MAPPING USES AND COMPETITION FOR SHARED WATER RESOURCES: CONFLICTS AND VALUES IN MKOJI SUB-CATCHMENT, TANZANIA

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Abstract

Conflicts over water are a common feature in closing basins and the difficulties in resolving them provide a serious barrier for the formulation of an effective IWRM strategy. Understanding the specifics of a conflict, including its dynamics and its evolution, provides an essential basis for subsequent efforts towards conflict resolution. Since conflicts are driven by interests and values of stakeholders, insight into the values underlying conflicts may further help the identification of promising ways to resolve them. Especially the latter is of crucial importance, as the identification of effective solutions to conflicts still remains more of an art than a craft. This paper discusses the use of two analytic frameworks that support a better understanding of local conflicts over water: conflict analysis and value-focused thinking. It illustrates the use of these frameworks to analyse local water conflicts in a closed sub-catchment in Tanzania. It shows how these frameworks support the identification of solutions that can help local stakeholders to “create value” in closing basins. On the basis of this illustrative analysis, the paper argues that these two frameworks deserve a wider use in the field of local water management.

Introduction

Existing policy documents on water resources management often point out the crucial importance of water to sustain life and development in their introduction (e.g. SIWI, 2000; WWAP, 2003). The true meaning of those words is reflected in the harsh realities that face water users in drought prone regions throughout the world. In those regions that suffer from occasional or chronic water scarcity, the distribution and use of scarce water resources requires hard choices and as a result, conflicts between water users easily erupt.

Within today’s paradigm of integrated water resources management (IWRM), the management of water resources is seen as a process that aims at coordinated development and management of water and other natural resources (GWP, 2000). In closed basins, in which there are no utilizable outflows in the dry season (Molden, 1997, p.6), conflicts over water are likely to be part of this process. The sustainable implementation of IWRM principles therefore is only possible if the involved stakeholders find a way to resolve their conflicts. Sustainable water resources management requires stakeholders to jointly manage their water resources, rather than fight over them.

Unfortunately, resolving conflicts in closed or closing basins is not an easy task. All utilizable water is committed to present uses and making water available for additional

uses requires a transfer of water or an increase in productivity (Molden *et al.*, 2001). Furthermore, on the local level the constraints posed by higher level institutions and external events further confine the room to find negotiated agreements.

The pervasiveness of conflicts over water in closing basins and the difficulties in resolving them, make a proper understanding of conflicts a prerequisite to the formulation of an effective IWRM strategy. Understanding the specifics of a conflict, including its dynamics and its evolution, provides an essential basis for subsequent efforts towards conflict resolution. Since conflicts are driven by interests and values of stakeholders, insight into the values underlying conflicts may further help the understanding of conflicts and the identification of promising ways out. Especially the latter is of crucial importance, as jointly constructed “win-win” solutions are often heralded as ideal in conflict resolution, but their identification still remains more of an art than a craft (cf. GWP, 2001).

This paper discusses the use of two analytic frameworks that support a better understanding of local conflicts over water: conflict analysis (Fraser & Hipel, 1984) and value-focused thinking (Keeney, 1992). It illustrates the use of these frameworks and shows how they support a better understanding of local conflicts, using a case of a closed water basin in the United Republic of Tanzania. Furthermore, it shows how these frameworks support the identification of promising solutions beyond the traditional solutions in water management that either imply “transferring water” or “increasing water productivity” (cf. Molden *et al.*, 2001). Although the discussed analytic frameworks have been used in the policy analysis community for quite some time, they have so far received scant attention in the IWRM community. This paper aims to illustrate that these frameworks deserve a wider use in the field of local water management.

ANALYTICAL FRAMEWORKS TO AID UNDERSTANDING AND RESOLUTION OF CONFLICTS

Understanding conflict

When confronted with water conflicts, a proper understanding of the conflict and its history is thought to be essential before addressing them. Generally, frameworks for conflict analysis are built around a core that addresses the key-issues over which conflict arises, the parties involved in a conflict, their main interests or objectives and the resources or means available to them to control issues and to influence the course and outcomes of the conflict (e.g. Fraser & Hipel, 1984; Fang *et al.*, 1992; Howard, 1989; Timmermans & Beroggi, 2000; Obeidi *et al.*, 2002).

Depending on the specific interests of the analysts, other aspects might also be covered, such as the perceptions of the parties in the conflict (Bennett *et al.*, 1989), the arguments used in conflicts (Horita, 2000; Hermans, 2003), the coalition building (Kilgour *et al.*, 1996) or the conflict management and resolution strategies employed by the parties involved (Castro & Nielsen, 2003).

In this paper we will limit ourselves to the core-framework for conflict analysis, which is usually referred to plainly as conflict analysis (Fraser & Hipel, 1984 Fang *et al.*, 1992; Howard, 1989; Obeidi *et al.*, 2002). This framework concentrates on the *issues* over which conflicts arise, the *parties* involved (usually called “actors” in conflict analysis terminology), the specific *options* they have to influence the course of the conflict, and their *preferences* for these options and the possible outcomes of a conflict (Fraser & Hipel, 1984; Hermans, 2003). Although this core framework can be used to construct specific models for detailed and in-depth analysis of conflicts, we will illustrate how just “framing” a conflict in terms of the framework’s basic concepts can help to improve the understanding of water conflicts on the local level.

...and moving towards conflict resolution

The conflict analysis framework helps to build understanding of a conflict, but by itself, does not promote the identification of creative ways out of the conflict. To resolve conflicts, a good understanding of *interests and values* of parties in the conflict is likely to help the resolution of existing or foreseen conflicts. Although values are incorporated in conflict analysis frameworks through the interests and preferences of the involved stakeholders, the focus is much more on options than on underlying values. However, a key to effective negotiation is "creating value" (Sebenius, 1992), which suggests that the underlying values of stakeholders merit a more detailed analysis.

Focusing on stakeholders' values can help in supporting conflict resolution, by suggesting directions for new alternatives (cf. Keeney, 1992; Gregory & Keeney, 1994). Therefore, a value-focused thinking (Keeney, 1992) approach is used to derive the stakeholders' perspectives on the underlying values of water. This offers a further understanding of the conflict, but, more importantly, also stimulates the identification of possible directions out of it (cf. McDaniels & Trousdale, 1999; Gregory *et al.*, 2001)[1]. This framework puts stakeholders and their fundamental objectives and values central and analyses them before addressing the more specific measures and alternatives available to stakeholders. A structured and detailed analysis can be done based on this framework, using it as a basis to quantify values into objective functions (Keeney, 1994). However, here we will limit the analysis to the mere way of thinking, illustrating how even employing the general perspective can help to identify new ways out of a conflict.

INTRODUCTION TO THE CASE STUDY: SHARING WATER RESOURCES IN THE MKOJI SUB-CATCHMENT, TANZANIA

The uses of the analytic frameworks for conflict analysis and value focused thinking are illustrated by applying them to analyse local water conflicts in the Mkoji sub-catchment (MSC) in southwest Tanzania. This case study is based on material collected as part of a larger project for which several activities have been undertaken, including an extensive household survey, comprehensive analysis of available monitoring data, focus group discussion and a participatory planning workshop (FAO, forthcoming)

The Mkoji sub-catchment is a rural area with a relatively low population density of about 146,000 people on an area of about 3400 km^2. It is one of the uppermost sub-catchments of the Rufiji river basin (see Figure 1). Water scarcity in this area has resulted in shrinkage of the Usangu wetlands, drying up of the Great Ruaha river[2] in the Ruaha National Park, and problems with power generation at two main hydropower stations (Mtera and Kidatu). Downstream water users are furthermore experiencing drinking water shortages during the dry season, deficits of water and pasture for livestock, less areas for fish breeding and less areas suitable for wildlife, while tourism in the Ruaha National Park also is affected by the drying up of the Great Ruaha River. As a result, there is an increasing pressure on the upper sub-catchments of the Rufiji river basin to release more water to meet water needs downstream.

[1] Note that this implies a broad interpretation of the values of water, beyond a mere economic valuation or a financial cost-benefit analysis of predefined alternatives

[2] The Mkoji sub-catchment drains into the Great Ruaha river, which in turn is part of the larger Rufiji river basin.

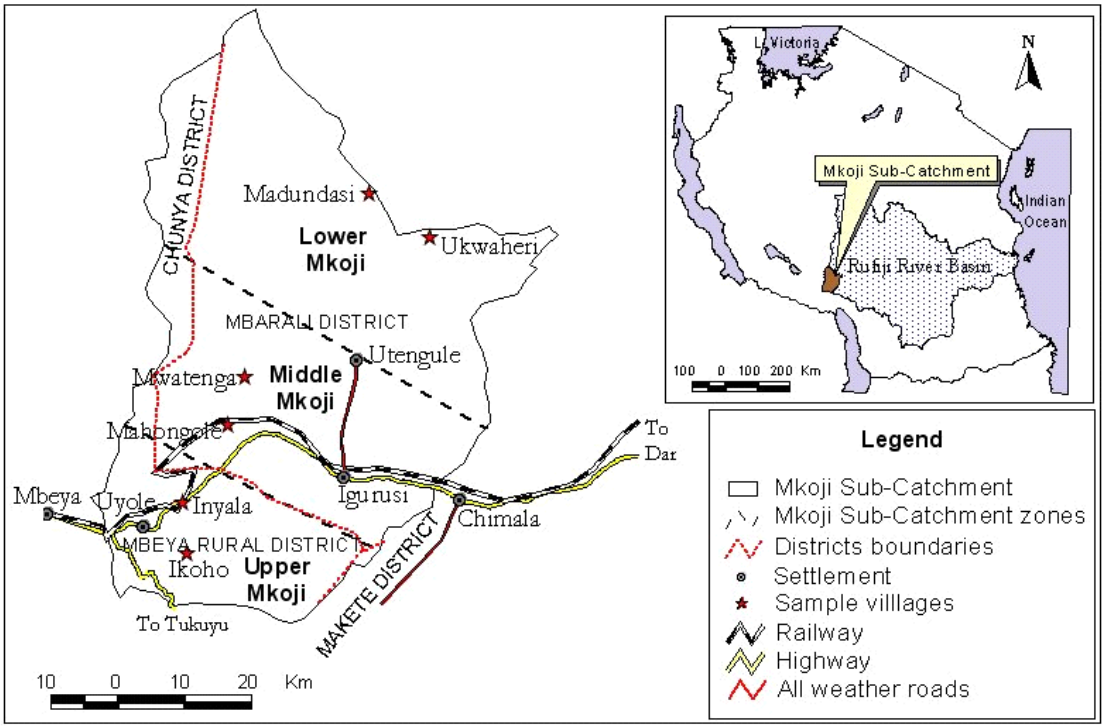

Figure 1 Location map of the Mkoji sub-catchment in Tanzania

The Mkoji sub-catchment (MSC) is one of those upper sub-catchments in the Rufiji river basin. However, the Mkoji sub-catchment is a closing sub-catchment that also suffers increasing water shortages. During the dry season, all the rivers dry up a few kilometres downstream of the highway that runs through the sub-catchment, which leaves the lower part of the sub-catchment without water. In fact, the communities in the lower parts of the MSC are experiencing similar problems to those further downstream: shortages in domestic water supply, lack of water and pasture for livestock, reduced breeding grounds for fish and shrinking wetlands.

Within the MSC, three different agro-ecological zones can be roughly distinguished, which all have different climatic conditions and differ in the availability of land and water resources:

- The Upper Zone, which mainly falls within the Mbeya Rural District and which is characterized by a mountainous landscape and a semi-humid to humid climate that allows year round cultivation of crops.
- The Middle Zone, which has a less favourable climate, but where the land and water resources enable rice cultivation and irrigation in parts of this zone.
- The Lower Zone, which covers the plains that extend into the downstream sub-catchments and which has a semi-arid climate and a low population density. This zone is inhabited by pastoralists who raise their cattle in the plains of the Lower Mkoji and the neighbouring areas. During the dry season, surface water streams do not reach this zone.

Competition for water concentrates in the Middle and Lower Zones, as this is the area where water flows run dry during the dry season. Here, competition for water is fierce and easily escalates into conflicts. Two types of conflicts that are frequently occurring in this area are discussed in more detail in this paper.

- Upstream/downstream conflicts within a water using community: within the MSC there are important conflicts within the irrigation schemes that are used for rice cultivation in the Middle Zone;
- Conflicts between water using sectors: another important conflict in the MSC is that between livestock keepers and agricultural irrigators. This is a multiple use conflict with an upstream/downstream dimension within the sub-catchment.

In addition to those conflicts, other conflicts are occurring as well in the MSC. However, to allow for a good illustration of the two analytic frameworks, this paper is limited to the above two types of conflicts, which can be quite commonly found in other closing catchments as well.

LOCAL CONFLICTS OVER WATER IN THE MSC

Understanding the conflict over irrigation water for rice

Background, evolution and dynamics

In the Middle Zone, paddy cultivation is the main source of income for the average households (see Figure 2). An important water requirement for paddy cultivation occurs early in the growing season, for the establishment of nursery fields and the subsequent transplanting of paddy. Most farmers attempt to transplant their paddy early in the season, because this will enable them to take advantage of seasonal dynamics in market prices, where rice that is marketed early in the season fetches a higher price.

Following the dynamics of the rice markets, the competition for water among paddy farmers reaches its annual peak at the onset of the wet season. Every year, during the start of the wet season, there is a fierce struggle among farmers to obtain water for early transplanting, even more so in years when the onset of the wet season is delayed. This may result in conflicts, whereby competing farmers destroy water canals and intakes to allow water to flow to their own fields. These conflicts may even erupt in armed fights and sometimes result in court cases, as shown by examples before the Igurusi Primary Court (Maganga *et al.*, 2003).

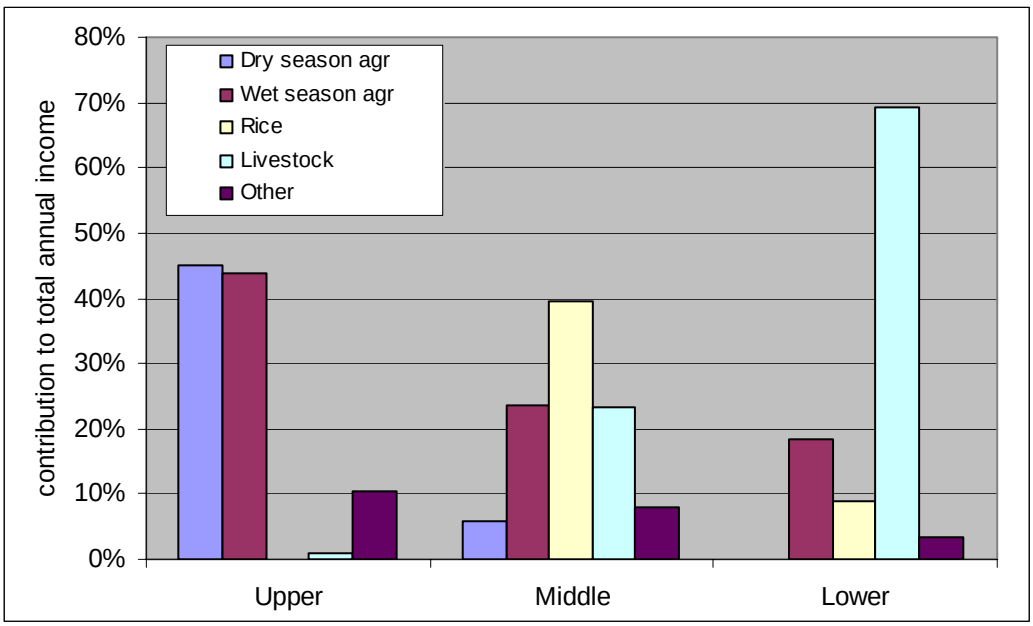

Figure 2 Sources of income for households in the three zones of the MSC

The conflicts seem to have worsened over the past years, probably due to the increase in irrigation activities in the Upper and Middle Zones. In both zones, there has been a trend to modernize irrigation infrastructures and to increase the capacity to abstract stream flows for irrigation. This has resulted in the construction of modern (concrete) intake and diversion structures, realignment of main and secondary canals, together with the establishment of operation and maintenance committees and new guidelines for water scheduling between farmers. Irrigation improvement projects have benefited some of the villages in the Middle Zone, but generally the modernization activities appear to be more widespread in the Upper Zone villages. As a consequence, upstream abstraction capacities have increased, leaving less water available for irrigators in the Middle Zones. Whereas the irrigation schemes in the Upper Zone have water flowing in almost all intakes, rotation in the Middle Zone involves inter-intake allocation.

Issues, parties and options

Using the conflict analysis framework, the conflict can be summarized in terms of issues over which conflict arises, the parties involved, their options and their preferences for certain options and outcomes. The issue can be identified as the access to irrigation water within the Middle Zone irrigation schemes. The irrigating paddy farmers are the main parties involved, and they all prefer to have sufficient irrigation water for their paddy, as early in the season as possible. One can further distinguish top-end and tail-end irrigators within the schemes, as well as farmers that have joined the irrigation associations and those that have not.

One of the obvious options that are available to the irrigators is to jointly establish and enforce the water rotation schedules. However, this would only help to resolve conflicts *within* the irrigation schemes but would not help much to confront the general trend of decreasing water availability in the Middle Zone. Therefore, it is likely to result in winners and losers, dividing the shares of an ever decreasing cake and leaving some farmers with less water than in the current situation. Also, enforcement is already problematic, as illustrated by the fact that many of the control gates within the improved irrigation systems were removed or damaged (Lankford, 2004).

Other options would be to improve water use efficiency, using for instance irrigation improvement programmes, improved crop varieties or other water saving measures. However, although there is ample room to increase water use efficiency, this has proven problematic in the past. Irrigation improvement programmes are generally expensive and often require external funding sources. The irrigation improvement projects that have been undertaken in the past in several villages within the MSC, have not always had very positive results. They mainly benefited the upstream communities, at the first improved intake in a river, at the expense of downstream communities (Lankford, 2004). Moreover, improvement projects often reduced the incentives for joint maintenance of the irrigation schemes by farmers, in this way contributing to an even less co-operative climate (Lankford, 2004). As for the other options: seeds for improved crop varieties are expensive and involve recurring expenses for seed purchases, whereas improved on-field water management practices often require training, initial investments and a transition period. This quickly puts these options out of reach for the average farmer.

In the end, the easiest option for the *top-end* irrigators is just to take the water they need, leaving downstream irrigators deprived of water. Unsurprisingly, this is exactly what is happening in the MSC.

Understanding the conflict over water for livestock versus irrigation

Background and evolution of the conflict

Rice is the main source of income for the farmers in the Middle Zone, while livestock is the main source of income for the average household in the Lower Zone (see Figure 2 above). During the wet season livestock keepers graze their herds in the Lower Zone of the Mkoji, while in the dry season they migrate their livestock herds to other seasonal grazing lands, as the Lower Zone does not provide enough pasture to sustain their herds during the dry season. Normally, 75% of the cattle in the Mkoji sub-catchment is herded outside the MSC during the dry season (FAO, forthcoming).

Traditionally, livestock keepers have been grazing their herds on the pastures around the Ihefu perennial swamp in the neighbouring Usangu Plains. However, the government of Tanzania recently decided to gazette a considerable portion of this area as a game reserve (the Usangu Game Reserve), which means that livestock keepers are no longer allowed to take their animals into the reserve for grazing. Although the decision was announced already in 1998, the restricted access to the grazing grounds around the Ihefu perennial swamp was only recently enforced by the District government officials.

Of course, this loss of access to grazing lands forced livestock keepers to find other suitable lands for their livestock during the dry season, which resulted in a move towards the irrigated areas in the Middle Zone. However, in these areas the livestock keepers easily get into conflict with the irrigating farmers, for instance when their cattle damages irrigation intakes and canals or when their cattle grazes irrigated fields.

Issues, parties and options

The issue in this conflict is access to water to sustain dry season livelihoods, competing over land and water for livestock versus irrigation. The main parties are the livestock keepers and the irrigators, who both prefer to use as much water as they can access from the scarce dry season water resources.

This leaves livestock keepers with two basic options: migrate their cattle illegally to the Game Reserve, or migrate their cattle to other grounds. Migrating their livestock illegally to the Usangu Game Reserve drives livestock keepers into conflict with the Game Reserve officials, which means that livestock keepers risk a fine as well as being chased away. Migrating their livestock to the Middle Zone fields drives the livestock keepers into conflict with the Middle Zone farmers, who do not have many options other than to protect their property. The result here is escalation of the conflict or in some cases formal settlement of conflicts through village leaders and courts. It is easy to understand that this situation satisfies no-one, as imposing fines and court settlements do not offer very structural solutions, not in the least for the livestock keepers.

A more drastic option for livestock keepers would be to move to away from livestock keeping towards other livelihood activities. Loss of natural grazing grounds pushes them towards intensification and expansion of their cropping activities, while diminishing floods allow for the reclamation of flood plains into agricultural land. The use of draught animal power enables the farmers in the Lower Zone to cultivate larger areas on heavy clay soils and as a result a shift towards rainfed agriculture can be observed. However, this shift is only taking place to a limited degree. Most livestock keepers prefer to hold on to their livestock herds as their traditional source of income and furthermore, rainfed agriculture is limited to those places where conditions allow for it. The potential of rainfed agriculture to provide a sustainable livelihood for all Lower Zone households remains unknown.

Summary: an impasse in local water conflicts

The descriptions of both conflicts paint a picture of conflicts between different parties that are to an important extent driven by external forces, such as increased irrigation activities in the Upper Zone and the closing off of grazing lands in the Usangu plains. The local stakeholders so far have mainly been responding to these external forces and that they have been doing so with a rather limited scope, looking for options in their immediate environment.

The result in both examples is an impasse in the conflict, where paddy farmers argue among each other for the irrigation water that reaches their irrigation schemes, while livestock keepers look for the nearest place to graze their livestock, entering into conflict with irrigators and government officials. This leaves all the involved parties dissatisfied, but none of them can improve its position without the help of some others. Therefore, the local stakeholders can hope for a positive external intervention from national or international organizations, although the past does not hold too much promise here, or they can try to negotiate local solutions among themselves by starting up a local dialogue.

Although the process of a local dialogue seems the more promising way to go, - with or without external support and facilitation - even this local dialogue does not offer an obvious way out. A dialogue needs perspective; otherwise the Mkoji sub-catchment would not be the first place where dialogue ends in deadlock.

VALUES INVOLVED IN THE WATER CONFLICTS

When framing the conflicts in terms of access to water, both conflicts seem stuck. So let us turn now to the values that underlie these conflicts. When looking at values, identifying *why* water is valued so highly by the local stakeholders, there might be some more possibilities to identify ways out of the conflicts and to provide a perspective for local dialogues.

The value of water for rice

In the above description of the yearly returning conflicts over water for rice it has already been mentioned that the fluctuations in market prices are an important driving force in the conflicts. Therefore, the underlying value is the same for all parties in the conflict: it is not over water per se, but over securing a good income: it is not over obtaining cubic meters of water but over obtaining Tanzanian Shillings.

One can easily see the reason to fight over water from looking at rice prices during the season: Market prices of rice vary considerably during the season, with prices that are higher early and late in the season. As said, especially early rice fetches a good price at the market. When marketing rice at the regular time, when the bulk of paddy reaches the market, a household with an average rice production can earn an income of US$ 107 for its harvest, whereas it can earn as much as US$ 309 if the harvest can be marketed early. Although the actual difference in income will be a bit smaller due to reduced yields for early rice, the difference will still be considerable, taking into account that average household incomes in the Middle Zone are around US$ 300 per year (Kadigi *et al.*, 2003; FAO, forthcoming).

Realizing the importance of the price dynamics in the local markets also means realizing that these price dynamics are related to scarcity – as basic market economics teaches us that scarcity of goods drives prices in the market. Most probably, the scarcity of rice on the local markets is due to the scarcity of water to produce this rice. The result is a cycle in which the scarcity of water drives up the price of rice, which in turn reinforces the demand

for water as more farmers want to take advantage of high market prices, which then in turn aggravates the conflicts over water.

So far, the quest for solutions to the conflicts of the paddy farmers has focused on *water*: improving water use efficiency or changing de-facto water allocations by enforcing rotations. Even though there is ample room for water savings and re-allocation of this saved water, past experiences show that this is difficult and partially likely to increase tensions because water savings may only benefit upstream farmers, while re-allocations will result in “winners” and “losers”.

Focusing on underlying values opens the way for other alternatives to enter the debate, focusing not on water, but on income generation. Then a promising way out of this vicious cycle of conflict seems to be the establishment of a joint management and marketing system to address the marketing of rice. So far, farmers have not been able to mobilize themselves for collective and coordinated marketing of their produce (FAO, forthcoming), but doing so would enable them to set up a more fair mechanism to share the benefits of early rice. Furthermore, it would allow them to construct shared storage facilities that would increase their control over the timing of marketing and could increase their bargaining position in negotiations with other market players. In this way, it could *create* value, by increasing the shared income from rice marketing for the Middle Zone farmers.

The value of water for livestock and irrigated agriculture

In the conflict between livestock keepers and irrigators, again income is an important underlying value, but also the use of water to secure basic livelihoods and jobs, regardless of whether the produce is marketed or not. For those farmers that can access irrigation water during the dry season, this water provides them with the ability to raise cash crops in a period when there are no other local livelihood options available to them. For livestock keepers, access to dry season water and grazing grounds for their livestock is crucial simply to sustain their agro-pastoral livelihoods.

Looking at the financial side of the conflict, one can see that livestock keeping is quite profiting in comparison to the cultivation of crops (see Figure 3). This is likely to be due to the large amount of “free” inputs for livestock keeping, in combination with the high market value of cattle. The only direct costs involved in livestock keeping are the costs for medication, transportation and in some cases hiring labour for herding when sufficient family labour is not available. All the other inputs are generally free of charge. In the past there also was a cattle tax that had to be paid, but this was abolished recently (FAO, forthcoming).

The high economic water productivity for livestock keeping opens up some room to exchange “water for income”, i.e. a local taxing system of some sort where livestock keepers gain access to grazing land in the upper parts of the MSC in return for some financial compensation or investments that can be used to start up other activities for the Middle Zone households. Such a system, very much like a “payment for environmental services” scheme or water markets, may enable some of the Lower Zone households to continue livestock keeping, supplementing the transfer to rainfed agriculture that is already ongoing.

Initially this solution may not receive a warm welcome from the side of the livestock keepers, as it means they will have to pay for their water and pasture. However, the livestock keepers that are illegally migrating their herds to the Usangu Game Reserve are already paying for access to dry season land and water, although they are paying fines rather than taxes. In the long run the establishment of a local taxing system or payment scheme seems worthwhile for the livestock keepers, when one takes into account that

such a system may be one of the few options to cope with the serious threats to their very livelihood base. There is a lot at stake for them.

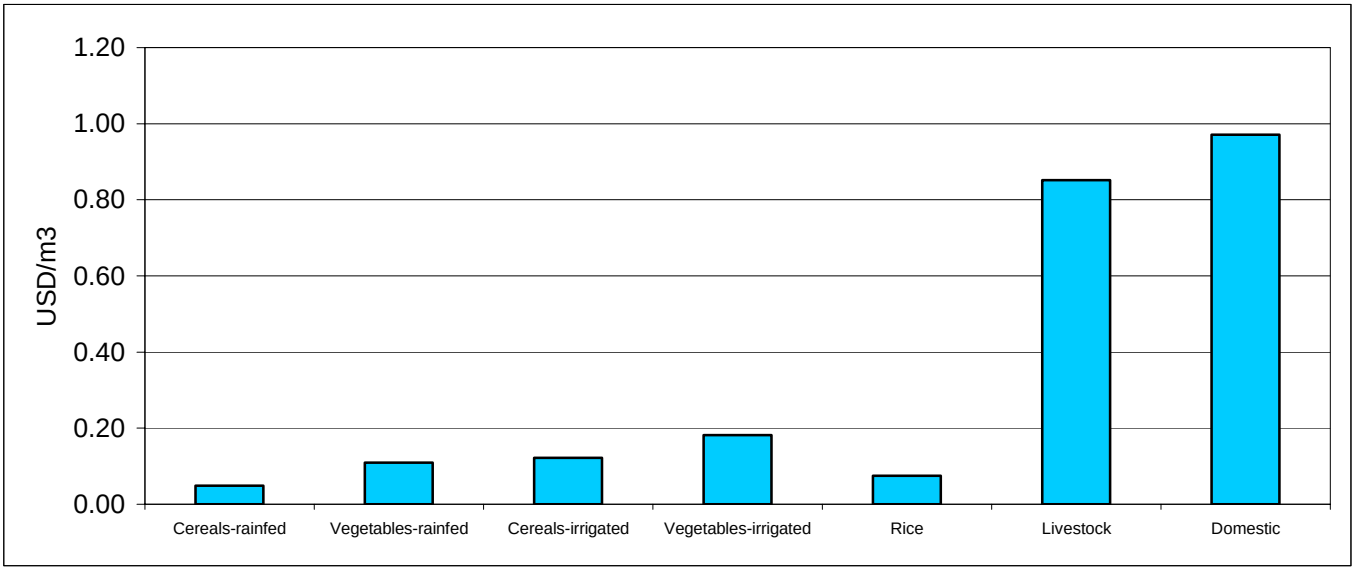

Figure 3 Economic water productivity of different sectors in MSC

Just as in the paddy irrigation conflict, also this "value-focused" option may open the way to creating value. It offers Lower Zone livestock keepers a way to sustain access to dry season grazing lands and at the same time generates a source of income for the Middle Zone irrigators.

The benefits and limitations of focusing on values

Focusing on the values involved in local water conflicts pointed to some new solutions for both conflicts discussed here, in addition to the options identified under a more conventional conflict analysis. Although the solutions offered through this value-focused thinking are neither of a groundbreaking originality nor the definitive answer to all problems, they would be very instrumental in working towards conflict resolution.

The solutions offered through value-focused thinking are a local taxation system for the conflicts over grazing land for cattle and the establishment of farmers' cooperatives for the conflicts over water for rice. Neither is a revolutionary innovation. However, this may be a quality as much as a weakness, as it suggests the feasibility of their practical implementation. Furthermore, although these solutions are not revolutionary, until now they have remained outside the scope of the irrigation and water specialists that have been looking at the water problems in the closing Ruaha river basin. So far, farmers' cooperatives and livestock taxation systems have not been part of the mainstream water debate, which rather focused on irrigation modernization, *Water* User Associations, *water* rights and *water* user fees.

One should also not assume that the solutions offered through value-focused thinking are the complete answer, that they are easy to implement or that they render useless the other options to improve water use efficiency and water allocation. However, the "value-focused thinking" solutions seem promising in the sense that they enable the parties in the conflicts to *create* value, while staying within reach of what can reasonably be expected from the local stakeholders. In this way, they may very well be considered a part of the set of "win-win" solutions that everyone is looking for.

CONCLUSIONS

This paper has described the use of two analytic frameworks, conflict analysis and value-focused thinking, to understand local conflicts over water and to identify ways for their resolution. These frameworks have enabled a description of the evolution and present state of two water conflicts in the Mkoji sub-catchment that are exemplary for water conflicts in various other river basins. Through the application of these analytic frameworks, two promising solutions were identified that might help in moving towards conflict resolution. These solutions are not the complete answers to these conflicts, but they illustrate that there are options outside the traditional water engineering solutions that are within the control of local stakeholders and that can help them to "create value" in closing river basins.

Especially the use of value-focused thinking offers local stakeholders a way to broaden their perspective on water conflicts, opening space for new solutions to enter the debate. This is not a broadening of *scale*, scaling up water problems to the regional, national or international level that is beyond the control of local stakeholders. It is much more a broadening of *scope*, including other areas that may offer room for new trade-offs and even the creation of value, while still remaining within reach for local stakeholders. Even if this does not lead to groundbreaking solutions, it certainly is no small contribution either.

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