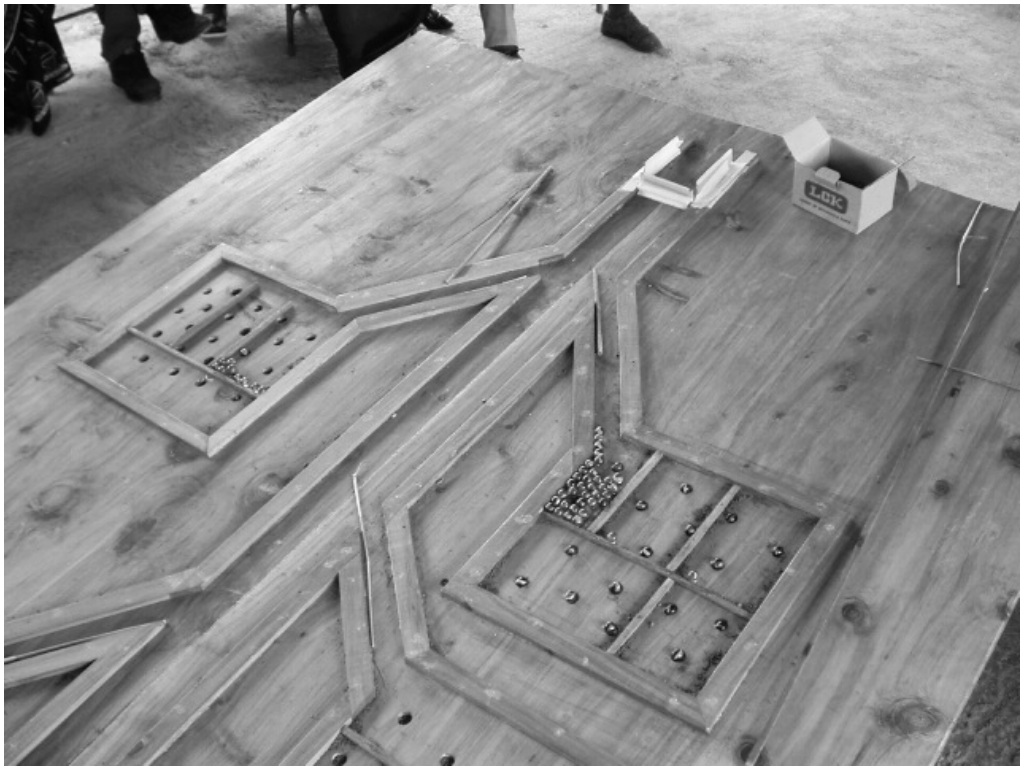

Figure 2. Day 1. Participants playing the river basin game by choosing water abstraction strategies

Figure 3. Day 1. Participants contemplate current inequitable division of water

Figure 4. Day 2. Participants discussing new resolutions to manage and share water