Assessment of factors which affect multiple uses of water and their impact on the sustainability of rural water supply in Zimbabwe- a case study of Marondera, Murehwa and Uzumba Maramba Pfungwe districts

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Abstract

Water with all its multiple uses plays a pivotal role in the sustenance of rural livelihoods, especially the poor. As such, the provision of water which go beyond domestic to include water for small-scale productive uses should be encouraged to enhance peoples' livelihood options by making significant contribution to household income, food security, improved nutrition and health. All these multiple benefits, if combined can assist in the fight against hunger and poverty.

This study was conducted in Mashonaland East province, covering Marondera, Murehwa and Uzumba Maramba Pfungwe districts in Zimbabwe for the period December 2005 to May 2006 to assess factors which affect multiple uses of water and their impact on the sustainability of rural water supply sources. Participatory Rural Appraisal tools such as discussions, observations and interviews were used for data collection. The survey found that people indeed require water for productive purposes apart from domestic uses, which are often given top priority. The study found out that multiple uses of water at household level can be affected by segmentation of water services into *domestic* and *productive* water supply schemes, technology and system design, water quality and quantity and distance to water sources among other factors.

The study recommends that water service providers to be able to provide appropriate, efficient and sustainable services, they should understand and appreciate the livelihood needs and priorities of the communities they serve. This calls for the need for harmonization and coordination of water service providers to best respond to communities' multiple water demands.

Keywords: Domestic uses; Livelihood; Multiple uses; Productive uses; Sustainability

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1. Introduction

In rural Zimbabwe, like many other rural areas in the developing world, people need water for their domestic needs (drinking cooking, washing, *etc*) as well as for small-scale productive activities such as back yard gardening, livestock watering, dairy, piggery, poultry, brick making, beer brewing and gold-panning. However, the provision of water services in Zimbabwe has traditionally focused only on the health benefits of water

supply, and hasn't catered for people's multiple water demands. The Integrated Rural Water Supply and Sanitation Programme (IRWSSP) primarily focused on providing clean water for domestic use from communal boreholes and deep wells with boreholes (Robinson *et al.*, 2004). The view that provision and improvement of domestic water supplies is largely a public health benefit has even persisted beyond the 1980s where international agencies also continued to focus on clean drinking water and adequate sanitation (Makoni *et al*., 2004). The focus on provision of water for livelihoods was absent in these programmes. The provision of water and sanitation in rural areas has since independence in 1980 remained in the hands of sector ministries and the national programme continued to focus on the provision of clean water for domestic use from communal boreholes and deep wells.

The segmentation of ministries, departments and organisations dealing with water services in Zimbabwe has left many people's multiple water demands unfulfilled. The proliferation of institutions in water provision and management has resulted in different water service providers coming with different approaches and sub-sectoral mandates. This has inevitably resulted in an uncoordinated approach towards water management and provision. For example, in the national programme for rural water provision, there was no attempt to identify water requirements of rural communities apart from water for primary use since water for productive use was under the Ministry of Agriculture through the Department of Agriculture and Technical Services (AGRITEX), now AREX, a different ministry altogether. This posed numerous problems as operational policies differs from one organisation to the other, one ministry to the other but all serving the same communities. This approach has also seen the Ministry of Health and Child Welfare (MoH) being responsible for sanitation and shallow wells, including family wells. The then Ministry of Water and District Development Fund (DDF) being responsible for drilling and maintenance of boreholes and deep wells while the Ministry of Agriculture, Local Government and Community Development has been responsible for land use, planning, mobilisation, finance and co-ordination of water and sanitation projects at national level, provincial and district level (Robinson *et al*., 2004). Also while the hardware becomes more user friendly, the newly established users' organisations sometimes perpetuate the main sectoral mandate (Van Koppen *et al*., 2006). The consequence is that poor people, especially the poorest of the poors' livelihoods become more vulnerable since service providers do not come to address their specific multiple water needs but part of their water needs.

Despite the sub-sectoral approaches in water services delivery, recent years have seen the emergency of Multiple-use Water Services (MUS) approaches. This is a holistic needs focused and demand driven approach, which addresses peoples' water demands and livelihood options in an integrated way. The multiple use water services approach, according to Van Koppen *et al*., (2006) takes people's multiple water needs as a starting point for providing integrated services, moving beyond the conventional sectoral barriers of the domestic and productive sectors. However, in the Zimbabwean context, these MUS approaches have tended to be NGO-associated initiatives and donor funded programmes and government has remained rigid with the old policy framework (Robinson *et al*., 2004). To understand the current situation in Zimbabwe on multiple uses of water at rural

household level and for possible implementation and upscaling of MUS approaches at a larger scale, a study was carried out to access factors which affect multiple uses of water and their impact on the sustainability of rural water supply.

2. Methods and materials

2.1. Study areas description

This study was carried out in Mashonaland East province, covering Marondera, Murehwa and Uzumba Maramba Pfungwe (UMP) districts. (Fig.1).

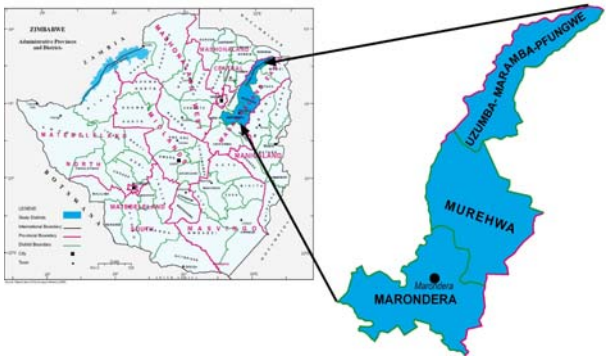

Fig. 1. Location of study districts

Marondera lies in a watershed area. The district is in agro-ecological region ii and receives high rainfall, especially in the resettlement areas. Average rainfall ranges from 600-1200mm per annum. The soils are predominantly well-drained sandy. **Murehwa** district falls in region iia, iib and iii. The average mean annual and effective rainfalls received in the district ranges between 700-1000mm, respectively. The soils of the whole district are varied in derivation, texture and depth. They are sandy loam and sandy clays with undulating lands, distinct hills and granitic rock outcrops with few portions of dolerite uplands and basalt in low lying areas. The soils are of poor inherent fertility (Zimuto, personal communication). **Uzumba Maramba Pfungwe** district comprises of 3 distinct communal lands namely; Uzumba south in agro-ecological region iib while Uzumba north is in region iii. Maramba and Pfungwe are in region iv. Pfungwe sometimes experiences prolonged dry spells even during some rain periods. Most rivers experience ephemeral flows with major river systems reduced to trickle or subsurface flows during the dry months. Region iib receives rainfall in the ranges of 900-1000mm, region iii; 650-850mm and iv 450-650mm, respectively. Geologically, 75% of the soils are sandy clay loams, derived from granite rocks. About 25% are reddish, brown clays from dolorite rocks, especially in Pfungwe.

2.2. Framework for analysis

A framework of principles for enhancing multiple use water services based on Van Koppen *et al*., (2006) was used to analyse the current situation in Zimbabwe on factors

which affect multiple uses of water and their impact on the sustainability of water supply in selected districts in Mashonaland East province. This analysis was done at community level, specifically looking at how water can be used effectively to alleviate poverty. The three-tiered action-research framework for implementing and upscaling MUS approaches shows that a multiple-use approach requires action at three levels; which are: at national level, intermediate and at community level. For the purpose of this study, principles at community level such as a through understanding of water-related livelihoods, efficient, equitable and sustainable use of water resources and appropriate technologies were examined.

Intermediate levels for this study were selected districts. A one-day stakeholder's workshop was held at Chibanguza hotel in Murehwa. This workshop was meant to gather baseline information and to get an overview of existing water sources, multiple water use practices and existing policies at district level. A plenary session was held during the workshop in which various district representatives cited water related projects in their districts and various water use practices. This was followed by a visit to study sites identified during the workshop to ascertain the validity of the information obtained during the workshop discussions.

At community level, discussions were held with ward councilors, village headmen, Village Health Workers, Water Point Committee Members, Village Pump Minders and participating households. Convenience random sampling was used to select households for administering questionnaires. A structured questionnaire was administered to 140 households. 50 in Marondera, 40 in UMP and 50 in Murehwa. Questionnaire administered at household level focused on issues of water use, quantities, sources, monetary returns on productive uses of water, reliability of water sources, operation and maintenance issues, problems encountered, existence of Water Point Committee, role of MoH, DDF, and AREX among other government ministries and departments. The target group for administering the questionnaire was generally household mothers or fathers. Children were also talked to but the adults were deemed to have reliable adequate knowledge on issues being investigated.

3. Results and Discussion

3.1. Domestic water uses

Domestic water use patterns are generally similar in all the study villages regardless of the type of the water sources and the distances covered to reach the sources. Water is used for drinking, cooking, bathing and washing of utensils among other universal domestic uses. However, consumption levels were observed to be different across the study villages as shown in Fig. 2. Statistical differences in consumption levels were mainly influenced by the size of the family, proximity to the source and also the wealth status of the family. The amount of water needed by an average household was reported to be in the range of 25 to 250 litres per day per household with a mean of 60 litres per day.

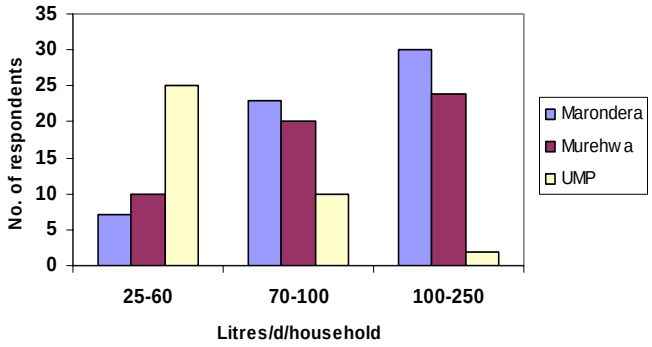

Fig. 2. Domestic water consumption levels

UMP appears to have the greatest number of respondents with a consumption level in the ranges 25-60litres per day per household. There is no significant difference in consumption levels of respondents in Murehwa and Marondera in the range of 70-100litres. This is because they have access to sources within premises or less than 500m. Sources within premises provided respondents with easy access to water and it was also established that those with easy access to water supplies use more water for bathing and washing. Families without water sources within premises more often go to nearby rivers for bathing and washing. Respondents who use around 100-250litres were found to be highest in Marondera and Murehwa

There were no restrictions on water quantities to be drawn from communal sources for domestic uses. However, frequent visits to the boreholes with large containers or pulling carts was not allowed in more than 50% of cases. This was mainly because there were doubts if the water was still being fetched for domestic use or for other uses such as brick making or gardening. However, frequent withdrawals of water from boreholes by a single family was also allowed for gatherings such as funerals, where permission was to be sought first from village authorities.

3.2. Productive water uses

A wide range of water-dependent activities were observed. These are; dairy, piggery, poultry, brick making, beer brewing, gold panning, livestock watering, gardening, small scale irrigation, banana plantations and orchard plantations. Water use patterns for productive purpose were largely determined by source type, distance and availability of water.

It was found that while some of these small-scale water dependent activities are about basic family consumption, 87% needed water for profit-oriented activities. Whether there was a reliable source of water close by or whether the sources were far from homesteads, nearly all respondents had family gardens of approximately 20-100m^2. Gardening was the most popular household activity in all the villages. Main crops grown include kovo, tomatoes, beans, cabbage, madumbe and butternuts among others. Sugar cane was also common in most gardens. Sugarcane is a high water demand crop and those who had it explained that there was need to ensure a constant supply of water. Men were found to be

with a leading role in the choice of crops. Men preferred growing sugar-cane and cotton while women were mainly interested in madumbe and vegetables.

It was a common practice for a family to have two or more gardens where the father and the mother take control. It was also common for the wife and the rest of the family to help in the fathers' garden but not so common for the father to help the wife. Single headed households had a choice of what to grow and what to spend the money on while those with both parents, the father had a leading role. Husbands with polygamous families reported the advantages of having many wives and children mostly as a very important helping hand to increase food supplies to the family.

No brick making was allowed to be done close to boreholes or to use water from such sources. Reasons cited were that some were doing this for business and would deprive others of water for basic domestic use. It was also explained that in case of breakdowns, it would be difficult to tell people to contribute to meet repairing costs when some of the contributors do not use such huge quantities. Brick making was cited by 67% as a business venture in all the study villages. Water use for brick making and building purposes was drawn from open wells and river, normally more than 500m away from the home. Water is usually collected in jerry cans or 25 litre buckets. Women carry it on their heads while men use wheel-burrows or donkey-drawn scotch carts.

> *"It is our ancestors who give us all this water you see, son…"*
> *"But we are not happy with restrictions on this borehole where we are not allowed to fetch more than a 100litre drum, yet for beer brewing, one needs not less than 300litres", complained one old woman*

Beer making was also cited as a common practice by all participating households. Beer making was mainly reported to be the role of women, especially those in the age group of 50 years and above. Beer making was cited by 63% not only as an income generating business but as an important traditional practice. Beer was regarded as important during celebrations and traditional gatherings such as: marriage ceremonies, traditional gatherings, weddings, etc. During such functions, beer is to be taken free of charge. For money making, beer brewing was said to be on weekly or monthly basis. The frequency of beer brewing was said to be influenced by the need to have money to meet family needs such as food, payment of school fees and money for going to grinding mills among other monetary needs. Beer brewing was met with mixed feelings in all the study villages. People were not allowed to draw water for beer making from communal sources such as boreholes because of the required large volumes of water.

3.3. Water use conflicts

Conflicts were reported in Pfungwe, Marondera and Murehwa. In Pfungwe, conflicts were reported to be very rampant during the dry periods of the year. In Nyabvenzi village, it was reported that the headman would from time to time be called to intervene when there were water conflicts. These conflicts, according to respondents were mainly due to different competing water use interests. Commonly cited conflicts were among those who wanted to water their livestock at boreholes while others did not approve this

idea. Some wanted to water their gardens and some did not approve this while some wanted to mould bricks and some were against this idea. Conflict cases were also reported by those farmers with plots in Nyakasoro irrigation scheme. Conflicts reported were among individual plot holders competing to get limited water for irrigation purposes during dry months of the year. This resulted in some plot owners irrigating their plots at night. Discussions with plot holders revealed that conflict resolution in Nyaksoro was not transparent due to known cases of bribery. *"The problem becomes more complicated when it involves relatives or wives of village leaders"*. Explains one old woman. "*Where do we report such cases to….."*, she lamented. In Murehwa, conflicts were reported to be very common between villages. Some villagers did not allow residents from other villages to use their boreholes. This was because some villagers were not willing to contribute when there was a breakdown. In all these cases, reported cases of witchcraft through use of evil spirits were also quite high. One incident was also reported in Marondera where one family was not allowed to do their laundry at a family well.

3.4. Water sources and technologies

Results from this study show that people require water for multiple purposes. In some cases, they allocate specific sources to specific purposes and more often they use the same sources to meet their multiple needs. Table 1 shows sources and technologies which are used in the study villages. The sources are listed in order of their priority of use. No piped water schemes exist in study villages.

Table 1
Water sources and technologies in study villages

District	**Source**
Marondera	Protected wells, Rope and Washer Pump, open wells, Nyandoro irrigation scheme, roof top rain water, boreholes and rivers
Murehwa	Boreholes, protected wells, Hand pumps, unprotected wells, river, roof top rain water
Uzumba Maramba Pfungwe	River, protected wells, Rope and washer pumps, (only Uzumba), unprotected wells, rivers, Nyakasoro irrigation scheme in Pfungwe, springs, roof top rain water and boreholes

4. Factors promoting or hindering multiple uses of water

Based on the results of this study, these factors are embodied in principles that have been identified as important for needs-based planning and design processes that have been considered to be at the heart of MUS (Van Koppen *et al*, 2006). These are; Appropriate technology, inclusive institutions, efficient, equitable and sustainable use of water resources and an understanding of water-related livelihoods.

4.1. Appropriate technologies

4.1.1. Technology and system design

Technology can enhance, promote or hinder multiple uses of water. In Marondera, for example, rope and washer pumps are used for a mix of both domestic and small scale gardening and watering of domestic animals. The rope and washer pump, according to respondents is very useful. They no longer walk long distances to get water from communal sources. Time reduction in watering the plots has also been cited by those using the pump to be from 8 hours to less than 3 hours. The burden among women and the girl child of carrying 20 liters of water x 100 per irrigation time has also been reduced since a hosepipe can be used to irrigate. The 5 hours saved as a result of using the rope and washer pump means that in many household mothers spend more time with their children, improving the quality of care to their families. For children, they no longer walk longer distances to fetch water; this frees their time to spend on school-home work. The advantages of the rope and washer pump were also reported in Uzumba at Chitimbe primary school. Girls can now spend longer in the classroom in a healthier learning environment due to the presence of clean water on the school premises. Girls no longer miss lessons to collect water from distant sources and no longer bring water in containers from home to drink and clean toilets. The rope and washer pump apart from supplying the school community with clean water has also enabled the school to grow a variety of crops to sell. Part of the money is used to buy school stationary, sports wear and also assisting with payment of school fees of those children from disadvantaged families.

Spring water tapping in Uzumba was found to be promoting multiple uses of water. Around the country, many people lack resources and technological know-how to capture water. As a result, they simply let it flow it flow. In Uzumba, one farmer got pipes from Mvuramazi Trust to tap water from springs and concentrate it into a small reservoir. This water is used for livestock watering, small-scale irrigation and fish farming.

Despite technology's ability to promote multiple uses of water, it was also observed that technology and system design can hinder multiple uses of water. For example, boreholes without a complete set of head-works can prohibit people to use the water for multiple purposes. In Murehwa, boreholes without washing slabs and cattle drinking troughs were observed. These boreholes, by nature of their design, prohibited people to do laundry on-spot and watering of livestock was also not allowed.

4.1.2. Ease of operation of the water points

The number of strokes required before getting water from boreholes varied from 2-100 strokes in some villages. In Zimbabwe, a maximum of 4 strokes is generally acceptable (Hoko, 2005). Strokes far more than the generally acceptable range were reported and this according to respondents restricted them to use water for multiple purposes. The higher the number of strokes, the more one quickly gets tired and can not keep on pumping large quantities of water. As such, respondents complained that this restricted them to fetch for example 10litres instead of say 20litres. Children below the age of 15 years can not draw more than 10litres of water from those boreholes, which require too

many strokes. Where convenient sources were nearby, such boreholes have been abandoned. They are only used in desperate situations.

A random attempt to pump water from some boreholes in all the three districts revealed a range from 10-more than 30 strokes. The number of strokes per borehole can be an indicator of the level of underground water. In Marondera, for example, average rainfall ranges from 600-1200mm per annum and the water table is very high. This can best explain why the highest number of strokes on functional boreholes is 10 in Marondera and 30 or more in Pfungwe, the driest part of Uzumba Maramba Pfungwe district with rainfall averages of 450-650mm per annum. Fig.3. show borehole stroke variations per district.

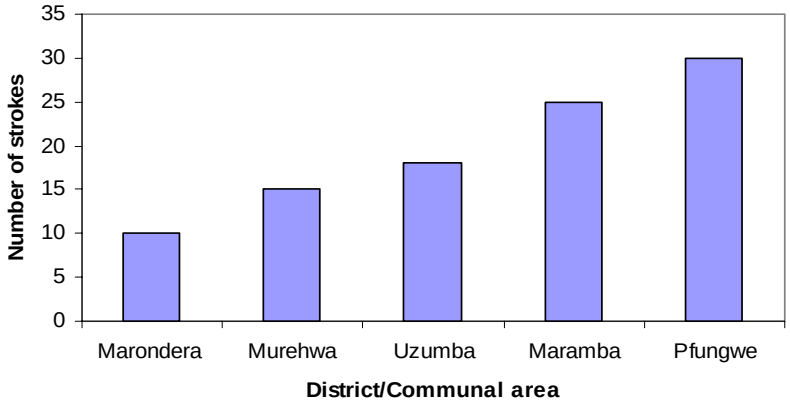

Fig. 3. Number of strokes per district/communal area

Greatest amounts of water use were recorded by those families with sources within homesteads. Per day such households could use more than 100litres on domestic only. Water estimates for a herd of three dairy cows were said to be in the range of 60litres, considering that one cow approximately needs 20litres.

4.2. Inclusive Institutions

4.2.1. Water use restrictions

During the survey, 57% of the water sources were reported to have potential to supply water for multiple uses but due to sectoral policies and institutional arrangements people were not allowed to engage in small-scale productive use of such sources except for 'perceived' domestic purpose only. In most cases, it was reported that service providers do not have time to engage in meaningful consultation with intended beneficiaries. In Murehwa and some parts of Uzumba Maramba Pfungwe, people were not allowed to use borehole water for any other purpose except for drinking and cooking. Community leaders such as water point committees and the village headmen are viewed as watchmen and ensures that no one breaks the water point use rules. On what is the possible action to take to those who disobey water point rules, one respondent pointed out that one risks being evicted from the village or is liable to pay a fine in monetary terms. Discussions with local leaders in villages also revealed that use of a water source on prohibited

activities attracts a fine or other form of unspecified form of punishment to be determined by the kraal head.

In Pfungwe, Nyakasoro irrigation scheme was designed in such a way that it only provides water for crop production. This thinking shows that when the initial designs were made, the designers failed to consider that beneficiaries of this schemes, apart from watering the plots also need water for domestic use or even water to drink while working on their plots. Of all the plot holders in Nyakasoro irrigation scheme, 68% indicated that they bring containers with drinking water from home. While the remaining percentage explained that they just drink from the irrigation canals. Bringing water in containers from home was an extra burden to them. None of the respondents using water from irrigation canals confirmed boiling it before drinking. Women felt that they suffered most since they have double functions. They lamented that traveling to boreholes to get clean drinking water after a whole day working on the plots was quite laborious and time consuming since the irrigation scheme was far away from where they live. Those who did not want to have another burden of going to fetch water from far away sources explained that they would fetch water from the canals when it is time to go home after a day's work.

4.2.2. Segmentation of services and ministries

At district level, there was evidence from discussions with personnel that there was no a clearly coordinated approach to water development. From discussions with, Ministry of Health and Child Welfare (MoH), it emerged that the Ministry of Health and Child Welfare mainly focuses on the health of the community. Its prime focus is on domestic water quality and sanitation. It is also responsible for training of Village Health Workers. At community level, 13.4% acknowledged receiving some form of support from Ministry of Health. This support was explained in terms of chlorine tablets, training of village health workers and some reported having received cement for upgrading their wells, 74.6% indicated that were not receiving assistance from MoH on water-related issues and 11.9% were not sure.

Discussions with AREX officials revealed AREX's pivotal role in farmer training and extension services. Overally, being responsible for providing technical services to farmers on good agricultural practice, soil conservation, cropping patterns and livestock production. They also have critical functions in water and environmental resources management. This survey showed that 50.7% acknowledge receiving advisory services from AREX, 40% said no support and 9.0% were not sure if AREX was helping anyone in their communities.

DDF's main function, according to key personnel at both provincial and district level is the drilling of boreholes, training of village pump minders/mechanics free of charge and construction of small reservoirs. DDF works closely with the Rural District Council (RDC) and uses RDC wards as entry points to various communities via ward councilors. DDF also work with AREX but within it defined mandates. A household questionnaire administered in all the three districts revealed that at least 20% people are aware of DDF and its role in their lives. The majority of people were in Murehwa, Maramba and

Pfungwe, 75% explained that they were not receiving any support from DDF while 5% were not sure.

Discussions with sector personnel also revealed that the collapsing economy and the political crisis, which the country is currently operating under has not spared them in all their community-related operations. DDF pointed out that the ever increasing cost of spare parts has made it difficult to help the communities. In both Marondera and Murehwa, the DDF personnel indicated that it was very difficult for them to visit communities even if a major broken down has been reported. They both cited lack of fuel to travel to the communities as an obstacle which also dealt them a serious blow to their community activities. The passive operations of these personnel were also reported by the communities and they complained about their frequency and the way they contacted their business.

The role of DDF in terms of water supply was not clearly understood in Marondera. Respondents complained about broken down boreholes which have been reported but nothing has been done to repair them. Instead, they cited Mvuramanzi Trust, a local non governmental organization as having helped them a lot in upgrading their family wells and provision of the rope and washer pump. In Uzumba Maramba Pfungwe, World Vision was cited as the leading player in repairing and rehabilitation of boreholes. Due to the introduction of the community-based (CBM) concept, DDF's role has shifted from being the providers but to bring technical advice or attending to major breakdowns. At national level, budgetary allocations for the maintenance of rural water supply systems have been cut due to the introduction of CBM where communities are supposed to take charge of their water supply and sanitation infrastructure (Robinson *et al*., 2004). This has proved to be unsustainable in most cases if there is no provision of water for productive purposes.

4.3. Livelihoods-Based services

4.3.1. Water quantity

Water availability in the dry season in Pfungwe was repeatedly cited as a great concern to the people where most families travel long distances of between 4-8 kilometres away from their homesteads. Where the quantity of water was limited, water use activities such as brick making, gardening were not allowed and water was strictly meant for drinking and cooking only. It is important in this case to understand that certain local prohibitions were actually meant to benefit users and not to deny them their human rights to water for other purposes as it was explained in Pfungwe. However, water quantity was in some cases explained in light of the wrong siting of some boreholes. Two incidents were reported where boreholes were wrongly sited because the ward councilor promised people that once they vote him, he will make sure they get a borehole. True to his promise, people got boreholes although the boreholes were prone to drying up most of the time. In some instances, it was also revealed that influential figures in the villages also influenced the siting of boreholes and this meant some boreholes ended up being drilled close to Chiefs, headmen or kraal heads even if there was not sufficient underground water. For example, in one village, respondents complained that the

borehole, which serves the whole village, was wrongly sited because the kraal head wanted it to be close to his second wife's homestead, his in laws and this borehole was dry most of the time.Water quantity drawn from certain sources was also shown to be directly related to the ease of operation of some water points.

4.3.2. Walking Distance

The reported distance of the respondents' water sources from their homesteads was moderate to near, not far, far and very far according to 45% of respondents in Marondera, 65% in Murehwa in Maramba, 67% and 86% in Pfungwe. Generally an acceptable walking distance to a water point should be 300m (Carter, 1996). Due to time constraints, this study could not go into detail to validate distances. But generally, the common reported distances in all the three districts ranged from 0-500m, then 500m-8km. Time estimates were also not reliable since most of the respondents were old and illiterate. Longer distances were reported in Kayangwa village in Pfungwe, where families drive cattle to Nyadire River, about 8 km away. They have a borehole in their village but the borehole does not have a cattle drinking trough and they have no option but to take their livestock to the river. The headmen lamented on the distance to the river as having a huge impact on their lives. The headman together with other respondents explained on the productive time lost and how driving cattle for longer distances can affect milk production and sometimes causes accidental cattle abortions. They also fell prey to thieves when people have harvested their field crops and cattle are let loose to be on their own go to the river without the owners.

Distance to water points apart from affecting water uses was also cited as a factor with a direct effect on people's willingness to pay or contribute in any way. In Marondera, in ward 12, there is no borehole in Mhuruyekunze, Mutimura and Muchareva villages. Respondents from these villages travel to Kapara village, about 3 km away. As such, they indicated that they are not willing to pay or contribute in any form to this borehole. They want to contribute to a central source. The fact that they sometimes get water from Kapara village was dismissed as not valid for them to be told to pay for such a facility. Those with water sources such as boreholes located about 3 km away had also to use convenient water sources as alternative sources which were in most cases not protected.

Water quantity is affected by distance to the sources. As such, multiple uses of water which is obtained from far away sources was explained not to be common by 67% of the respondents. Such water was in most cases, restricted to a single use for example drinking only. It was very common for households with protected water sources more than 2 km to use alternative sources, often unprotected to supplement water from protected sources.

4.3.3. Perceived water quality

Users' perceptions determine the uses of water. In light of this, availability of water can not automatically translate to its uses. The World Health Organization (WHO) has also set minimum standards for drinking, bathing, irrigation and domestic water quality. For example, saline water if used for laundry can consume a lot of soap which becomes a hidden cost for water users. Saline water can also be destructive to delivery pipes and boiler pipes if used for industrial cooling. In Maramba and Pfungwe, people were not

using borehole water for drinking, washing and cooking as was the purpose of the boreholes. Instead, they were getting water for drinking, washing and cooking from rivers. Use of rivers for example Maguranga and Dewe, as alternative sources for both domestic and productive was reported highest in Pfungwe with some 68.5% of the respondents using rivers instead of nearby boreholes. Asked on why using unprotected sources, yet they had well protected boreholes, they cited that borehole water was rusty, salty and the brownish colour stains clothes. Murehwa recorded 93% of borehole users with no quality-related complaints, followed by Marondera with 87.9%. Borehole use for domestic was found to be low in Maramba and Pfungwe with 91% of users complaining on unsatisfactory colour, taste and high soap consumption. High soap consumption, an indirect measure of hardness, as has been explained by Hoko (2005), was perceived as high by 67% in Pfungwe, 0% in Marondera, 10% in Mangwe and 17% in Murehwa. Other non-quality related complaints were also reported across all the villages. These ranged from; sharing of sources with animals, absence of washing slabs as well as cattle drinking troughs, drying of some water sources in August and September, too many restrictions and too many strokes on some boreholes.

4.4. Efficient, equitable and sustainable use of water resources

4.4.1. Reliability of water sources

Reliability of water sources varied from district to district and from source to source. Marondera and Murehwa had fairly high respondents having reliable family wells at 82% and 60%. These family wells were reported to be used for both drinking, washing, cooking and watering small gardens around the home. To be sustainable, water-supply sources need to continue to deliver the required amounts of water of good quality and quantity well into the future. This means on-going investment and maintenance. If a system fulfils all people's needs, they will be more willing to pay for its establishment and upkeep.

In general, reliability of water points was highest in Marondera, followed by Murehwa and UMP. While reliability and sustainability of boreholes in particular was high in Murehwa and Uzumba as compared to Marondera and Maramba Pfungwe, the existence of active village pump minders was also a pointer to sustainability of communal water sources. Village pump minders were reported to be available by 28% of responses in Marondera, 47% in Murehwa and 58% in UMP and the remaining respondents were not sure whether village pump minders were there or not. This was easily captured where there were two or more respondents, trying to recall but failing to give a conclusive response, sometimes arguing among themselves. The frequency of borehole use and users' perceptions on the usefulness of such sources was reported to be related to the role and existence of village pump minders. According to respondents in all villages, most of the people who were previously trained by DDF had either left the village to relocate somewhere under the land reform programme, death or gone for work elsewhere. In UMP, training of village pump minders was done by both DDF and World Vision.

In UMP, most surface water sources dried around September and it is only during this period when people would go back to their boreholes. Apart from seasonal variations,

silting of these rivers due to excessive gold panning is also a serious threat to water availability, hence affecting the reliability and sustainability of surface water sources. In Marondera, some sources were reported to dry in September and users had an option of fetching water from their neighbours. However, it was not an easy practice to go to your neighbours to fetch water. In Marondera and Murehwa and some parts of Uzumba, respondents emphasized that individual water sources are viewed as family property rather than communal property. Mistrust was cited as one reason why families did not want their sources to be for public use. Discussions with family heads showed that in some cases, sharing was allowed, especially among close friends, good neighbours or even trusted family members.

4.4.2. Ownership of water sources

Marondera and Murehwa had highest respondents with family water sources within homesteads at 97% and 63%, respectively, followed by Uzumba, 47%, Maramba, 30% and Pfungwe 14%. Those with family wells indicated that it was through own drilling or with the assistance of donors. Those who do not have family water sources cited financial problems as being prohibitive and this greatly affects their daily living. In Maramba and Pfungwe, family wells were considered to be the least feasible option due to the dry nature of the area. Ownership of sources gives the owner the option to decide on what to use it for. Those with family sources used them for a mix of uses and they were prepared to invest into their sources to ensure that they were functional all the time.

Multiple uses of communal water sources was not allowed in 87% of cases. Mis-management of such sources was also reported to be quite rampant. Visits to some community-owned sources confirmed missing parts on some boreholes for example bolts and nuts. Fence was also missing on some boreholes and the general cleanliness of borehole surroundings was not pleasing. The mis-management of boreholes was observed to be highest in Marondera. This was mainly because most families have individual sources so proper maintenance of boreholes was not a priority to most families. Responses on the role and presence of the WPC were mixed, with some confirming their presence (18%), some not sure (3%), some saying it was once there (42%) and 37% simply do not know of such committees. Those who indicated that they were not aware of such committees were those households with family sources and rarely use communal water points where local arrangements have been laid down to all users, in most cases, regular users.

Borehole breakdown was also reported to be highest in Marondera with reported cases of 6 times per year and sometimes take a maximum of 6 months before DDF is consulted. Murehwa and UMP recorded a down-time of 2 weeks-1month. Normally prolonged stay of a borehole before being repaired was reported to be when there was a major breakdown, which was in most cases beyond the capacity of trained village pump minders. In case of some villages in Murehwa and UMP, where WPC were reported to be active, breakdowns are reported by caretakers to pump minders for prompt repairs. If the problem requires community contributions, the water point chairperson reports the issue to the village kraal head who will then call for a village meeting and explain the problem.

Commonly cited borehole breakdowns in all the villages were loosening of some components, missing parts or rubber cylinders. Many respondents attributed this to misuse by children while vandalism and theft was also cited. In Murehwa and UMP, these breakdowns were regarded as minor and it was the duty of the water point committee to mobilize resources from users. Mobilisation might be a daunting task, especially in some villages in Marondera where the majority use family sources. As a result, when there is a breakdown in Marondera, boreholes are abandoned for alternative sources. The perception regarding ownership of water sources, apart from determining uses also has a strong bearing on respondents' willingness to pay for operation and maintenance of such sources, an observation also made by Machingambi and Manzungu (2003) in Mutare and Chimanimani districts, Zimbabwe.

5. Conclusion and recommendations

The use of water for multiple purposes is not a new practice in Mashonaland East province. However, what seems to be new is the documentation of practical cases and conceptualization of terms. As such, documentation of experiences and good practices should be done to enhance adoption of MUS approaches and designs. Practitioners and communities should be encouraged to document their success stories and good practices. The local media is an important route for information dissemination. Daily news and television could be used to showcase multiple uses of water and related projects.

At rural household level, domestic water supply sources are not an answer to people's water needs. Instead, people require water, which go beyond domestic to include water for small-scale productive purposes to enhance and sustain their livelihoods. Access to water for multiple uses provides people with opportunities to secure sources of food, income, improved health and poverty alleviation. However, multiple uses of water at household level can be affected by; technology and system design, policies and institutional arrangements as well as segmentation of the water sector, walking distance, water quality and quantity among other factors.

This study has helped in the setting up of Pilot Learning Alliances in the three study districts and these will be used as entry points for conducting action-research. The study suggests that up-scaling of MUS initiatives should be done at all levels and there should be strategic MUS partnerships with livelihood-oriented local NGOs and government departments. There is also need for increasing organizational MUS LA membership, advocating government, bilateral organisations and donor financial and policy support for MUS initiatives. The study further recommends that productive uses of high yielding water points should be encouraged where possible. Rainwater and roof top harvesting should strongly be encouraged, especially in the drier parts of the country and also in those areas where underground water is saline. All water service providers should work in close collaboration to best respond to peoples' multiple water needs.

To conclude it all, the long-term success for the implementation and up-scaling of multiple-use water services approaches in Zimbabwe will depend on whether the government is prepared to create a conducive environment for the donor community and

promotion of livelihoods-based water service delivery infrastructure. This can not be achieved overnight, especially considering the political and economic crisis at the moment but there is need for political will to attract investors, donor aid and also to change where necessary the legal framework governing the provision of water services to rural areas.

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