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Water conflicts on the Manjirenji-Mkwesine irrigation water supply canal, Masvingo province, Zimbabwe

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The case of the 45 km long Manjirenji-Mkwesine irrigation water supply canal in the south-eastern lowveld of Zimbabwe in Masvingo Province presents risks of conflicts among the different irrigator categories which this study investigated along with the questions on conceptual model, stakeholder participation and institutional arrangements through which the operation of the canal was mediated. Eighty percent of the respondents indicated that they have either witnessed or been involved in water related conflicts ranging from illegal water diversions to non-payment for water use. While several institutional arrangements were involved in conflict resolution, more than 87% of the stakeholders indicated that these were ineffective. A conceptual model on shared irrigation water is proffered drawing from insights on meaningful stakeholder participation, institutional support, treatment of water as an economic good and also as a natural resource. This model can minimize conflicts among stakeholders for the sustainability of the shared Manjirenji-Mkwesine irrigation canal.

Key words: Manjirenji- Mkwesine irrigation water supply canal, water conflicts, conflict management, stakeholder participation, institutional arrangements, sustainable irrigation water service, Zimbabwe.

INTRODUCTION

In tropical countries such as Zimbabwe, rainfall is the single most important climatic factor affecting crop production. Zimbabwe is mainly semi-arid. Access to water, its allocation and use for agriculture are becoming increasingly critical concerns that may have profound consequences on societal stability and welfare. The struggle for access to water resources is regarded as the second most important conflict after land (Matiza, 2000). Land though has dominated the Zimbabwe agrarian politics as the defining issue and has tended to eclipse another equally important element: water (Clever, 1995). Since the major portion of Zimbabwe has a semi-arid climate, water availability is a determining factor in land utilization. Participatory irrigation system provides

suitable arena to study potential conflicts about how the water is shared and distributed.

The case of the Manjirenji-Mkwesine irrigation water supply canal in the south-eastern lowveld of Zimbabwe in Masvingo Province presents risks of conflicts among the different irrigator categories. Irrigation water is conveyed by gravity for over 45 km from the Manjirenji Dam to Mkwesine Estates, a privately owned entity involved in large scale sugar cane cultivation. Mkwesine Estates is jointly owned by Triangle and Hippo Valley Estates who are involved in sugar cane cultivation and crushing. In the early eighties, sugar cane was cultivated on about 8000 hectares of Mkwesine Estates. For boosting up the agriculture in Mkwesine Estates, a canal was constructed long back in 1966 for supplying irrigation water with rights of servitudes to pass through privately owned commercial farm lands and through rural settlements. The situation has changed now with the coming on board of several other stakeholders who were originally excluded.

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Presently, the canal is operated by the Zimbabwe National Water Authority (ZINWA). Stakeholders other than ZINWA and its client Mkwasi Estates include the rural farmers through whose land canal is passing. With the turn of the millennium, government has started a fast track land reform program under which the lands of Estates and surrounding commercial farms were allocated to the farmers based upon two models. The first model (A1) is a resettlement pattern based on the village system in which settlers are individually allocated 6 hectares of arable land and about 12 hectares of communal grazing land; whereas second model (A2) is based on commercial farm settlement pattern in which settlers are individually allocated land holdings ranging from 20 to about 1000 ha. Because of this program, two other water-user groups came into existence and on the other hand Mkwasi Estates was left with only 500 hectares of land. Certainly, the demand for the irrigation water has grown greater than the capacity of the canal potentially creating tension and conflicts among the different stakeholders which this study sought to investigate. The study also sought to understand the participation of the stakeholders and the institutional arrangements through which the operation of the canal is mediated. Besides, how these perceptions have shaped their social relations are also investigated. Concepts on community participation, institutional support, treatment of water as an economic good have potential to minimize tension and conflicts among stakeholders. On the bases of the evidences of the operational realities of Manjirenji-Mkwasi irrigation water supply canal and drawing on these concepts, this study proposes a conceptual model to manage and minimize tension and conflicts among stakeholders sharing a common resource.

This paper proceeds by first discussing our proposed view of a conceptual model to manage and minimize tension and conflicts among stakeholders sharing irrigation water. A brief description of the materials and methods follows. The findings are then discussed and finally conclusions are drawn.

Conceptualizing shared irrigation water service

Our proposed conceptual model for a sustainable shared irrigation water service (Figure 1) combines several critical factors. Firstly, the price of water should be fixed in the range which is affordable to least economic status farmers. Institutional arrangements with stakeholder participation backed by mechanisms of conflict management are vital for the sustainability of the shared irrigation water service. Institutions are the means through which people's needs are articulated. Secondly, the outcome of improved access to irrigation water namely increased farm produce and consequent increased income leads to an improved ability to pay for water pricing and ultimately leading to a sustainable

shared irrigation water service.

MATERIALS AND METHODS

Study area

The study was carried out along the selected sections of the canal that supplies irrigation water from Manjirenji Dam to Mkwasi Estate. The Mkwasi area lies in the south-eastern lowveld of Zimbabwe and is located about 35 km north-east of Chiredzi town and 129 km east of Masvingo town. Mkwasi receives less than 450 mm per annum rainfall through erratic showers, and therefore subject to periodic droughts (Vincent and Thomas, 1962). Hence, shortage of water has always been regarded as the most limiting factor to crop production in this region and the local land-use systems are in accordance to it. It was only after successful experimentation with sugar cane cultivation that the region started to receive attention to exploit this potential. Manjirenji Dam with a capacity of $284.2 \times 10^6 \text{ m}^3$ and yield of $129.48 \times 10^6 \text{ m}^3$ was constructed across Chiredzi River in 1966 by the Sabi Limpopo Authority (SLA) to supply Mkwasi Estate with irrigation water.

Research design

Data collection methods

Qualitative data collection tools were predominantly used. These included semi-structured interviews, key informant interviews, field observations, and focused group-discussions with stakeholders. In addition, quantitative data collection tools were used to assess the impact of communal farmer irrigation using the canal water. A total of three research assistants were engaged. These were residents of the Manjirenji-Mkwasi area who were familiar with the local people and customs. In the presence of these local assistants, stakeholders interacted comfortably and shared their views openly. The data collection exercise for this study was conducted during the period October 2008 to March 2009.

Sampling procedure

The 45 km canal was roughly divided into 5 equal sections. From each section, 6 farmers were selected using the stratified random sampling to include each stakeholder category. A total of thirty (30) farmers from a total of 110 plots were sampled. The three (3) management sections of Mkwasi Estates were included in the sample. Sampling was for the feasibility of the study given the time and cost constraint and also the depth of the inquiry. Table 1 describes the sample size selected among various stakeholder groups.

Data analysis

This research employed the case study method research strategy. Yin (2003) defined the case study as "an empirical enquiry that investigates a contemporary phenomenon within its real-life context, especially when the boundaries between phenomenon and context are not clearly evident". We consciously wanted to cover the contextual conditions of how stakeholder participation and institutional arrangements work to access the Manjirenji-Mkwasi irrigation canal water and minimize tension among stakeholders and in the process benefit from the inherent multiple sources of evidence. The objective was not to make statistical generalization, that is an inference about a population, but analytic generalization

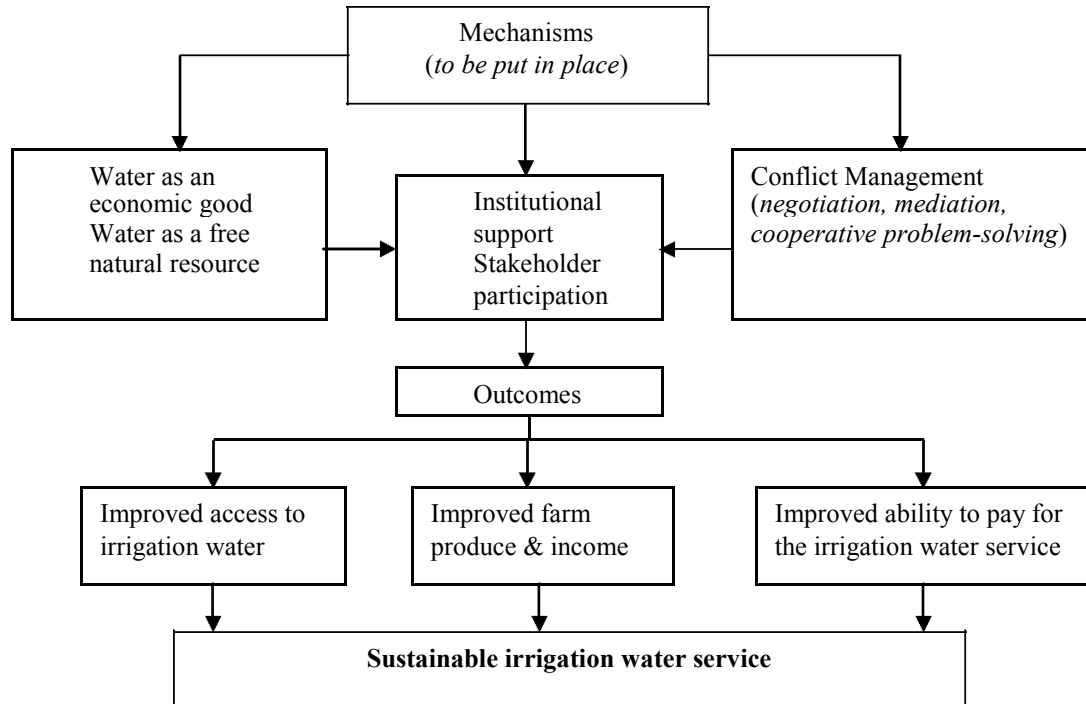


Figure 1. Conceptual model of shared irrigation water service.

Table 1. Stakeholders in the Manjirenji-Mkwesine irrigation water canal and the sample studied, 2008/09.

Sector	Number of farms	Sample size	Percent of total sample size
A1 farmers	66	13	43.3
A2 farmers	44	9	30.0
Smallholder irrigation	9	5	16.7
Mkwesine Estates	1	3	10.0
Total	110	30	100

in which previously developed theory was used as a template with which to compare empirical results of the case study (Yin, 2003). In addition, the impact of the irrigation canal water to maize yield was assessed using maize yield data collected from both irrigating and non-irrigating communal farmers. T-tests for comparison of the two mean maize yields were done at 5% significance level.

RESULTS AND DISCUSSION

Water conflicts on the Manjirenji-Mkwesine irrigation canal

Eighty percent of the respondents have either witnessed or been involved in water related conflicts. Table 2 summarizes the responses of the farmers interviewed concerning the occurrence of water conflicts.

The nature and the source of the conflict were further investigated. Several issues were identified as the

sources of tension concerning the access and use of the irrigation water (Table 2). Conflicts were identified between upstream and downstream farmers; and also between the irrigators and the water authorities. The major sources of conflict were associated with the illegal water diversions, followed by the theft of irrigation equipment. The shortage of the irrigation water and the resultant intense competition for it leading to access denial for certain stakeholder groups were also cited as sources of conflict. Tempering of water control and measuring devices installed on canal is another cause of conflict. Several respondents also mentioned the non-payment for water-related use as a cause of conflict. Table 3 summarizes the sources of conflicts.

Illegal water diversions

The A1 group farmers emerged as the largest

Table 2. Occurrence of water conflicts on the Manjirenji-Mkwesine irrigation canal, 2008/09 (n = 30).

Stakeholder category	Are there any water conflicts? (Percent of total)		Total
	Yes	No	
A1 group farmers	30.0	13.3	43.3
A2 group farmer	23.3	6.7	30.0
Smallholder irrigation	16.7	0.0	16.7
Estate	10.0	0.0	10.0
Total	80%	20%	100%

Table 3. Sources of conflict on the Manjirenji-Mkwesine irrigation water canal, 2008/09 (n = 30).

Source of conflicts	Percent of respondents
Illegal water diversions	23.3
Theft of irrigation equipment	20.0
Rise in water demand outstripping supply	16.7
Denial of access to irrigation water	16.7
Destruction of the canal (tempering with control gates and removal of measuring devices)	13.3
Non-payment of water price	10.0

stakeholder group that either witnessed or have been involved in water-related conflicts (Table 2). Many of them have constructed illegal furrow diversion structures running from the main canal resulting in severe water shortages downstream, which ultimately leads to conflicts with A2 group farmers. Mkwesine Estate and a few other farmers of the adjoining area have an agreement with ZINWA, according to which the authority has prepared timesheet for allocating water to them. In some cases, farmers expecting their allocation would not get it or receive less than their demand due to illegal diversion of water. But, ZINWA is procuring the water price for the total allocation without considering this loss incurred illegally. Such cases have been taken to Water Controllers, who monitored the water deliveries to the various users. The Estate employed water recorders to cross check the water deliveries to the Estate sections.

Theft of irrigation equipment

The influx of new farmers to the canal for irrigated agriculture presented security challenges for irrigation equipment. Key informant interviews were held about the conflicts. The key informants were the Water Controllers, Irrigators Water Recorders, ZINWA and AGRITEX (Agricultural, Technical and Extension Services) officials, and representatives from the Runde Sub-Catchment Council. They all reported a rise in theft of irrigation equipment. The newly resettled farmers particularly the A1 settlers and communal farmers were being blamed for

the lawlessness. Focus group discussions held with the communal and the A1 farmers confirmed the animosity between them and the A2 farmers and Mkwesine Estate.

Rising demand for irrigation water

The Manjirenji- Mkwesine canal has caused an upsurge of micro-irrigation schemes using the illegal water diversions. More farmers from the dry regions moved to the canal leading to a concomitant expansion of irrigated agriculture as well as growing conflicts and competition for water resources. Water recorders claim that water levels in the canal used by the Mkwesine Estate fell dramatically. A counter -claim was that the canal was in urgent need of repairs because a lot of water was lost before it reaches Mkwesine Estate. The new comers to the area were the ones who were denied access to the water and were forced to abstract it illegally.

Yields from both dry land and irrigated maize plots in the communal area were collected to assess the impact of the informal irrigation along the canal. There was a significance difference ($p < 0.05$) between the maize yields from the dry land farmers and that from the irrigating farmers. The dry land farmers interviewed also confirmed that it was beneficial to practice irrigated farming explaining the increasing pressure on the limited water resources. The re-current droughts have tended to force the farmers to illegally abstract the water for a livelihood. Figure 2 shows the least significant differences (lsd) in yield between the dry land and the irrigating

Yields variation with type of farming

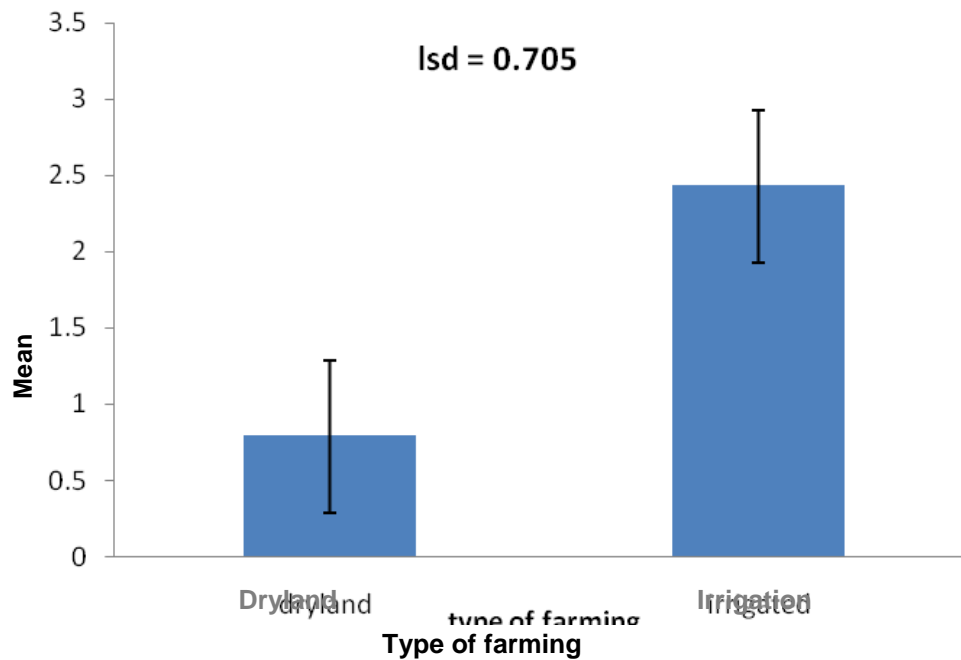


Figure 2. Mean yield (t/ha) of dryland and irrigated farming.

Table 4. Stakeholder payment for the use of the Manjirenji-Mkwesine irrigation water, 2008/09 (n = 24).

Stakeholder category	Are you paying for using water? (Percent of total)		Total
	Yes	No	
A1 group farmers	0	37.5	37.5
A2 group farmer	8.4	20.8	29.2
Smallholder Irrigation	0	20.8	20.8
Estate	12.5	0	12.5
Total	20.8%	79.2%	100%

farmers.

Non-payment for irrigation water

A total of 24 farmers responded to the inquiry on payment for the irrigation water from the canal. The charges included the ZINWA levy, agreement-water charges and the sub-catchment council water permit levied per cubic meter of water used. More than 79% of the respondents were not paying any levy for water as shown in Table 4.

According to the smallholder farmers's opinion, water is a natural resource and it should be freely available. This view of water as a free good was also expressed by many communal farmers across the country during the water sector reform consultations in the late 1990s (Kujinga, 2002; Manzungu, 2003). The A2 groups along

with Estate farmers who are paying their water charges are in the favor to stop water access to the defaulters. ZINWA also faces resistance from such farmers while stopping them to divert water.

Lack of awareness among farmers regarding levies, necessary documents and the Water Act of 1998 (Zimbabwe, 2000a, b) leads to the non payment of dues. Besides, many communal and A1 group farmers mentioned that they would like to pay but do not have the necessary documents to use for making the payments to the water authorities. In addition they were not aware of where and how to apply for the permits and the agreement-waters. Non-occurrence of awareness programs is the basic cause behind it.

About 20% of the farmers interviewed were paying for the irrigation water. One of the A2 group farmers mentioned that he was paying agreement-water charges

to ZINWA to ensure that he receives his allocation. All respondents from the large-scale commercial farmer category and the Estate were paying the water levies. Generally large-scale commercial farmers have a history of paying for irrigation water (Manzungu and van der Zaag, 1996).

Water conflict resolution on the Manjirenji-Mkwesine irrigation canal

Focus group discussions held served to among other things understand the local institutional arrangements available for conflict prevention, management and resolution. Of what particular interest was the effectiveness of these institutional arrangements? Participation of the individual stakeholder categories themselves in conflict prevention, management and resolution was also discussed. Besides, key informant interviews were conducted with farmer representatives from all farmer categories, officials from ZINWA, AGRITEX and the Department of Irrigation (DoI) to triangulate the findings.

Institutional arrangements in conflict resolution

Several institutional arrangements were involved in resolving the water -related conflicts arising along the Manjirenji-Mkwesine water canal. Among them were the government officials from AGRITEX and DoI. Table 5 highlights the institutional arrangements involved in the mediation of water conflicts arising on the canal.

Arbitration by government officials tended to be limited to the communal and the A1 and A2 group farmers, their clientele in agricultural extension services. However, the respondents mentioned that the mediation was not enforceable at law and the disputing parties could disregard the verdicts reached.

The Estate and the other surrounding commercial farmers accessed its water together as a syndicate. The syndicate employed Water Controllers who controlled the flow of agreement water to the individual farmers in the syndicate. The Water Controllers played a pivotal role in conflict resolution. An unhappy farmer can take his case to the Water Controllers who in turn would arrange for a hearing among the affected parties.

Effectiveness of the conflict resolution mechanisms

According to most of the stakeholders (87.5%), the conflict management and resolution mechanisms applied have not been very effective (Table 6).

Both A1 and A2 farmer groups felt that the arbitration of conflicts by government officials remained effective for limited periods only. Bolding (1999) highlighted a similar

problem in the eastern highlands of Zimbabwe along the Nyanyadzi River where Nyanyadzi Irrigation Scheme experienced water shortages. These were due to illegal water diversions by upstream informal irrigators and a solution proved difficult to reach. On the other hand, mediation by Water Controllers in the Estate-commercial farmers syndicate was relatively effective.

Individual stakeholder efforts to resolve water conflicts

Another area of interest was the stakeholders' efforts to resolve disputes on their own without referring them to any institution for arbitration. Of the 21 individual farmers caught up in water conflicts, only three from the large-scale commercial farming category have been involved in trying to resolve these conflicts. Table 7 summarizes the participation of individual stakeholder category members in resolving the water disputes.

The communal and the A1 and A2 farmers never participated in resolving the water disputes on their own, preferring to refer them to the government officials. The large-scale white commercial farmers on the other hand participated in conflict resolution through their Estate-commercial farmers water syndicates. This demonstrates the importance of local organizations in conflict management and resolution. The absence of local stakeholder organizations and the invisibility of the Chiredzi Sub- catchment Council contribute to the limited stakeholders' participation. According to the Water Act of 1998 (Zimbabwe 2000a, b), the sub-catchment council provides the formal arena on which the local farmer's water needs are articulated.

Conceptual analysis of the Manjirenji-Mkwesine irrigation water service

Often it is not the actual shortage of water that may lead to tensions but rather the way in which the matter is governed and administered (OECD, 2005). Whether water is scarce or not, the highly complex and sensitive nature of its availability, use, and allocation requires strong, capable mechanisms and institutions to negotiate and balance competing interests and to manage this vital resource. The existence of such institutions and mechanisms is a critical factor influencing societal stability over water. For example, Manzungu and Machiridza (2005) assert that water management failures may result from a lack of capable institutional structures and an absence of adequate mechanisms for dialogue. Another important proposition is ensuring broad stakeholder participation in dialogue processes on shared resources. In particular, if water is taken out of its natural system, the people affected by these changes need to be compensated for their loss and be involved in the

Table 5. Mediation of the water conflicts on Manjirenji-Mkwasi irrigation water canal, 2008/09 (n = 30).

Stakeholder category	Water conflicts resolved (Percent of total)				Total
	Sub-catchment council	Government officials	Nothing done	Syndicates	
A1 group farmers	0	33.3	4.2	0	37.5
A2 group farmer	0	8.3	20.8	0	29.1
smallholder Irrigation	0	4.2	16.7	0	20.9
Estate	0	0	0	12.5	12.5
Total	0	45.8	37.5	12.5	100

Table 6. Effectiveness of conflict resolution mechanisms on the Manjirenji-Mkwasi irrigation canal, 2008/09 (n = 30).

Stakeholder category	How effective were the conflict resolution mechanisms? (Percent of total)		Total
	Relatively effective	Not effective	
	A1 farmers	0	
A2 farmer	0	29.2	29.2
Smallholder Irrigation	0	20.8	20.8
Estate	12.5	0	12.5
Total	12.5	87.5	100

Table 7. Stakeholder members' participation in water conflict resolution on Manjirenji-Mkwasi irrigation water canal, 2008/09 (n = 21).

Stakeholder category	Participation in water conflict resolution (Percent of total)		Total
	Yes	No	
A1 group farmers	0	37.5	37.5
A2 group farmer	0	29.2	29.2
Smallholder Irrigation	0	20.8	20.8
Estate	12.5	0	12.5
Total	12.5	87.5	100

decision-making process.

Mechanisms to be put in place

Perception on water resources: The increased competition over water has in many places led to water obtaining a monetary value. A particular lobby of farmers thought that water is a God gifted resource and it should be available for free. Worldwide scarcities of water lead the planners to price this essential commodity. The Dublin and Rio conferences also recognized that water has an economic value and should be treated as an economic good. But still the price of this essential commodity is very nominal either due to low economic status of its beneficiaries or due to some political interventions.

Institutional arrangements and stakeholder participation: Institutional arrangements provide the forum through which stakeholder development needs are mediated. Several institutions were mentioned in the case of the Manjirenji-Mkwasi irrigation water. These included state institutions such as DoI and AGRITEX. Also included were ZINWA, Mkwasi Estate-Commercial Farmers Syndicate, the Water Controllers and the Chiredzi Sub-catchment Council. At the same time, a complete stakeholder inventory was supposed to be undertaken so as not to exclude others. Evidence from the case of the Manjirenji-Mkwasi canal suggests that large water conveyance projects for irrigation purposes should include the broader community needs. Communities through which the conveyance infrastructure passes were supposed to be integral part of the irrigation project. Stakeholder participation refers to a

process based on the citizen's physical involvement in shaping society's developments and projects and benefiting from its results (Viera, 1991). This implies that people who should be beneficiaries of a particular project must be involved in its initiation, planning, implementation, management and evaluation. In this way, tensions arising from the way that the resource is used and allocated are mitigated. While the extent to which stakeholders influence the water management decisions varies, full participation where every stakeholder has equal power to determine the outcome of a decision is preferred (Pateman, 1970), though it might be difficult to achieve because some stakeholders may have more influence than others.

One of the mandates of stakeholders and their institutions is to manage and resolve conflicts. Skills in conflict management, prevention and resolution such as negotiation, mediation, and co-operative problem solving (Centre for Conflict Resolution, 2001) were largely non-existent in the Manjirenji-Mkwesine irrigation case.

Outcome: sustainable irrigation water service

Our proposed model (Figure 1) asserts that the mechanisms for managing shared water resources must be put in place first. Then the outcome which includes an improved access to water, farm produce and income and ability to pay for the irrigation water will ultimately follow leading to a sustainable irrigation water service. Evidence from the Manjirenji-Mkwesine irrigation water canal case shows that farmers struggle for access to water, productivity is low and that many irrigators were not paying for the water. Consequently the project is burdened with conflicts and the irrigation water service delivery itself is poor.

CONCLUSION AND RECOMMENDATIONS

Evidence from the study showed that the demand for irrigation water outstrips by far the canal supply leading to tension and conflicts among the users. The nature of the conflict was centered on illegal water diversions by irrigators upstream of the canal resulting in confrontations with downstream irrigators. Besides, stakeholder inventory was incomplete and shortsighted resulting in the exclusion of other stakeholders. In particular, those farms through which the canal passes should have been beneficiaries of the project. Thus they should have been involved in its initiation, planning, implementation, management and evaluation. The lack of knowledge about the Water Act of 1998 (Zimbabwe 2000a,b) constrained full stakeholder participation in the governance of the water resources. The Act prescribes the creation of water councils through which stakeholders articulate their water needs and interests. Among other things, it provides guidance on issues such as water

permits and the levies paid for water use. Hence to minimize conflicts, awareness therefore of the provisions of the Water Act is an imperative.

Finally, the proposed conceptual model in this paper on shared irrigation water is recommended. The insights on meaningful stakeholder participation, institutional support, the treatment of water as an economic good and also as a natural God-given resource have potential to minimize tension and conflicts among stakeholders in shared resources such as irrigation water. Empirical evidence from the operation of the Manjirenji-Mkwesine irrigation water supply canal clearly demonstrated the lack of these essential concepts and the consequent prevalence of tension and conflicts among the stakeholders.

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