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An Assessment of the Effect of the Interaction of Small Dam Development and Management Institutions on the Quality of Maintenance of Small Dams: A Case of Mzingwane Catchment, Zimbabwe.

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Abstract

Small dams are an important source of both primary and productive water for rural communities especially in resource and water scarce semi arid areas such as Mzingwane Catchment in Zimbabwe, which was the study area. However failure of small dams in this area can result in the deprivation of the communities of vital water sources. It was against this background that this study was carried out to assess the institutional collaboration and the effect of the existence and functional status of site specific small dam management structures on the quality of maintenance of small dams. Literature reviews, interviews and informal discussions were used to get an insight into how these institutions were interacting with each other as well as with the community. Observations and inspections were done to check the physical condition of small dams in order to assess quality of maintenance that was being carried out on them. A comparison was then made between the quality of maintenance being carried on a particular small dam and the existence and functional status of a dam committee at the respective small dams. The results of the study indicated that about 90% of the small dams studied were not being properly maintained. Of these, about 43% were not being maintained at all. Of the unmaintained and poorly maintained small dams, about 97% had either a non functional or none existent dam committee. Other major issues affecting the maintenance of small dams in the study area were the limited capacity of institutions, unclear roles of communities in the management of small dams, lack of resources and lack of incentives for locals willing to maintain the small dams. The study concluded that despite the existence of a government institution mandated to develop and maintain small dams, some form of effective and community based small dam management system has to be in place if dams are to be properly maintained especially in a resource scarce area. Recommendations were that the current small dams management structures need to be made more sustainable and effective. Some of the suggested ways of doing this include ensuring that within the leadership of these management structures, there is at least an influential member of community who is empowered to make decisions concerning the maintenance of the small dams. Levies and fees for productive uses of the small dams could be introduced to help contributing resources towards sustainable and effective functioning of dam committees and the maintenance of the small dams. Issues of unclear roles should also be resolved by making clear the policies on the role of communities and other stakeholders in the management of small communal dams.

Key Words: *Small dams, maintenance, management, collaboration.*

Introduction

Small dams in Mzingwane Catchment are generally not being well maintained (Mufute et. al, 2008,). Dams which are not well maintained eventually fail, depriving the communities of much needed water that is vital for sustenance of livelihoods. Communal small dams are an important source of both primary and productive water in Mzingwane Catchment (Sithole and Senzanje, 2006). Sustainable ways of preventing their failure should therefore be found so as to ensure reliable water availability in the area of study. It is against this background that the contribution to the maintenance of small dams of institutional collaboration and the existence and functional status of small dam management structures at each small dam need to be investigated. There is also limited research on the institutional interactions and collaborations and the involvement of communities in the development and management of small dams in the study area.

The major aims of this research were to;

- Determine the extent of the institutional interactions and collaborations in small dams development and management in the area of study,
- Establish the existence and functional status of site specific management arrangements (dam management Committees) at each of the small dams studied,
- Relate the management set up and functional status at each small dam to the quality of maintenance being carried out on it,
- Determine other issues affecting the maintenance of small dams in the study area

Materials and Methods

Description of the study area

The study was conducted in Mzingwane Catchment in southern Zimbabwe, which is part of the Limpopo Basin (Figure. 1).

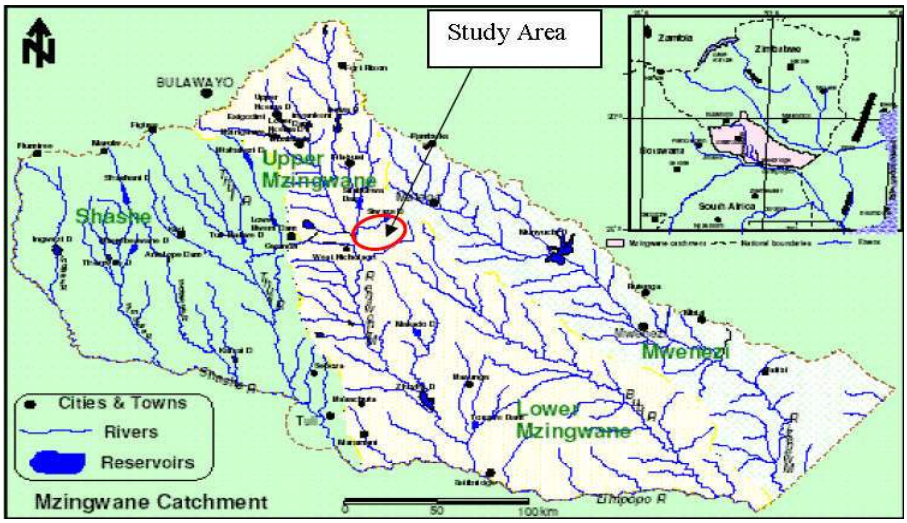

Figure 1 *Project Study Area. (Source of map: Love et. al., 2005.)*

Assessments were carried out on 43 small dams and 1 medium sized dam in wards 4–9 and ward 12, which are in the Godlhwayo communal area in Insiza district. The medium sized dam (Siwaze dam) is owned and managed by the Zimbabwe National Water Authority (ZINWA). ZINWA is a parastatal responsible for the planning, development and management of water resources including medium sized to large dams in Zimbabwe (ZINWA Act, 2002). Soils in Insiza are coarse-grained sandy loams. Slightly heavier textures often occur in upper slope positions close to rock outcrops. Associated soils are gravelly and shallow (Onema, 2004). Rivers in this area are mostly ephemeral (Sawunyama, 2005). According to Onema (2004), the communal lands are characterised by relatively high population densities in some areas. The resultant disturbance of the vegetation by cultivation has greatly depleted the extent of climax woody cover, resulting in erosion and siltation of water bodies (Mufute et. al, 2008). The average annual rainfall is 550mm/year. Because of low rainfall and high evapotranspiration rates, the catchment is generally water scarce. The groundwater potential has also not been fully investigated; however the potential seems to be limited as evidenced by the poor yields of the few boreholes that were drilled in the study area (Moyo, 2005). As a result, there are few alternative water sources to small dams for rural communities in the study area.

Data Collection and Analysis

Literature reviews were carried out in order to;

- Get an overall insight on the institutional arrangements, interactions and collaborations in the water sector in general and in the design, construction, management and maintenance of small dams in the country and more specifically in the area of study,
- Get an insight on how small dams are managed and maintained elsewhere and in the area of study,
- To get information on the existence and status of a site specific management arrangement (dam management committees) at each of the small dam site. This was done through interviews and assessment of records from institutions such as DDF[1].

Key informants from institutions such as DDF, AGRITEX[2], RDCs[3] and Non Governmental Organisations (NGOs), involved in the small dam construction, management and maintenance in the study were interviewed. This was done so as to;

- Understand their role in the small dams maintenance and
- How they interact with the communities and other institutions involved in small dams.

Community members near communal small dams and individual farmers who own small dams were also interviewed. This was done using an interview checklist in order to;

- Get information on their involvement and their views on the construction, management and maintenance of small dams in their localities,
- Assess their level of awareness of the need to maintain the small dams,
- Assess their level of knowledge on how to maintain small dams,
- Get information on problems and challenges they face in the management and maintenance of small dams,

- Get information on small dam management arrangements and on the existence and status of small dam committees in their localities,
- Get their views and assess their knowledge of the institutional roles and arrangements in the management of small dams in general.

Informal Discussions

These were carried out with community members who are small dam users, councillors and traditional leaders as well as with key informants from the different institutions involved in small dams. This was done mostly to get personal views and information pertaining to the problems and other issues in the construction, management and maintenance of small dams in their localities.

Observations

These were done so as to check the current physical condition of small dams in the area of study in order to assess quality of maintenance that was being carried out on the small dams. The assessments were guided by small dams design, construction and maintenance guidelines from Zimbabwe and other countries (WEDC, 2006; RELMA, 2005; ASWCC, 2002; CARE Zimbabwe, 2002; NZSOLD, 1997; FEMA, 1987; Kabell, 1987; Shaw, 1977). A detailed methodology of how this was done and the results are discussed in another paper (Mufute et. al, 2008)

Criteria for classifying quality of maintenance of assessed small dams

Results of the physical condition assessments were used. Selected indicators of the quality of maintenance such as the presence of trees on the embankment were used to score the quality of maintenance (see Table 1). The selection of the indicators was guided by the use of the inspection and maintenance guidelines (WEDC, 2006; RELMA, 2005; ASWCC, 2002; CARE Zimbabwe, 2002; NZSOLD, 1997; FEMA, 1987; Kabell, 1987; Shaw, 1977). For each indicator noted on the inspected dam a score of 0 was recorded and if the indicator was not observed, a score of 1 was given, the total scores were then obtained and classified according to tables1, 2 and 3. See Table 6 for the results of the classification that was done for small dams in the area of study.

Table 1: Maintenance Indicator Symbol Key

Maintenance Indicator Symbol	Indicator observed on the small dam
A	Gullies on the embankment
B	Scarping on the embankment
C	Dislodged Rip rap and or spillway seam masonry
D	Trees on the embankment
E	Termite mounds on the embankment
F	Removed fence around the small dam embankment

Table 2: Indicator Score Key

Description	Score
Indicator observed on the small dam	0
Indicator not observed on the small dam	1

Table 3: Quality of maintenance scoring key

Quality of Maintenance	Total score of all indicators observed on the small dam
Good maintenance	6
Fair maintenance	5
Satisfactory maintenance	4
Unsatisfactory maintenance	3
Poor maintenance	1-2
No maintenance	0

Results and discussion

The Extent of Interaction and Collaboration between Institutions and Communities Involved in the Development, Management and Use of Small Dams

Outcomes from Interviews and Discussions with DDF

Interviews and discussions revealed that DDF carries out the design, construction and maintenance of communal small dams. DDF also indicated that when NGOs or any other institutions want to design, construct or maintain small communal dams in the area; they are supposed to approach DDF who would then supervise or coordinate the exercise from feasibility studies right through to hand over of the small dams for use by the communities. On the ground however the consultations were limited as revealed by interviews with the communities. The interviews also revealed that DDF and communities are supposed to be jointly responsible for maintenance, however DDF were not maintaining small dams during the time of the study. Lack of funds for maintenance, rehabilitation and transport as well as high staff turnover, inexperienced staff and obsolete equipment were cited by DDF as the biggest problems they face in doing their work on small dams.

Outcome of interviews and discussions with NGOs

World Vision (WV) and CADEC were the main NGOs involved in the construction and rehabilitation work on small dams in the area of study. Christian Care was also involved in the construction of two small dams in the study area. The NGOs indicated that they liaised with all relevant stakeholders involved in small communal dams such as RDCs, AGRITEX, DDF, contractors and local communities. They indicated that they were 'facilitators' in the communal small dam programmes they

are involved in. They engaged and paid contractors who constructed or rehabilitated the small dams. They also involved villagers in the construction and maintenance of small dams under what are referred to as *food-for-work* programs (where the community members contributed their labour to do community work in exchange for food rations). In some instances the NGOs would meet the transport and subsistence expenses for officials from the government organisations they worked with. They also supplied the communities with basic tools for construction or maintenance such as shovels, wheel burrows and picks. The NGOs handed over management of the constructed dams to the community after basic training on maintenance.

The NGOs also indicated that there was need to train the DDF dam staff as they alleged that it was mostly made up of staff members that were new and little experienced in small dams issues. This, the NGOs claimed was compromising the availability of expert advice on issues of small dams to the communities they work with. They also claimed that because of limited equipment available to DDF for dam construction and rehabilitation, coupled with inexperienced staff, the NGOs were forced in most cases to hire private contractors to design and construct the small dams.

Interviews and discussions with AGRITEX and the soil and water conservation branch and the RDC officials

According to local AGRITEX officials in the area of study, AGRITEX was not directly involved in the construction and maintenance of small dams. However other institutions such as NGOs worked with them in activities to do with small dams. This is because experienced AGRITEX officials through their agricultural extension work are generally well known and respected in the communities they work in and have a good understanding of the geographical and local social set up of these areas. As a result they were used as a gateway into the community. AGRITEX also advised communities on good agricultural practices in the irrigation plots and nutrition gardens around the small dams. They were also involved in the pegging and demarcation of the plots and gardens. The soil and water conservation branch is under the Department of Mechanisation in the Ministry of Agriculture, Mechanisation and Irrigation Development. The AGRITEX department is also in the same ministry. The branch also have a mandate to offer extension services to farmers and rural communities in soil and water conservation issues including the design and construction of small dams. However at the time of the study the branch had no representation on the ground in the area of study and the interviewed communities indicated that they were not aware of the existence of the branch as well as its roles in the development and management of small dams.

The DDF Act of 1988 and the RDC Act of 2002, both mandate these two institutions to initiate and oversee developmental activities in rural areas including small dams as well as levying users of such infrastructure. According to discussions held with the Insiza Rural District Council officials, DDF approaches the RDCs in the area of their jurisdiction so as to agree on prioritised projects including small dams. The RDC will then grant the permission to DDF, NGOs and other players in small dams to go on with the project and may cheap in with resources and personnel if available. However the situation on the ground is that the RDCs usually just grant their authority and facilitate the beginning of the work and are usually not fully involved the actual construction and management of the small dams.

Interviews with communities

All the interviewed community members (this include the traditional leadership such as village heads councillors and ordinary community members) indicated that they had not seen DDF

carrying out any maintenance work on small dams in the last three years or more before the study. Traditional chiefs are usually approached to be informed of the planned programmes once they give their permission, they are usually sidelined in the rest of the development works as well as the management of the small dams. According to interviewed community members, DDF used to carry out maintenance activities on the dams they constructed or inherited from pre- independence institutions, but have since stopped. Interviewed community members who worked with NGOs also indicated that they have not seen the NGO staff that assists them in dam maintenance being accompanied by DDF staff whenever they come to assist them on issues to do with small dams. This indicates that the collaboration between NGOs and DDF and between DDF and the community in the area of study was limited.

Interviewed community members on 89% of the DDF constructed small dams indicated that they were not sure about their role in the maintenance of the small dams .They claimed that the dams were not officially handed over to them by DDF and their roles in the maintenance of these small dams was not spelt out to them by DDF. On the other hand, those small dams that were constructed or rehabilitated by NGOS were being partially maintained with the assistance of NGOs (see also table 7). Community members in such areas indicated that they there is good collaboration between them and NGOs and their role was to provide labour and sometimes tools and draught power during the construction, rehabilitation or maintenance work.

Even though it was mentioned in the interviews with NGOs, DDF and RDCs that these institutions collaborated in their work on small dams, the communities on the ground claimed that the NGOs were doing their field work on their own without the involvement of DDF or the RDCs. Most communities as mentioned above were also not sure of their role in the management and maintenance of small dams in their localities. All this shows that the level of stakeholder collaboration, consultation and involvement by the players in the construction, management and maintenance of small dams was limited.

The above scenario implies a lack of clarity on the roles of communities, DDF, RDCs, NGOs and the Department of mechanisation in the development and management of small dams in the area of study.

Existence and functional status of dam specific management committees

Referring to table 7; according to the DDF database on small dams in the study area, the institution indicated as chairing, was the institution responsible for coordinating all management issues to do with the small dam concerned. However interviews with the communities on the ground revealed that on close to 89% of the small dams, dam committees were nonexistent, defunct or non functional at the time this study was done (tables 6, 7 and 8). This was especially evident on small dams constructed and chaired by DDF where 100% of the small dams had either a non functional or nonexistent dam committee. Of the 5 small dams with committees indicated as functional, one is owned by a farmer, one by ZINWA and three are managed by the community with the assistance of NGOs.

Relationship between the management set up and functional status to the quality of maintenance being carried out on the small dams

Table 6 shows the quality of maintenance associated with the studied small dams. The quality of maintenance was classified according to a scoring criterion for the various indicators of maintenance such as tree growth on embankments which were observed on each small dam as explained in tables 1, 2 and 3. Table

7 shows the relationship between dam management committee status and maintenance status of the studied small dams. Table 8 is a summary of tables 6 and 7.

Table 4: The quality of maintenance of small dams in the study area

Small Dam	Ward in which dam is located	*Presence of maintenance indicators on embankment						Maintenance Score and Quality	
		A	B	C	D	E	F	Total Score	Quality
Sababa	5	0	0	0	1	0	0	1	Poor maintenance
Embondweni	4	0	0	0	0	0	0	0	No maintenance
Sidzibe	5	1	0	0	0	0	1	2	Poor maintenance
Sapila	5	0	0	0	0	0	0	0	No maintenance
Moyo Msengi	5	0	0	0	0	0	0	0	no maintenance
Mabhada	4	1	0	0	1	1	0	3	Unsatisfactory maintenance
Zilwane	4	0	0	0	0	0	0	0	No maintenance
Hlhashtwayo	12	1	0	0	0	0	0	1	Poor maintenance
Dube Jubele	6	1	1	1	1	0	0	5	Fair maintenance
Chobukwa	6	0	0	0	0	0	0	0	No maintenance
Shagwe	6	1	0	0	1	1	0	3	Unsatisfactory maintenance
Makoshe	6	1	1	1	0	0	1	4	Satisfactory maintenance
Mabuze	4	1	0	0	0	0	1	2	Poor maintenance
Backley	4	1	1	0	1	0	0	3	Unsatisfactory maintenance
Dam Dolo	4	1	0	0	1	0	0	2	Poor maintenance
Lonto Dam	6	1	1	1	1	1	0	5	Fair maintenance
Chengeta	12	0	0	0	0	0	0	0	No maintenance
Ngwabi	12	1	1	0	0	0	0	2	poor maintenance
Fulunye School Dam	12	1	1	0	0	1	0	3	Unsatisfactory maintenance
Fulunye Main Dam	12	1	1	0	0	0	0	2	Poor maintenance
Gwenyimo	9	1	1	0	1	0	0	3	Unsatisfactory maintenance
Sanali	9	0	0	0	0	0	0	0	No maintenance
Manyange	9	0	1	1	1	0	0	3	Unsatisfactory maintenance
Maninginingi	9	0	0	0	0	0	0	0	No maintenance
Chehondo	9	1	1	0	0	0	0	2	Poor maintenance
Bikibiki/Maboyani	8	0	0	0	0	0	0	0	No maintenance
Edward Dam	8	0	0	0	0	0	0	0	No maintenance
Gondongwe	8	0	0	0	0	0	0	0	No maintenance
Gumbalo	8	0	0	0	0	0	0	0	No maintenance
Konde	9	0	1	1	1	0	0	3	Unsatisfactory maintenance
Singwambizi	7	0	0	0	0	0	0	0	No maintenance
Maputi	7	0	0	0	0	0	0	0	No maintenance
Vocola	7	0	0	0	1	1	0	2	poor maintenance
Mzambani	12	0	1	0	0	1	0	2	poor maintenance
Denje	12	0	0	0	0	0	0	0	No maintenance
Avoca	12	1	0	0	1	0	0	2	poor maintenance
Dewa	12	0	0	0	0	0	0	0	No maintenance
Bova	12	0	0	0	0	0	0	0	No maintenance
Sifinini	7	1	1	0	0	0	0	2	Poor maintenance
Mashoko	8	0	0	0	0	0	0	0	No maintenance
Manzanlhope	4	1	1	0	1	0	0	3	Unsatisfactory maintenance
Magelimani	12	1	0	0	0	0	0	1	Poor maintenance
Masuto	4	0	0	0	0	0	0	0	No maintenance
Siwaze	12	0	1	1	1	1	1	5	Fair maintenance

*0 = presence of indicator, 1= absence of indicator. See also tables 1, 2 and 3 for indicator and score interpretation.

Tables 6, 7 and 8 and Figure 2 show that majority (about 90%) of the small dams in the area of study are not being properly maintained. Of these, about 43% are not being maintained at all. Of the unmaintained and poorly maintained small dams, about 97% had either a non functional or none existent dam management committee (Figure 3) and Table 8). This indicates that the existence of a dam management committee or some form of an effective site specific dam management system is a contributory and necessary factor for the proper maintenance of small dams. This point is further supported by the fact that 100% of the satisfactorily to fairly maintained small dams had some form of an effective management system in place to oversee the maintenance issues. Of these 4 dams, one was managed by a farmer (Dube Jubile dam) and one was managed by ZINWA (Siwaze dam). Interestingly, the other two were managed by communities with material assistance from NGOs. One of the fairly maintained small dams Lonto Dam, (See Tables 6 and 7.) was formerly managed by DDF and because DDF was no longer coming to carryout maintenance work, the proactive community took over the maintenance of the small dam. The VIDCO[4] Chair (also the local Headman) worked with village heads, the councillor, the community and CADEC (an NGO) through a food-for-work programme to repair the small dam. The other small dam (Makoshe) was constructed in 1998 by an NGO and had no dam committee in place (see also Table 7). However the proactive and resourceful VIDCO Chair mobilised the community to raise funds for repairs of the dam whenever the community felt there was a need to repair or maintain the small dam.

Small dams constructed by and with committees chaired by DDF constituted 47.7% of all the assessed dams. Of these, 100% had either a non functional or a nonexistent dam committee and all but one were being unsatisfactorily maintained, poorly maintained or were not being maintained at all. Their physical condition was poor as indicated by the dislodging of riprap and scarping of the embankments for example. Details about the physical condition o the small dams are explained in Mufute et. al, 2008. Lonto Dam was the only dam constructed and chaired by DDF which was being fairly maintained. On this small dam, the VIDCO Chair (Also Headman) worked with village heads, councillor, the community and CADEC through a food for work programme to repair the dam (Table 7). This indicates that community involvement under effective structures can be very helpful in ensuring that small dams are maintained.

Of the 5 small dams with committees indicated as functional, only two dams, the one owned by a farmer (Dube Jubele dam) and Siwaze dam managed by ZINWA were fairly maintained. The other three of these small dams were managed by the community with the assistance of NGOs. However they were either unsatisfactorily or poorly maintained and were in poor condition (Tables 6 and 7). All this indicates lack of sustainability in most of the small communal dam management structures in the study area.

Of the assessed dams, 11.4% were owned or initiated by farmers. Of these, only one (Dube Jubele) was being fairly maintained, 40% were not being maintained at all and 40% were being unsatisfactorily being maintained (see tables 6 and 7). The owner of Dube Jubele dam did unscheduled maintenance on his own. Occasionally he sought advice from an experienced AGRITEX officer. The farmer was the councillor of his ward and was relatively better resourced as compared to his fellow villagers. The satisfactory condition of

his small dam suggests that with commitment, sufficient knowledge, regular advice and resources, small dams can be better maintained. On some of the other farmer owned or initiated small dams, the farmers did limited maintenance on their own and some of the small dams were not being maintained at all. On those unsatisfactorily maintained and unmaintained small dams, issues such as erosion, scarping and riprap deterioration were noted during observations. All the farmers however showed through the way they responded to questions that they knew the basics of dam maintenance.

All the community members interviewed at the 43 dam sites expressed awareness of the need to maintain small dams and seemed knowledgeable on basic maintenance requirements such as scouting for trees and termite mounds on the embankments. This suggests that the message on the need for small dams maintenance was getting to the communities.

Small Dam	**Dam Committee Status**	**Committee Chairing Institution**	**Maintenance Status (Based on total score, table 6)**	**Comments**
Sababa	Non Functional	DDF	Poor maintenance	DDF not involved in repairs, Villagers repair under food for work programme sponsored by World Vision
Embondweni	Non Functional	DDF	No maintenance	Community repair on their own when dam is threatened
Sidzibe	Non Functional	DDF	Poor maintenance	Maintenance last done a few years ago
Sapila	Non Functional	DDF	No maintenance	Maintenance last done a few years ago
Moyo Msengi	Not in place	None	No maintenance	Farmer initiated, Maintenance abandoned many years ago.
Mabhada	Not in place	None	Unsatisfactory maintenance	Community repair on their own when dam is threatened
Zilwane	Non Functional	DDF	No maintenance	Maintenance abandoned many years ago.
Hlhashtwayo	Non Functional	DDF	Poor maintenance	Maintenance last done a few years ago

Handover-takeover policies on the responsibility for management of small dams between DDF and communities were not clear. This has resulted in the communities being unsure of their role in small communal dams management, as revealed by interviews with the community members. With the above scenario and given that DDF was chairing small dam management committees on 21 of the 43 assessed small dams (table 7) and had no resources to commit to the management and maintenance of the small dams, the effectiveness of the concerned dam management committees was thus seriously limited.

Some communities (on 15% of the assessed dams) were trying to repair and maintain the DDF constructed small dams on their own. These communities had basic knowledge of inspection and maintenance issues but they lacked proper organisation, financial resources, technical know-how and equipment to carry out more involving work such as repairing scarped slopes.

Dube Jubele	Functional	Farmer	Fair maintenance	Farmer owned; unscheduled maintenance done by farmer on his own. Occasionally seeks advice from an experienced AGRITEX officer
Chobukwa	Not in place	None	No maintenance	Dam breached. Community tried to repair it on their own.
Shagwe	Functional	CADEC	Unsatisfactory maintenance	Community repair dam under a 'Mushandira' programme with material assistance from CADEC (NGO).
Makoshe	Not in place	None	Satisfactory maintenance	VIDCO Chair mobilises community to raise funds for repairs.
Mabuze	Not in place	None	Poor Maintenance	VIDCO Chair (Also headman) mobilises community to raise funds for repairs and to do the repairs.
Backley	Not in place	None	Unsatisfactory maintenance	VIDCO Chair (Also Headman) works with village heads and councillor and CADEC through a food for work programme to repair dam
Dam Dolo	Not in place	None	Poor maintenance	VIDCO Chair (Also headman) mobilises community to raise funds for repairs and to do the repairs.
Lonto Dam	Non Functional	DDF	Fair maintenance	VIDCO Chair (Also Headman) works with village heads and councillor and CADEC through a food for work programme to repair dam
Chengeta	Not in place	None	No maintenance	Dam abandoned after completely failing due to siltation
Ngwabi	Not in place	None	Poor maintenance	Dam breached. Community tried to repair it on their own.
Fulunye School dam	Not in place	None	Unsatisfactory maintenance	Dam breached. Community tried to repair it on their own.
Fulunye Main dam	Non Functional	DDF	Poor maintenance	Maintenance last done a few years ago
Gwenyimo	Functional	CADEC	Unsatisfactory maintenance	Community repair dam under a 'Mushandira' programme with material assistance from CADEC.

The quality of maintenance of these dams was therefore unsatisfactory or poor (Table 5).

Table 5: The relationship between dam committee status and quality of maintenance on studied small dams

On 15.9% of the small dams assessed where there were no dam committees in place, the VIDCO, councillors and traditional leaders mobilized community members to contribute their labour, funds and materials to repair small dams when it becomes essential such as when the dam wall was about to breach. The resources were mobilised without external assistance. This indicates that with the right leadership and guidance some communities are willing to contribute labour and funds for the maintenance of the small dams in their areas of residence. However in such areas the maintenance is usually irregular and there is lack of expertise to tackle more serious conditions such as leaking embankment and scarping. As a result the quality of maintenance on such small dams was either poor or unsatisfactory (Table 5)

Interviews with community members at the dam sites also revealed that on 18% of the assessed dams, there were no proper dam committees in place (See also Table 5) but the councillor, VIDCO and traditional leadership got mostly material assistance to do minor maintenance such as cutting down trees. They also repaired dam embankments when it became evident that breaching was

Sanali	Non Functional	DDF	No maintenance	Maintenance last carried out a few years ago
Manyange	Not in place	None	Unsatisfactory maintenance	Farmer initiated and managed but built with the assistance of community.
Maningingi	Not in place	None	No maintenance	Dam breached. Community tried to repair it on their own.
Chehondo	Functional	Christian Care	Poor maintenance	Community repair dam under a 'Mushandira' programme with material assistance from Christian Care.
Bikibiki	Non Functional	DDF	No maintenance	Maintenance last done a few years ago
Edward Dam	Not in place	None	No maintenance	Farmer initiated and managed but built with the assistance of community.
Gondongwe	Non Functional	DDF	No maintenance	Maintenance last carried out a few years ago
Gumbalo	Non Functional	DDF	No maintenance	Dam not being maintained. Community trying to engage Christian Care to assist.
Konde	Not in place	None	Unsatisfactory maintenance	Farmer initiated and managed but also used by the community.
Singwambizi	Not in place	DDF	No maintenance	Maintenance last done a few years ago
Maputi	Not in place	DDF	No maintenance	Maintenance last done a few years ago
Vocola	Non Functional	DDF	Poor maintenance	Community mobilisation for fund raising and carrying out repairs or hiring contractors by councillor and traditional leaders.
Mzambani	Not in place	None	Poor maintenance	Community repair on their own when dam is threatened.
Denje	Non Functional	DDF	No maintenance	Dam not being maintained. Community has a garden committee which works with an NGO in garden activities.
Avoca	Non Functional	DDF	Poor maintenance	Maintenance last done a few years ago

imminent. They did the repairs mostly with the material assistance of NGOs (CADEC, WV and Christian Care) under some kind of a food-for-work programme or 'mushandira' (where the community contributed their labour to do community work without pay). This was mostly for dams rehabilitated or constructed by NGOs. The communities in these areas were also trained in basic maintenance such as dealing with termite mounds and cutting down trees on the embankment. However observations revealed that they seemed to lack technical skills to deal with erosion, riprap maintenance and scarping. These problems are more complex and usually require the input of experts. Again however; the maintenance in these areas is usually irregular and there is lack of expertise to tackle more serious conditions such as leaking embankment and scarping. As a result the quality of maintenance on such small dams was also mostly either poor or unsatisfactory (Table 5).The physical condition of small dams in these areas was however far much better than that of dams that DDF constructed and left to the communities to use without clear hand-over-takeover arrangements.

Interviews also revealed that there were no regular monitoring and maintenance programmes in place on all the assessed small dams with the exception of Siwaze dam which is a medium sized dam managed by

Avoca	Non Functional	DDF	Poor maintenance	Maintenance last done a few years ago
Dewa	Non Functional	DDF	No maintenance	Maintenance abandoned many years ago.
Bova	Non Functional	DDF	No maintenance	Maintenance abandoned many years ago.
Sifinini	Non Functional	DDF	Poor maintenance	Maintenance last done a few years ago
Mashoko	Non Functional	DDF	No maintenance	Maintenance abandoned many years ago.
Manzanlhope	Not in place	None	Unsatisfactory maintenance	Herd man mobilises the community for fund raising and carrying out repairs or hiring contractors.
Magelimani	Non Functional	NGO	Poor maintenance	Community repair on their own when dam is threatened.
Masuto	Not in place	None	No maintenance	Maintenance abandoned many years ago.
Siwaze	Functional	ZINWA	Fair maintenance	Operated and maintained by ZINWA

ZINWA. Instead of a dam management committee, ZINWA has employed a dam attendant who is stationed on the dam and is responsible for the regular simple inspections (such as scouting for trees and termite mounds) and simple maintenance work that is done on the dam such as grass cutting and small tree removal on the embankment. However more technical inspections and maintenance work were carried out by engineering teams from the catchment offices and head office. This was revealed through an interview with a dam attendant stationed at Siwaze dam. On all the other assessed small dams the interviewed communities indicated that maintenance was only carried out when there was a notable threat to a small dam such as when it was about to breach due to scarping or a leaking spillway. Small dams inspection and maintenance guidelines recommend planned and regular inspection and maintenance (WEDC, 2006; RELMA, 2005; ASWCC, 2002; CARE Zimbabwe, 2002; NZSOLD, 1997; FEMA, 1987; Kabell, 1987; Shaw, 1977).

The study findings indicate that stakeholder collaboration and cooperation as well as full participation of the local communities is necessary in the sustainable development and management of communal small dams.

Other issues affecting the maintenance of small dams in the study area

Lack of incentives was also discouraging some otherwise committed members of the community from carrying out the maintenance work as they felt they would be doing work that would benefit all users of the dams with little or no reward for their maintenance efforts. Worse still they got little assistance from the majority of the people who benefited from using the dams.

Table 6: Status of Dam Management

DMC Chairing institution	Status of Dam Management Committee and Quality of Maintenance																		Total No. of Dams
	[1]Functional						Non Functional						Not in place						
	Good maintenance	Fair maintenance	Satisfactory maintenance	Unsatisfactory maintenance	Poor maintenance	No maintenance	Good maintenance	Fair maintenance	Satisfactory maintenance	Unsatisfactory maintenance	Poor maintenance	No maintenance	Good maintenance	Fair maintenance	Satisfactory maintenance	Unsatisfactory maintenance	Poor maintenance	No maintenance	
DDF	0	0	0	0	0	0	0	1	0	0	7	11	0	0	0	0	0	2	21
NGO	0	0	0	2	1	0	0	0	0	0	1	0	0	0	0	0	0	0	4
No Chairing Institution But:																			
- Farmer Owned/initiated	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	2	5
- ZINWA Owned	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
- Other	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	4	4	4	14
Total	0	2	0	2	1	0	0	1	0	0	8	11	0	0	1	6	4	8	**44**

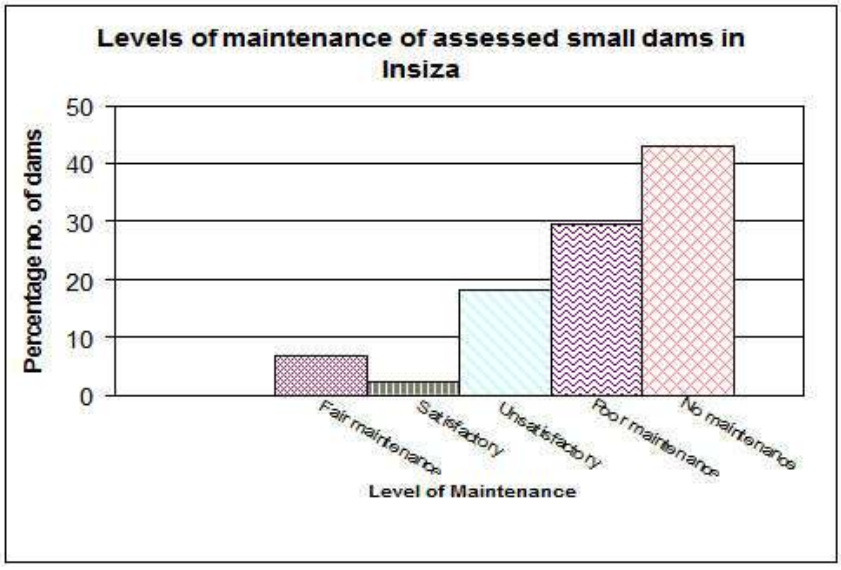

Figure 2: Quality of maintenance of assessed small dams in Insiza.

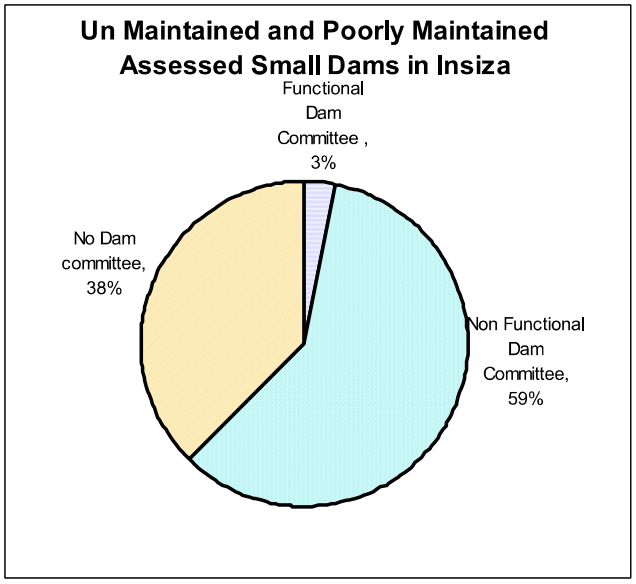

Figure 3: Unmaintained and poorly

In some cases for example on two of the 5 farmer initiated or managed dams that were assessed, shear lack of appreciation of the need to maintain dams resulted in the lack of maintenance of small dams. Trees and termite mounds (some of the signs of lack of maintenance) were growing on the small dams yet the farmers were able to demonstrate to the interviewers that they knew about basic maintenance requirements such as cutting down trees and destroying termite mounds on the embankment.

Conclusions and recommendations

The level of stakeholder collaboration and involvement in small dams in the area of study was limited.

There was a lack of effective and sustainable dam site specific management structures on most of the studied small dams. This coupled with the uncertainty expressed by communities on their role in the management of small dams, also resulted in situations whereby no one was carrying out maintenance work on the majority of the small dams studied. As a result the majority of the small dams studied were in poor physical condition. The existence of an effective site specific small dam management system and the full participation of local communities is therefore an important factor if small dams are to be properly maintained in the study area where the mandated institution is short of resources to do the maintenance and inspection work on their own.

The other major issues affecting the maintenance of small dams in the area of study were the limited capacity on the part of other institutions such as DDF, lack of resources, limited training in dam care, lack of incentives for locals willing to maintain small dams and limited appreciation of the need to maintain small dams by some community members.

The quality of stake holder collaboration and consultation need to be improved. The National Action Committee (NAC), the national body responsible for guiding water sector development and sustainability through defining strategic policies and plans for the Rural Water Supply and Sanitation Programme in Zimbabwe, may take a leading role in the process. This would create or facilitate linkages and increased coordination between institutions and communities, more efficient use of available resources. This would help reduce the impact of lack of resources for staff and community training as well as for management and maintenance of small dams.

Resolving issues of unclear roles by making and effecting clear policies on the role of communities, RDCs, DDF, NGOs and other stakeholders