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WHEN WATER COMMITTEE GOOD PRACTICES ARE NOT RELEVANT: SUSTAINABILITY OF SMALL WATER INFRASTRUCTURES IN SEMI-ARID MOZAMBIQUE.

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summary

This paper explores the contradiction between the need of large scale intervention in rural water supply and the needed flexibility to support community institutions by investigating the implementation of the Mozambican National Rural Water Supply and Sanitation Program in a semi-arid district of the Limpopo Basin. The results highlights that coordination between leaderships, the key committee members and the village governance level was more important for borehole sustainability that the normative functioning of the committee. In a context where the centrality of leadership prevails for collective action against the westerner concept of self-help and organization, sustainability of rural water infrastructure derive from from the capacity of leaders to mobilize the community for supplementary funding. This in turn depends on the added value to the community of the water points and village politics. Any interventions that increased community conflicts for example for lack of transparency weakened the coordination and collective action capacity of the community and infrastructure sustainability. These results stress the role of project/program implementation pathway.

Highlights

- At village level, money availability is more limiting for borehole maintenance than spare availability
- In local context leadership prevails upon water committee good practices
- External initiatives that increased community conflict collective action capacity of the community and consequently the sustainability of small water infrastructure.
- There is a need to producing measurable indicators focusing on the quality of support to community water institutions.

Key words: Leadership, Mozambique, Small water infrastructure, Water committee, Water Governance

1. Introduction

The perceived failure of government to implement and manage sustainably rural water supply has led to support community-based-management (CMB) interventions which now prevails in most developing countries policies (Schouten and Moriarty, 2003). CMB has been promoted not only to achieve greater efficiency and sustainability of water infrastructure but also to advance the

empowerment of marginalized groups such as women and/or the poor (Cleaver and Toner, 2006). Sustainability of water supply infrastructure that can be defined as the "*continued, satisfactory functioning and effective use of the infrastructure*" (UNICEF, 2010) has long been considered as one of the main challenge of rural water supply intervention in developing countries. Community management, with its basic principles of participation, control over decision-making, ownership and cost sharing is now considered as central to long-term operation and maintenance (Lockwood, 2004). Early community involvement in the design and construction of water points (WP) also facilitates community ownership and proper functioning of infrastructure (Batchelor et al., 2000).

At national level, the CMB approach has been often integrated with the demand responsive approach (DRA) championed by the World Bank. DRA aims to ensure that infrastructure are adapted to community need and demand - that is to its economic capacity and willingness to pay (Moriarty et al., 2013). If the DRA approach has permitted to increase coverage indicators, the indicators of success often hid the poor quality and non-functionality of WP. its two main critics was that communities could not maintain their systems alone and the sustainability of hardware or Small Water Infrastructure (SWI) required long term institutional support: DRA is a project-based approaches and intervention are bounded in time and space which limits large up-scaling and sector improvement (Lockwood, 2004; Smits et al., 2013). To overcome the shortcoming of DRA projects, programs are being reviewed to incorporate a service delivery approach orientation. They aim to encompass the full cycle of water service delivery from planning to operation and maintenance in order to improve water rural supply by the provision of lasting services against defined and measurable indicators (Moriarty et al., 2013). They emphasize the need to strengthen the institutions at the intermediate level, increasing sector coordination and harmonization.

The approach retained by the Mozambican National Rural Water Supply and Sanitation Program (NRWSSP) or PRONASAR program (*Programa Nacional de Abastecimento de Água e Saneamento Rural*) launched in 2010 is typical of this type of hybrid program. The rural water sector was reformed in order to move from the traditional focus on building new facilities, towards setting up institutional and management structures that can maintain and ensure long-term water facilities (Jiménez and Pérez-Foguet, 2010). Following the Paris Declaration on Aid Effectiveness (2005), various donors abounded a common fund for rural and water sanitation. The program has four components (1) Support to sustainable increase in rural water supply and sanitation coverage (2) Development of appropriate technologies and management models for Rural Water and Sanitation sub-sector (RWSS) (3) Capacity-building and human resource development in the RWSS (4) Support to decentralized planning, management, monitoring and financing of RWSS, with a focus on "*inclusive, bottom-up planning, improving the accuracy, completeness and communication of information for planning, budgeting and managing rural water and sanitation*" (MOPH/DNA, 2009). Districts were proposed as the focal point for planning, implementation and monitoring of the program while Provincial level was put in charge of elaborating and managing the contracts with the private sector for drilling and "Participation and Community Education" or PEC. Although the importance of involvement of communities, capacity building and institutional development is being highlighted, the program also strongly encourages the involvement of private sector through the development of "*clear contractual framework*" (Jiménez and Pérez-Foguet, 2010; Quin et al., 2011). The private sector are mobilized in the construction phase (drilling constructors), maintenance beyond community means (mechanics), commercialization of spares (salesmen) and software activities such as support to community management institutions (NGOs and consulting firm). This contractual dimension between community, administration and private sectors ensures in particular the up-scaling and large scale dissemination of the approach.

But there is an inherent tension between large scale intervention and support to community institutions. Up-scaling or large scale dissemination often need standardized procedure while community institutions are characterized by their variability. Indeed studies underlines that a large variability of rules may ensure a sustainable management of WP such as for example tariffs value, their management or collection mechanisms (Batchelor et al., 2000). Moreover investigation on community institutions points out how these institutions are shaped by social relationships and by local and wider contexts of history, politics and economy (Benjaminsen and Lund, 2002; Cleaver

and Toner, 2006; Leach et al., 1999). This paper explores this contradiction through example of the implementation of the PRONASAR program in the semi area Mabalane district, a little populated and mostly agro pastoral district located in the upper Mozambican part of Limpopo Basin.

2. Context

Mabalane is one of the 5 districts of the Gaza Province selected for the pilot phase of the PRONASAR program. The 5400 families of the district are spread in 3 administrative posts (APs): Mabalane-Sede (42 % of the population), Combomune (30 %) e Ntlavene (28 %). Each AP is divided in localities grouping various villages and communities. At local level the administration is being represented by a "locality chief" (*Chefe de Localidade*) appointed by the government. A locality village "controls" various communities. All communities in a locality elect a 1st scale leader (lider do primeiro escalão) to represent them at locality level. At village or community level a 2nd scale leader (*Lider do Segundo Escalão*) is elected to represent village members. New election can be organized if the leader chooses to resign (to migrate for example) or if he dies but there is no periodic reelection. Communities have also a traditional leader which inherits his responsibilities and is in charge of traditional ceremonies and land allocation. In the area he generally holds the title of 3rd scale leader. Each leader has his own set of advisors. Other sets of responsibilities in the village includes the block and sub-block chiefs - which used to be party related – and members of the community police. The Frelimo party also has his own local representation and memberships system.

Two third of the population of the district is located on the riverine area along the Limpopo River which also delineate the border of the Limpopo National Park (LNP). The villages located on the left side of the river are thus part LNP buffer zone and submitted to its specific regulation concerning fauna and flora management. With 72 % of its population below poverty line Mabalane is part of the 4th quartile of the poorest districts of Mozambique according to official ranking based on nutrition, food security and access to public good indicators. It is also the third most problematic district of the Gaza province in term of nutrition index, with higher chronic denutrition level that national average (PEDD Mabalane, 2010). A train line connects Mabalane to the informal Northern Gaza capital Chókwè a 100 km away but none of the district 439 km of roads were tarred in 2012: access and transport remains a real issue for most communities, particularly for the villages of the LNP buffer zone as there is no bridge in the district.

There is three main sources of water in the district: the Limpopo river flows or its alluvial waters (during the dry season) accessible to riverine communities; the water stored in small reservoirs on a non-permanent basis; groundwater whose access characterized by very deep water table (over 50m up to 100 m) and salinity issues (FAO, 2004). Thus water access depends of the localization of the villages and three main areas can be distinguished: (1) the riverine villages of the right margin which have access to alluvial and river water. This zone can further be subdivided between villages located in the southern and middle part of the district which are close to the tarred road and/or to the district center and thus have more easy access than villages from the northern area. (3) The left margin riverine villages constrained by the LNP regulations and access issues (4) The Plateau villages with no access to superficial water: All water bodies in this area follow an ephemeral regime which allow filling a few small reservoirs, non-of them being permanent.

Prior to the PRONASAR project, the district claimed having 56 boreholes, 15 small water systems (SWS) which are motorized water system pumping groundwater or the river water as well as 17 non-permanent small reservoirs. Officially 25 % of the boreholes were non-operational, a higher level than the 20 % national average (MOPH/DNA, 2013; Munguambe and Langa de Jesus, 2011). The real number of functioning water points remained however subject to caution: during a partial census undertaken in 2012 in the right margin riverine villages, 12 out of the 36 water points (WP) were found non-operational (33 %) while other SDPI internal documents pointed out 31 % of non-functioning boreholes;

Most of the existing boreholes and SWS had been developed in the last fifteen years by projects and interventions managed by different NGOs (namely World Relief, LWF, CARITAS and PROMUJE), either as post war reintegration process and/or post-flood or drought relief support. Even if each NGO had their own strategy in term of community mobilization and organization of governance, in most of the case it included the creation of a water committee and the payment of a water fee for the maintenance of the WP. In all the villages visited a water committee still existed although its composition varied from one village to the other. One person of the village was also in generally in charge of the regular maintenance of the hand pump. In all WP users are expected to pay a water fee, which is most of the time a monthly tax although it occasionally took the form of payment by containers, cattle head or a quota when breakdown occurred.

The PRONASAR program had put a strong emphasis on the restructuration of the maintenance model: One of the three contracts of the intervention was devoted to Participation and Community Education (PEC) dimension which aimed to "*ensure involvement of communities in the process of building, rehabilitation and management of boreholes in order to guarantee their sustainability"* (DPOH, 2011). It also included sanitation education and organization of the spares supply chain. The two other contracts dealt with the technical dimension of borehole development (hydrogeological survey, drilling and drilling supervision) which planned to develop 30 boreholes and rehabilitate 7 others in a three year period (2011-2013). Payment was made against achieved results measured by quantitative indicators (Box 1).

BOX 1: INDICATORS FOR MONITORING OF THE PEC CONTRACT

- 100 % of the water committees of the newly created or rehabilitated boreholes have been capacitated and have selected a maintenance and management system
- 100 % of the mechanics and spare salesman have a business plan identifying communities clients, services prices and type of repairs.
- 100 % of water committees of newly build or rehabilitated WP have a written agreement with a local mechanic
- 100 % of these committees have the fund to pay the services as specified in the agreement
- 80 % of old water points have a revitalized and active water committee
- 80 % of them have funds for operation and maintenance

If the PRONASAR document underlined the need to adapt borehole governance model to local context, in practice the PEC contractor promoted a given model (a water committee with specified functions) and organized the training for fund management around the recommended PRONASAR fee booklet. The program insisted on the need for communities to cover the main operation and maintenance expenses but did not impose a given tariff or collect mode for that. The contractor focused on the payment of a monthly fee whose value was to be chosen by the community. The program however acknowledged that some repairs or rehabilitation was out of reach of community and that the district services should include in their budget a value (non-specified) to cover for this type of repairs. The organization of the spare value chain focused in the development of agreements and "contracts" between salesmen, mechanics, the communities and the district service. Thus the PEC contract gave a strong importance to the structuring of the spare value chains, the formal institutionalization of the committee, the organization and management of water fee collection all of these dimension being summarized in the idea of "professionalization" of community management (Pendly and Obiols, 2013).

3. Methodology

The development and management of SWI in the context of the PRONASAR program was investigated in a three steps approach. First the institutional framework, the normative and

implementation orientation of the program were characterized by reviewing program documents and interviewing key actors at national, provincial and district level.

Twelve communities located in the three areas identified in Mabalane were selected to explore water uses, access and SWI management at community level. Selection used information concerning water points and population available at district level, notably the PRONASAR data. This village level survey included: (i) an interview of each leaders (ii) focus groups with water committee members (iii) in two villages focus group with women (iv) transect walk and visit of village SWI accompanied by member(s) of the water committee.

In three villages a quantitative survey (119 interviews in total) was also carried out to analyze water uses and perceptions over water access and SWI management. Villages were chosen to have more than 200 households, more than one borehole and different water sources. One village was selected in the southern right margin, another in the middle northern part and the third one in the LNP buffer zone. The data concerning number of households in the document proved incorrect: household lists (provided by leaders) are elaborated according to expectation and the same household may be counted under different name in order to enhance the chance of one household to get access to external support. Thus the number of households varies in the different district documents. We also identified many mix-ups between village names. It seems that Village 3 of our sample was confused in the PRONASAR database with another neighboring bigger village: this confusion can only explain why this small village (69 households instead of the 225 households on paper) received a second borehole while none of the other bigger neighboring villages did. Table 1 summarizes the main characteristic of the three villages studied.

TABLE 1: SOME INFORMATION CONCERNING THE THREE VILLAGES STUDIED

	Village 1	Village 2	Village 3
Households number	175 (360 on paper)	334 (492 in paper)	69 (226 on paper)
Interviews number	36	66	16
Water sources	River and 3 boreholes (1 old, 2 new PRONASAR)	River, 1 lagoon, 1 reservoir, 3 old boreholes (one non-functioning), 1 new PRONASAR	River (20 mn walking), 1 old borehole, 1 new PRONASAR
Infrastructure	Health center, Movitel aerial, small solar system INAS intervention (older people) School building in medium state	New health center School building in bad state	Extremely precarious “school” (traditional material)
NGOs project support	One research-action project focusing on small animal breeding (2008-2010)	Long term intervention of one NGO which is no longer intervening (tank cistern, irrigation, conservation agriculture etc)	No intervention
Associations	Goat breeder association Charcoal making association (non- functioning)		

In each village, the leaders were asked to group each households in four wealth groups (*Poorest, Poor, Middle and Better-Off*) according to their own perception. Twenty percent of the households in each package were them randomly selected and interviewed.

In this sample, 71 % households were headed by men but 54 % of the interviewees were women. Thirty-two percent of the households had at least one member away (in migration for example). Fifty one percent reported having at least one member with chronic disease[1] and 32 % at least one

[1] **With a strong likelihood to be AIDS related**

member above 65 years. In average households held 8,9 persons with 3,7 children under the age of 15. Village 3 had slightly younger household with consequently smaller family (Table 3).

The group "*Poor*" represent 42 % of all interviewees of our survey and the group "*Poorest*" 21 %. This proportion gives an indication of the size of each group as estimated by the leaders. The percentage varies slightly by village. In any case all leaders allocated more villagers in the lower half of the classification than in the higher wealth half.

TABLE 2: DESCRIPTION OF THE SAMPLE

	Village 1	Village 2	Village 3	Total sample
Age of head of households	50,2 (13,5)	49,2 (14,3)	44,1 (12,7)	48,8 (13,9)
Total family size	8,5 (4,0)	9,3 (5,2)	7,9 (3,5)	8,9 (4,7)
Children less than 15 years old (yo)	3,7 (2,4)	3,7 (3,3)	4,1 (2,9)	3,7 (3,0)
Number of people with chronic disease	0,6 (0,8)	0,7 (0,8)	0,6 (0,7)	0,6 (0,8)
% household reporting people with chronic disease	44 %	57 %	44 %	51 %
Nb of people above 65 yo in households	0,4 (0,8)	0,5 (0,8)	0,2 (0,4)	0,4 (0,7)
% household reporting people above 65 yo in households	31 %	36 %	19 %	32 %
Head of household is a women	27,8 %	32,8 %	18,7 %	29,4 %
Iinterviewee is women	63,9 %	43,3 %	75,0 %	53,8 %
% household reporting member in migration	33,3 %	29,8 %	37,5 %	31,9 %

Average (standard deviation)

The questionnaire was divided in 5 parts: (i) main characteristics of the households (ii) identification of the sources of water used for the different uses (iii) perception concerning borehole management (iv) Access to emergency relief aid and project intervention (v) perception concerning equity and priority interventions at village level. This last part used a card selection approach: Interviewees were asked to select and justify their choice concerning three preferred development options and three least preferred options in a set of eighteen options presented on cards. The different options were selected because they had been tried by different programs/projects in the area. Five of these options directly dealt with water supply SWI and sanitation (option A B C D E and R) (Box 2).

BOX 2 : THE DIFFERENT OPTIONS PROPOSED IN THE CARD PREFERENCE EXERCISE

A A new borehole even with saline water , monthly payment following on-going tariff
B A new borehole only if water is not saline, monthly payment following on-going basis
C A small water system with good (non-saline) water payment on container basis (50 ctv/container)
D Rehabilitation or building of a reservoir
E Demonstration of cistern in 5 families
F Upgrading of the school
G Motorized maize mill / grinder
H Subsidy for irrigation (1 moto-pump and 1 year input) to an association (40 families cultivating 5 ha)
I Subsidy for irrigation (1 moto-pump and 1 year inputs) to 1 farmer for 15 ha - commits to engage 5 villagers
J Subsidy for irrigation (1 moto-pump and 1 year inputs) for farmer for 20 ha – partnership with 9 other farmers
K Subsidy in the form of 20 goats for 20 families on a rotating scheme: off-springs are given to other families
L Subsidy in the form of 7 cows for 7 families on a rotating scheme
M Subsidy in the form of one pair of oxen and plough to one family
N Food for work program allowing to engage 30 families
O Monthly subsidy 5 vulnerable families or orld people on a 50 MT
P Subsidy to 100 families in the form of vouchers to buy input in agricultural fair
Q Demonstration of innovation agricultural techniques developed in the plot of 1 farmers (but attended by village)
R Demonstration of improved pit latrine in 2 families
S Authorization of making charcoal making on a quota system (Village 3 only)
T Authorization of making charcoal with no conditions attached (Village 3 only)

4. Results

4.1. Water quality and small water infrastructure management

Different sources of water were available in the villages studied: principally boreholes (of different salinity level) and river but a few families also occasionally collected rainwater mostly during the rainy period (see table 3). Obviously the source of water mobilized depended on the location of the village: Plateau area villages were more likely to benefit from a small reservoir with occasionally borehole(s) and/or wells. Riverine village had access to alluvial and flowing water depending of the season.

In our quantitative survey sample, each person used in average 18,9 liter of water per day with no statistical difference between wealth groups, below the international norm of 20l/day per person for good service (Zita et al., 2012).

The different water uses logically mobilized different sources: for example in riverine villages cattle were watered in the river. But this varied according to location and in remote area cattle were supposed to use (dedicated) small reservoir until they dried and then the animals were herded to the river. But in some villages they were authorized to be watered at waterhole providing a special water tariffs (per cattle head).

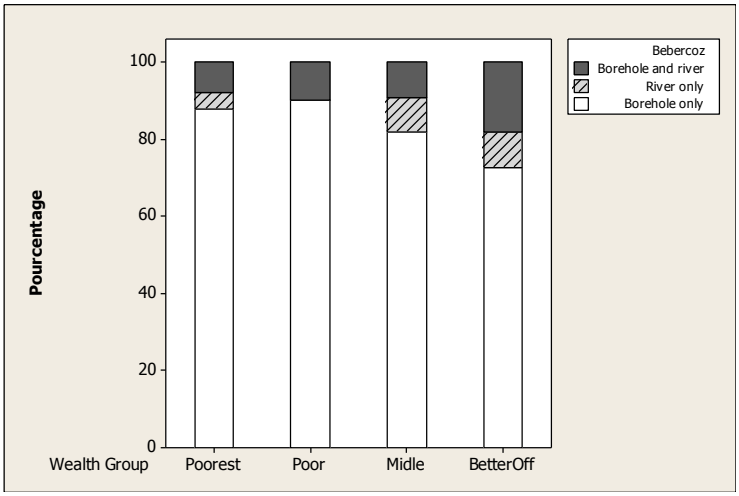
TABLE 3: MAIN WATER SOURCES IN THE THREE VILLAGE STUDIED FOR DOMESTIC AND ANIMAL USE

	Village 1	Village 2	Village 3
Number boreholes	3 (2 PRONASAR built)	3 (1 PRONASAR built) + 1 non funcional	2 (1 PRONASAR built)
Salinity (µS/cm)	4700 (old WP -CPWF measure) 4800 (PRONASAR WP) (3500 old wp CPWF measure)	4900 (old WP - CPWF measure) 2800 (PRONASAR wp and measure)	3300 (PRONASAR measure)
Distance to River (walking time)	15/20	3	15/20
Nb Families	180	335	80
% of respondents using only borehole for domestic purposes	86 %	81 %	100 % (except during the hottest month of the year due to salinity)
% of respondent collecting rainwater during rainy season for domestic purpose	8 %	0 %	0 %
% of respondents washing cloth only in the river	100 % (86 % in rainy season due to water turbidity)	96 %	100 %
% of respondents using only boreholes water for small animals	77 %	77 %	73 %
% of respondent using only river for cattle drinking	100 %	100%	100 %

(Source CPWF Mabalane interviews and CPWF L2 survey)

Salinity level also impacted uses (Table 3) and source of water used for domestic purposed varied depending mostly of distance to the source and salinity of the closest WP. This was also related to household wealth. When borehole provided saline water some households especially those with transportation and labor availability still used river water in spite of acknowledging its lesser hygienic quality (Figure 1). Consequently better off families tended to make more use of the river non saline water than poorest families.

FIGURE 1: WATER SOURCES FOR DOMESTIC PURPOSES DEPENDING OF WEALTH GROUP



Salinity level also impacted borehole maintenance: When various water sources were available, focus groups indicated that population mobilized to fix borehole only if no other water source of lower salinity level was found in the vicinity. For example In Village 1 and 3 located at a certain distance from the river the old boreholes had been adequately maintained even if relatively saline. In Village 2, the borehole that has not been functioning for quite a longue time was said to be more saline than others.

The card preference exercise underlined that water access remained a key priority of most interviewees. Although there was no consensus on the best type of SWI and whether to accept saline borehole quality, many villagers would rather have a supplementary borehole with saline water than no borehole (Table 4). SWS were also a debated infrastructure. Although some villagers had a preference for SWS as a way to limit labor mobilization, the price was assessed by others as excluding. Not surprisingly preference varied per village that is according to the local context of water access: for example SWS was particularly rejected in Village 2 close to *Chinhequete* whose SWS has been facing difficulties for years due to poor management. There was little difference between wealth groups except for the building of a reservoir which in riverine villages with good access to water is perceived as cattle drinking scheme.

The exercise also clearly pointed out toward a preference for “blanket” equity option: villagers favor development options that benefit the whole village or intervention toward development of public good/services. They tended to reject interventions that benefit a small number of people or can be controlled by a few families. They gave importance to options that can enhance village cohesiveness and/or avoid envy and tensions.

TABLE 4 : % OF INTERVIEWEES SELECTING DOMESTIC WATER SUPPLY OPTION AS THEIR FAVORITE OR LEAST PREFERRED

A: A new borehole even with saline water, monthly payment following on-going tariff		
BEST	24 % (all in village2)	• Ensure the existence of a supplementary borehole, as it does not impose any condition • Water is still a problem, a borehole even with saline water is always welcome / it is better than nothing • What is important is to have water, we are not interested whether it is saline water or not. • Ensure the existence of an additional borehole, water is the most important
WORST	17 %	• Saline water cannot be used to wash cloth, make tea or cook beans • Saline water cannot be drunk • We already have saline water, we need non saline water
B: A new borehole only if water is not saline, monthly payment following on-going basis		
BEST	9 %	• It is non saline water, will substitute saline water for the same price • It will be less tiring for people as they will not have to go to the river to wash cloth • We can do everything with good water even wash clothes
WORST	27 % (39 % in village2)	• The equipment of the boreholes depends on good water, if you do not find it, there is no borehole; • It is selective/conditionnal, we still need more boreholes, even if they are saline • Because it selective, it reduce the possibility of having one more boreholes • It is really selective, what is important is having water, who wants good water, can go to the river.
C: A small water system (motorized) with good (non-saline) water payment on container basis (50 ctv/container)		
BEST	14 %	• We will have good water and we will spare time and effort with a tap • You pay the water at a good price, it is good water and you do not make effort to fill your tank • Good water at reasonable price and little effort
WORST	15 % (27 % in village2)	• People won't always have money to pay for a 25 l tank every day; they will go back to the river • I have seen the system of the neighboring village, it is already degraded whicg means that it is not sustainable • *it exclude part of the population those who do not have money , they will be excluded from water access
D: Rehabilitation or building of a reservoir		
BEST	0 %	
WORST	39 % (46 % in village 2) Related to wealth group (22 % only for the better-off)	• It excludes some people, we have all the same rights as we are from the same zone • We already have reservoirs, and during the dry period they also dry up, it is better to go the river. • Reservoir depends on the rains, when it doesn't rain it does not help in anything. • People will use it for other objectives such as bathing or cleaning clothes instead of cattle drinking.
E: Demonstration of cisterns in 5 families		
BEST	5 % (all village 1)	• Will be useful for irrigation
WORST	14 %	• It benefit only few families ; Too selective will create envy and conflicts • The one that will receive the tank will prohibit access to other

4.2. Small water infrastructure maintenance at village level

In all villages visited, there was someone in charge of the maintenance of the hand pump who generally had received a specific training by previous projects with other members of the communities. Fifteen years afterward or more few trainees remained in the village. People that are generally entrusted to do the maintenance of the WP are often young, dynamic and capable – that is

why they are selected. This means that they are also more likely than others to migrate and look for better opportunities. Indeed, NGOs now encourage training a large pool of people within village including women which are more likely to remain than the young and dynamic young men often chosen for this task (Batchelor et al., 2000). In any case for important repair, villages would resort to a couple of well-known motopump mechanics. Technical capacity was never pointed out as a limiting factor for maintenance. Neither was access to spare except for specific cases (e.g no more seller in Mozambique of a specific brand of hand pump).

Indeed a village could have one well maintained borehole and a non-operational one and an investigation of maintenance history underlined that if preventive maintenance was rare, corrective reparation were being operated but often on an irregular basis. A borehole might be non-operational for many months and then repaired. Isolated communities may have very well maintained boreholes and short breakdown duration. Nonetheless some villagers complained about the frequent breakdown of boreholes.

Spares are at the best available in Chókwè city or in Maputo (500 km away) but in spite of the distance motivated communities were generally able to find a reliable person to bring the spares. Distance of course increased spare cost but more importantly it increased the delay for reparation. So distance was not so much a limiting factor for spare access than as factor of repair delay. Money seemed to be more limiting than spare availably.

4.3. Payment of water fees

In the quantitative survey 57 % percent (n= 115) of interviewees declared to be in time of their water fee payment. This number varied village from village: a majority of resident of Village1 declared having more than 6 months' debt while 70 % of Village2 declared being "in time" (Table 5). For 92 % of interviewees their last payment was a monthly fee while for 5 % did it was a debt payment or an exceptional participation for repair. There was a clear difference between the *Poorest* group and other wealth groups in fees payment date (figure 2)

TABLE 5: DATE OF THE LAST PAIEMENT OF WATER FEE BY INTERVIEWEE

	Less than 2 months ago	2 – 6 months ago	More than 6 months	Do not know
Village 1	26 %	6 %	68 %	0 %
Village 2	70 %	7%	4 %	18 %
Village 3	63 %	19 %	13 %	6 %
TOTAL	57 %	9 %	23 %	11 %

Source CPWF IWEGA study

The 2012 fee book was checked in Village 1 (one functioning borehole at the time). According to the data 18 205 MT were collected in 2012 for a total 275 households registered that is an average of 66,2 MT/family. This represented 55 % of the expected amount (10 MT/month/ household). Only 21 % had paid the full amount and 53 % had more than 9 months' debts. This data globally correlates with the data of the survey.

FIGURE 2: LAST PAYMENT OF THE WATER FEE ACCORDING TO WEALTH GROUP

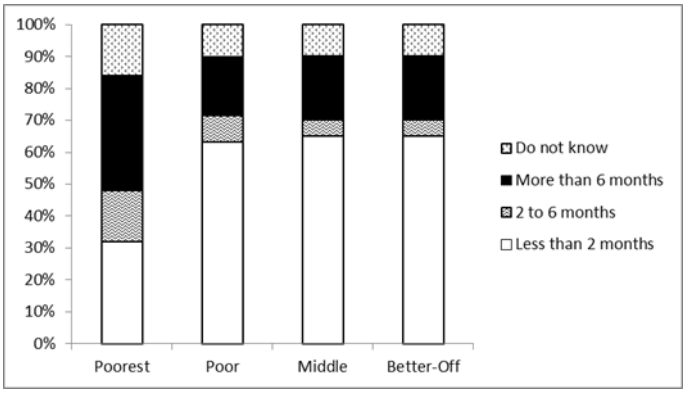


TABLE 6: PAYMENT OF WATER FEE IN 2012 IN VILLAGE 1 ACCORDING TO BOOK

	Nb	%
Households having paid water fees	181	66 %
Households not having paid water fees at all	94	34 %
Households having paid the totality of the water fees	58	21 % (32 % of the paying households)
Households than paid but paid less than 9 months	53	19 %
Households indebted for more than 3 months inclusively those not paying	147	53 %

Source CPWF IWEGA study

4.4. Community functioning and water committee

The survey does not point out toward major transparency issues with 87 % of people informed of money use and 84 % approving the use. *Poorest* group tend to be slightly less informed and satisfied (Figure 3 and 4). They were small difference between the *Poor* and *Poorest* group that could be explained by a lower degree of degree of "connectedness" of poorest people, by lesser engagement in community life or stronger perception of exclusion.

FIGURE 3: WHERE INFORMATION CONCERNING USE OF WATER MONEY WAS GATHERED

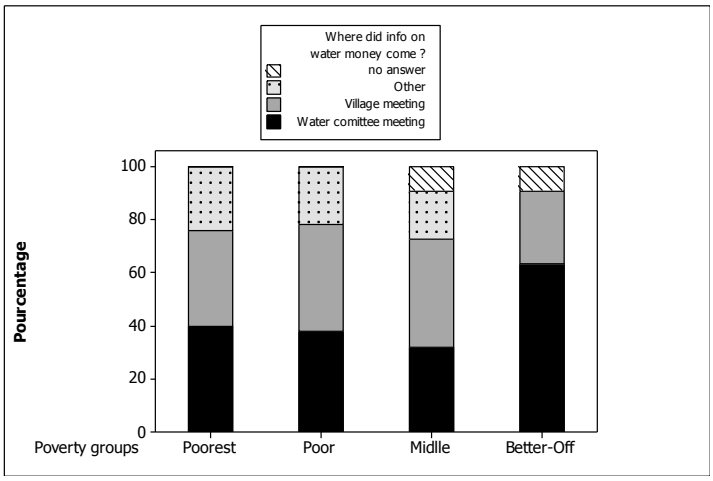


FIGURE 4: HOW INFORMATION CONCERNING MONEY USED HAS BEEN OBTAINED

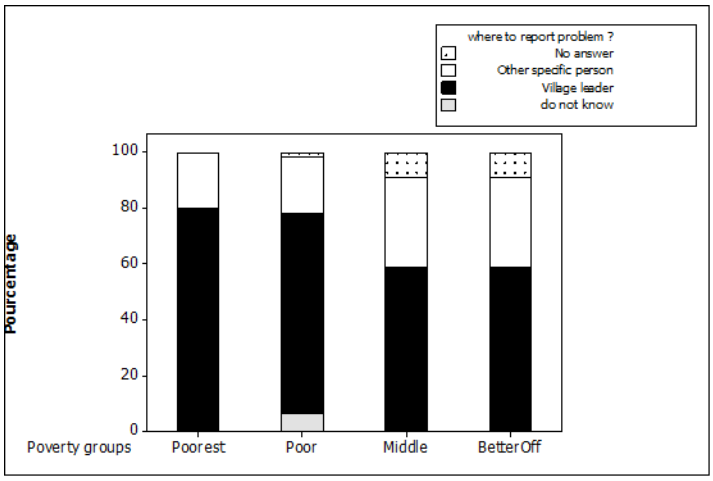
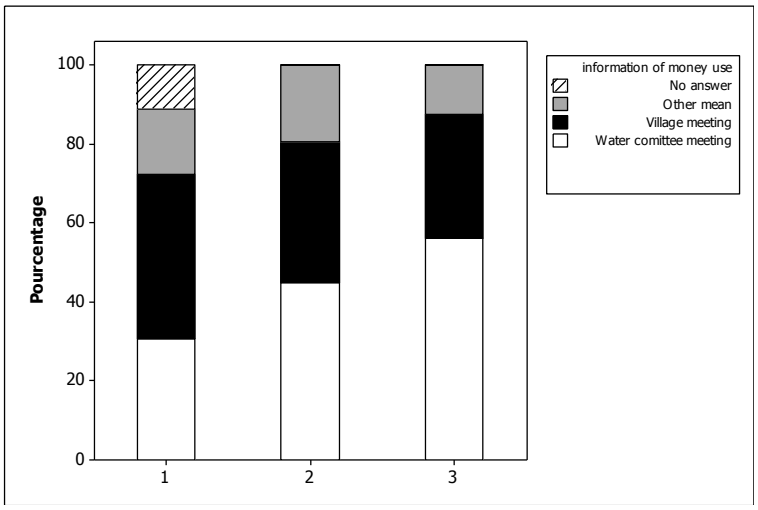


FIGURE 5: PERSON CONTACTED IN CASE OF PROBLEM IN BOREHOLE



Yet although in all the visited villages a water committee existed, its role in money management and information transfer appeared unclear to villagers: The committee was in charge of the management of borehole for 38 % of respondents while it was the community leader's responsibility for 28 % and another person for 33 % (the mechanics or treasurer for example). But when something was wrong in the borehole 72 % would report the problem to a member of the water committee and 25 % to another person of the community (not the leader), 4 % not knowing where to report. Forty three percent declared learning about the use of water money through committee meetings, 28 % through village meeting and 33 % by other mean.

Indeed, focus groups indicated that good functioning resulted more from the commitment of a couple of key person (the mechanics and/or secretary and sometimes the president who keeps the money) than functioning following the normative recommendation of PRONASAR or PEC contractors. The PEC contractor gave a specific attention to structuring water committee under the assumptions that a fully staffed committee had a lower risk of money mismanagement but this had been irregularly enforced at village level. Composition, power and role of committee indeed varied from one village to the other. In any case, committee members were nominated by leaders and not elected as recommended by the model promoted.

Globally focus group underlined that the role of water committee was limited. If the borehole had a small problem, the person in charge of maintenance would try to fix the problem when informed. If

spare or other material were needed and not available, a restricted water committee (people in charge of maintenance, money keeper, secretary and/or president) had to be mobilized to provide the necessary funds (from the borehole maintenance funds coming from water fees). The leader was most of the time informed when not directly involved in the decision. If enough money was not available, the leader was in charge of convening a village meeting where a supplementary contribution would be requested. In the social context of the communities, only the village leader is legitimate to organize supplementary fund collect.

Repairs depended thus of the capacity of the leader to mobilize the community. Difficulties of mobilization were repeatedly reported in two cases: (i) the community did not think it was worth paying for repairing the WP because the poor quality of water and availability of an alternative source of reasonable quality at walking distance. (ii) The legitimacy of the leader was contested. This was often associated with existing or past conflicts associated with poor entry strategy and/or lack of transparency of previous interventions. Occasionally these conflicts escalated up to the point of vandalism of water infrastructure. Thus all external interventions related or not to water-indirectly impacts SWI maintenance by affecting community trust or enhancing existing tensions. But even if contested leadership could jeopardize the sustainability of SWI, some communities were able to overcome their difference to make the necessary repairs in domestic SWI due to their vital necessity in the area.

5. Discussion

5.1. A governance model matching community functioning?

There was thus a discrepancy between the governance model promoted by the PEC contractor and the actual functioning of committee and communities. Responsibilities and decision making varied in each village depended on the relationships between the different leaders, including their age, families' ties and historical backgrounds. There were quite complex arrangements between inherited (traditional) leadership and elected leaders as well the respective leaders' advisors and ad-hoc committee created by external interventions; Water committee members as all ad-hoc committees (water committee, irrigation committee, hygiene committee etc) tended to be selected in the inner circle of leaders' "advisers" (*Indunas*, advisers, party members, chief block) but this was not exclusive. In practices the different responsibilities were blurred, depending of villages, one person holding various titles or titles being mixed.

Leaders played a key interface role between the community and the external world: while some leaders were accountable to their community and trusted, many acted as gate-keepers, especially when the external intervention had direct economic return. Even if this gatekeeping role was limited for water supply which is perceived as a public good in the local context, the equity exercise underlined the rejection of interventions that benefited only part of the villagers. These also concerned pilot or demonstration experimentation related to water that targeted only a few villagers. Such interventions especially those with direct economic return generate envy, tensions and frustration and thus lower trust and village cohesiveness.

The contractor focus on committee good practices (such as fully staffed committee and regular meetings) did not fit their real role at community level which is of low level administration (fee collection and daily management); Strategic decision making notably money issues is leader(s)'responsibility. Indeed transparency and accountability of water committee was an important issue at village level but it also depended on other factor such as internal politics of the community and leadership. Interventions weakening community social capital even when not directly related to water could be as detrimental for WP sustainability as water fee accountability issues. This pervasive cumulative impact of poorly designed and implemented external CMB initiatives has been underlined in forestry management in Southern Africa (Kamoto et al., 2013). In other words implementation pathways matters and have to be adapted to village local context.

This results also highlights the importance of leadership in the reliability of water delivery as underlined by (Mesa et al., 2014). In local context, the centrality of leadership for collective action seems to prevail against the westerner concept of self-help and organization (Cammack, 2012). This questions the emphasis on formalization of water committees.

5.2. The limits of perceptions and local knowledge

In this thirsty area, many villagers would rather have a supplementary borehole providing saline water rather than no borehole. On the other hand, maintenance level is related to the added value of WP to the community which includes its relative salinity level. With a focus on sustainability it thus makes sense to avoid the building of a supplementary saline borehole a decision of the PRONASAR program. But this decision had not been shared with the population and was the source of many tensions and frustrations (Ducrot and Bourblanc, 2014). As underlined, these tensions should not been overlooked as they can directly impact the engagement of community. It also stresses the importance stakeholder's participation in planning and design phases of service delivery approaches.

But community may lack information and/or experience to properly assess the interest and drawback of innovative water system. Although not a priority in these riverine villages where cattle have easy access to the river, the development of small water reservoirs coupled with SWS is considered by local technicians as the only sustainable system for the isolated Plateau communities which have limited access to water. But SWS are more complex and costly to manage than hand pumps: they require thus higher management organization and higher tariffs. Population - and technicians - are not necessarily well aware of these dimensions as underlined by the preference choices. The development of small reservoir with SWS should not be undertaken without debating these issues with the community and providing an effective support to community going beyond the creation and rapid training a few members.

5.3. The limitation of monitoring indicators

Service delivery approaches highlight the need of measurable indicators to ensure the efficiency of contractual relationships and program implementation. This indicators should help to overcome the drawbacks of project-based approach that gave a stronger attention to outputs (e;g number of committees revitalized or WP built) than outcomes (such as quality of service) (Lockwood and Smits, 2011). But in practices the indicators proposed remains more or less the same and did not account for outcomes or equity issues.

Contrary to other program water rural supply (Cleaver 2006) equity issues were explicitly considered in the PRONASAR program: it recommended for example the allocation of budget at district level for repairs out of reach for communities as well as promoting social tariffs at community level. Specific indicators were proposed at program level. But they were not part of the PEC contract. Not surprisingly the contractor focused exclusively on the fixation of a monthly tariff, ignoring other options or social tariffs even if they were already in use at village level. Moreover although the PEC contractor was aware of some of the factors impacting local maintenance (such as salinity level for example) the type of indicators proposed associated with the delays and difficult contractual relationship with the provincial level (Ducrot and Bourblanc, 2014) favored the development of a superficial local approach which was enough to comply with indicators. The same bias could be observed with the drilling contractors who was logically interested to finalize the contract within the contract timing than slowing pace to give time to technicians, district government and leaders to reorganize WP allocation in a participatory manner when it appeared that salinity level constrained the initial allocation. This resulted in many frustration and local tensions which could impact the sustainability of the newly build WP.

6. Conclusion

The results demonstrate that the water committee good practices that the PEC contractors tried to disseminate had little relevance locally for borehole sustainability. Community responsibility for SWI management and maintenance was not challenged and maintenance was globally considered as a community issue. But the articulation between leaderships, the key committee members and the village governance level was more important for SWI sustainability than proper normative functioning of the committee. This in turn depends on the added value of the SWI to the community and on the mobilizing capacity of the leader or village politics. Any approaches in interventions that increased community conflicts for example for lack of transparency or favoring some resident weakened the coordination and collective action capacity of the community and consequently SWI sustainability. In this context the tensions related to the implementation of the innovative PRONASAR program should not been neglected. These results stress the role of project/program implementation pathway. It also call for building of technicians' capacity to be more sensitive to the social and political dimension of (water) infrastructure management and the need to define indicators measuring the quality of the implementation process to complete classical efficiency indicators.

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