West Africa Water Supply, Sanitation and Hygiene Program (USAID WA-WASH)

Proposals for the maintenance of hand pumps in the municipalities of Gorgadji and Aribinda (Sahel Region)

Report

June 2015

IRC

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List of acronyms and abbreviations

AEPA : Approvisionnement en Eau Potable et Assainissement /Water supply and sanitation

AR : Artisan Réparateur /Local Mechanic

AUE : Association des Usagers de l'Eau /Water User Association -WUA

BAD : Banque Africaine de Développement /African Development bank

CPE : Comité de Point d'Eau / Water Point Committee - WPC

DAO : Dossier d'Appel d'Offres /Tender document file

DEIE : Direction des Etudes et de l'Information sur l'Eau /Direction on Water Studies and Information

DGRE : Direction Générale des Ressources en Eau /General directorate for water resources

DREAHA : Direction Régionale de l'Eau, des Aménagements Hydrauliques et de l'Assainissement / Regional directorate for water, hydraulic works and sanitation

FCFA : Franc des Communautés Financières Africaines /African Financial community Franc

OMD : Objectif du Millénaire pour le Développement / Millenium Developement Goals -MDG

ONG : Organisation Non Gouvernementale /Non-Governmental Organisation -NGO

PAR : Programme D'Application de la Reforme /Program for the Application of the Reform

PCD-AEPA : Plan Communal de Développement Sectoriel AEPA/Municipal Developement Plan –Water and sanitation

PN-AEPA : Programme National d'AEPA /National WASH programme

PEM : Point d'Eau Moderne /Modern Water point

PMH : Pompe à Motricité Humaine /Hand Pump

Executive summary

Boreholes equipped with handpumps are the main improved technology for water provision in rural Burkina Faso. In the two focus municipalities where IRC operates, Gorgadji and Aribinda, 123 and 208 boreholes can be found, out of which respectively 88% and 89% were in a functioning state as of March 2014. Moreover, 8% of the total is over 30 years old and needs rehabilitation. Access rates were in 2012, respectively of 44% in Gorgadji and 41% in Aribinda (based on 300 individuals/water point). As for any infrastructure, these boreholes need regular maintenance.

Maintenance as well as all aspects of water service provision is currently the responsibility of municipalities in rural Burkina Faso. In Sahel, one of the regions following a reform on water management introduced in 2008, municipalities delegate maintenance of hand pumps to WUAs. They also officially appoint local mechanics to ensure continuous maintenance.

Before the implementation of the local monitoring cycle (supported by IRC), repair times were on average 7 days long, with breakdowns lasting sometimes up to several months. Since the monitoring started, the down time has been reduced to an average of less than 3 days. In spite of this progress, a number of boreholes cannot be repaired quickly enough in the absence of professional mechanics, low financial provisions at Water users associations (WUAs) and household and easy access to adequate spare parts. This study explores the relevance of these hypotheses and explores options to reduce breakdown times further.

The analysis was based on data collected by IRC over the period 2012-2014, and looked at breakdown patterns, repair time and associated costs for all functioning boreholes. It concludes that despite a reduction in downtime, there is a direct correlation between the number of breakdowns and the costs of repair. This is explained by the following two factors:

1. The difficulty to obtain new spare parts, resulting in the use of second hand parts of lower quality, thus leading to more frequent breakdowns and;
2. The limited knowledge of mechanics, which “do the best they can with what they have”.

The study also shows that financial capacity from WUAs and contributing households is not a determining factor. Indeed, approximately USD 1,500 is available in Gorgadji and USD 25,000 in Aribinda (over a 6 months period) and these resources are currently not used optimally (especially in Aribinda). With such amounts, Aribinda could rehabilitate over 7 boreholes (at an average rehabilitation cost of USD 3,000) and Gorgadji maintain adequately 25 to 30 boreholes (at an average repair cost of

USD 50). In other words, based on current tariffs collected at village level, the two communes both have the financial potential to cover the cost of repairs in a more professional way and thus limit the number of breakdowns.

Management models and modalities were explored through this study to find out how municipalities could take the next step. The “full warranty” modality, which implies a transfer of responsibility related to maintenance to a private operator, was explored. This modality has already been tested in the country years ago, and lessons from its failure (mainly due to the lack of legal recognition) were identified.

With the objective of finding innovative yet realistic means to improve maintenance, IRC believes the “full warranty” modality is worth further exploration. To that end, it sponsored a complementary study on an improved model for more professional and efficient hand pump maintenance. This study has been completed by an operating and maintenance company, Faso Hydro, already operating in the Sahel region (on small piped systems).

The second part of this report presents three scenarios for further professionalization of maintenance. In all scenarios, a set of pre-conditions needs to be met. Pre-conditions include higher functionality levels and further training of existing mechanics. The “full warranty” modality would bind the private operator to:

- Reduce the number of breakdowns;
- Repair with the highest quality spare parts;
- Reduce downtime to less than 24 hours;
- Carry out regular water quality testing.

Roles and responsibilities of key stakeholders were also assessed as compared to the current Reform, and suggested changes formulated to position the private operator as an intermediary between the WUAs and the municipality.

The full cost of water delivery was calculated to include repairs and maintenance, salaries, and gross profit margin and fixed and variable costs identified, based on Faso Hydro’s experience and knowledge of the region and on the current national recommendations and norms. Based on these calculations, three scenarios are detailed in the tables below.

Table A. Summary of financial scenarios for improved maintenance

Figures in F CFA	Scenario 1	Scenario 2	Scenario 3
Contribution to payment of district technician and costs of the District Water and Sanitation Committee	5 000	8 856	5 494
Provisions for major repairs (borehole, superstructure etc.)	NA	75 600	75 600
Water managers salaries (*currently working on a volunteer base*)	NA	132 000	NA
Misc. costs from WUAs (communications, transport)	NA	84 000	NA
Replacement of hand pump spare parts with full warranty	25 000	46 492	34 593
Initial contribution for hand pump rehabilitation	5 000	8 856	5 494
Initial contribution for a new borehole	5 000	8 856	5 494
Margin on variable costs	35 000	78 138	56 245
Total incompressible costs of the operator (including mechanics)	8 975 000		
Total /year	**9 050 000**	**9 417 798**	**9 157 920**
Minimum number of hand pumps to achieve profitability	256	115	160
Annual cost/household	2 500	14 000	6 304

Scenario 1 is based on financial recommendations by the government (and displayed in the Reform documents). Scenario 2 considers all operation-related costs (maintenance and repairs, local staff - currently involved on a voluntary basis, contributions to rehabilitation, etc), while scenario 3 only covers maintenance and repairs. Results indicate an important gap between the current water tariff (2500 FCFA/year/HH) and the real full cost of water services (14,000 FCFA/year/HH). To bridge that financial gap, subsidies could be envisaged.

Considering the different size of the two municipalities, the adoption of a professional maintenance model (based on the three scenarios listed above) needs to take place at extra-communal level in order to be financially viable. A number of questions remain unaddressed: how to guarantee preconditions are met? What about timeline and financing rehabilitations of all boreholes in need? How long should the full warranty contract last for? This study being a first step in exploring this modality, answers to these questions are expected to arise as the idea is endorsed by stakeholders and adjusted.

This analysis and the scenarios have been presented to local government stakeholders (mayors, Regional directorate representatives, local mechanics etc.) and to national stakeholders in a two-day workshop held in July 2014 in Ouagadougou. Reactions were lukewarm and demonstrated a mix of interest, in particular to the suggestion of increasing private operators' presence and role in the management of water services. For IRC and its partners, further advocacy work at local level is required to understand and overcome these hesitations.

I. INTRODUCTION

1.1 CONTEXT AND JUSTIFICATION

This report focuses on defining the conditions for the establishment of an effective repair and maintenance system for handpumps in the Sahel region. It is in the context of improving the sustainability of water services to which two municipalities (Gorgadji and Aribinda) have committed since October 2013, with the support of IRC Burkina Faso (Triple S project) and the results of a monitoring process that has been undertaken since the completion of a baseline study done end 2012.

The local repair and maintenance of equipment is a key element of the sustainability of public drinking water. Indeed, the isolation of some areas of the Sahel region, the lack of human and financial resources to rapidly deploy on-site interventions and the lack of a reliable system of spare parts nearby are the main constraints for the rapid repair of handpumps, which experience outages of over three days.

According to the Reformation, the handpump management unit is the village. It is in the village that repair and maintenance expenditures are paid and water user revenues are collected. the collected revenues must be able to cover repair and maintenance cost and the manager's salary. Preventive maintenance is shared: Water user associations pay 10,000 FCFA per handpump per year for maintenance personnel to come around 2 times per year to service all handpumps in a municipality.

Corrective maintenance (repair) is not pooled as such, but the presence of trained craftsmen trained and familiar with the equipment is beneficial. The water users of each village, through their WUAs, must mobilize the necessary resources to repair their handpump. The financial management of repairs or maintenance is not pooled: a WUA may have excess cash while another has shortage and cannot pay its 10,000 FCFA contribution to maintenance, which will lengthen the breakdown period and the lack of services to a number of users. To produce an analysis appropriate to the context, IRC enlisted the services Faso Hydro Ltd for the development of maintenance scenarios, as well as for contextual elements.

1.2 STUDY OBJECTIVES

Despite efforts by all stakeholders, the maintenance sector remains inefficient with long duration of breakdowns, repeated failures over short time, maintenance personnel's lack of knowledge about

certain brands of pumps and lack of financial resources to cover the cost of repairs etc. In view of these observations, a reflection on the issue of management and maintenance funding was started: would the pooling of revenue for maintenance help to improve the quality of service to be provided, all else being equal (at constant rate and level of collection)? And if so on what scale; several WUA, one or several municipalities? To answer these questions, this study is conducted on the maintenance of municipal handpumps in Gorgadji and Aribinda to show the conditions under which the management of the said service could be delegated to a private entity on the basis of performance indicators in order to comply with the regulations.

The idea is to know what it would cost to comply with management and maintenance requirements across both municipalities when this would be delegated, and compare the costs to the way currently management and maintenance is organised, based on a system of village volunteers and maintenance personnel under contract with municipalities.

1.3 MANDATE AND EXPECTED RESULTS

This report is targeted to sponsors and policy makers at the local level. It is based on tender document for service providers that could be consulted later. The following items are contained in this study report:

- The context and the issues associated with the provision of services in both towns targeted;
- A description of the operational organization to be put in place for maintenance and repair (clarification of the system to see how it can be more efficient than the existing);
- The condition of the equipment to be under this contract (to be refined by incorporating water points with small debits or those whose water is not potable so with problems not related to pump failures);
- The modalities and response time in case of failure;
- The warranty on repairs and spare parts;
- A proposed contract between the service provider and the municipality;
- Any useful precision to ensure the professional quality of service compared to the current system.

Financially the study report shows:

- The projected costs for a time period for the duration of the investment;

- A proposed fee to cover these costs based on the standards in terms of number of persons per handpump;
- An analysis of the difference between the new rates and the current proposals and incentive for users to adhere to the new system;
- An analysis of the cost per m3 of water potentially mobilized;
- An analysis of the preconditions and obligations of the other parties needed to ensure the success of the new system;
- A proposal to collect fees from users and the financial system;
- Role of the municipality in the system.

1.4 METHODOLOGY AND SOURCES OF INFORMATION

Most of the data used in this study come from studies conducted by IRC in the area since 2012. Some data, such as flow rates and water quality etc. is not already available, the consultant could not deepen the diagnostic on functionality.

Moreover, the scenarios do not take into account actual population growth. In reality access rates may be lower. A standard rate is used to estimate population growth, but it is not used in calculations on handpumps renewal and boreholes rehabilitation.

1.5 FEEDBACK FROM TECHNICAL STAKEHOLDERS

IRC shared its proposal and the different scenarios with technical stakeholders in two workshops in July 2014 and June 2015. These sharing activities were shown necessary not only to validate the proposal, but also to identify bottlenecks in the sector and implementation difficulties.

The involvement of a "professional" player (potentially a local private operator) is subject to a great distrust in the sector, and more dramatically, among populations where it could actually improve the service. The terms of contracts and the current state of infrastructures (prerequisite to good management in the case of service delegation) are other elements that have raised questions of various stakeholders. The final chapter of this report provides further details.

II. THE STUDY AREA

The municipalities of and Gorgadji Aribinda are situated in the Sahel region. They fall respectively in the SENO and SOUM provinces. The population of the region according to 2006 national census is estimated at 968,442 inhabitants, of which 264,991 in SENO and 347,335 people in SOUM. The town of Gorgadji, one of six (06) municipalities of SENO had in the same period an estimated population of 29,913 people in 16 villages. Aribinda, one of the 9 communes in SOUM, housed 91,020 people in 43 villages, among which Aribinda.

According to population estimates made by IRC show 36,789 people in the town of Gorgadji in 2013 and 99,903 inhabitants in Aribinda, respectively increase rates of about 3% and 1.33% per year.

Extensive farming is the main economic activity. It is of the transhumance type and is dominated mainly by goats, sheep and cattle. Water availability remains a constraint to development. Despite the existence of pastoral wells and ponds, wells are used during the dry season. However, we note that in SENO province water supplies are low and often the groundwater tables are discontinuous. SOUM province, however, is the only one of four in the region having the best conditions for groundwater recharge

III. HANDPUMP SITUATION IN THE STUDY AREA

3.1 PHYSICAL STATUS OF WATER POINTS

3.1.1 Municipality of Gorgadji

In March 2014 the status was that 123 communal boreholes with handpumps have been installed from 1974 to 2013 in the town of Gorgadji and distributed as follows:

- Nine boreholes abandoned
- Five non-functional handpumps
- One borehole converted into autonomous water point (PEA)
- One hundred and eight (108) functional handpumps.

Of this total, the age of five holes was unknown. In the absence of more precise information, we consider the year of installation as that of the installed equipment and therefore deduce the age of the handpump.

With reference to the PN-AEPA, 117 boreholes of which the year of installation is known, eleven (11) or 9.40% were older than or equal to thirty (30) years old: therefore they must be renewed. Forty-six (46) 39.31% are less than fifteen (15) years old: these pumps must be rehabilitated.

Annex No. 1 provides a summary of the status of the equipment of Gorgadji. Note that one hundred and thirteen (113) handpumps are potentially functional.

3.1.2 Municipality of Aribinda

In March 2014 the status was that two hundred and eight (208) Community boreholes were drilled from 1974 to 2014 in the town of Aribinda and distributed as follows:

- One borehole abandoned
- Sixteen handpumps broken down (or non-functional)
- Two boreholes not yet equipped
- One borehole of which the status is unknown
- One borehole drying up
- One hundred eighty six (186) functional handpumps.

Of this total, the age of five boreholes was not reported. In the absence of more precise information, we consider the year of installation as that of equipment installed and therefore deduce the age of the handpump.

With reference to the PN-AEPA, two hundred eight boreholes (208) of which the age is known, eighteen (18) or 8.65% were 30 years old or more : they must be renewed. Eighty-two (92) or 44.23% are 15 or more years old: these pumps must be rehabilitated.

Annex No. 2 provides a summary of the status of equipment in Aribinda. Note that two hundred and three (203) TDC are potentially functional (without the drying-up borehole).

3.1.3 Partial conclusion.

The overview of the status of the water points in the two towns, is that there is a total of three hundred and sixteen (316) potentially functional boreholes with handpumps predominantly of the INDIA, DIACFA and ABI types in the two towns and two VERGNET handpumps in the town of Aribinda. In total there are 29 boreholes of 30 years and older. There are 138 handpumps of 15 years and older.

In the guidelines of the PN-AEPA, boreholes and equipment must meet the set standards.

At a unit cost of eight million FCFA to equip a borehole and 2.5 million FCFA to rehabilitate one, the investment to renew or rehabilitate would amount to ½ billion CFA franc, an amount hard to raise at this stage .

It should nevertheless be noted that the conditions laid down by the PN AEPA address the technical considerations and this should be taken into account in future investment programs in the municipalities.

The data show that in total 330 handpumps are in place and distributed as follows:

Table 1: Number of handpumps in the 2 municipalities

Municipality	Total number of communal handpumps	Functional communal handpumps	Non-functioning handpumps	Handpumps with inknown functionality	Abandoned handpumps
Gorgadji	122	108	5	0	9
Aribinda	208	186	16	5	1
Total	330	294	21	5	10

Source : IRC

Annexes 1 and 2 show the detailed situation of the park per municipality and village. These appendices contain the brands of handpumps as summarized in table below.

Table 2: Distribution of handpumps per brand

Type handpump	Distribution per bands		
	Aribinda	Gorgadji	Total
ABI	6	3	9
DIAFA	44	15	59
INDIA	80	90	170
VERGNET	2	0	2
Unknown	76	14	90
TOTALS	**208**	**122**	**330**

Source : IRC

The results based on IRC's data contain shortcomings. Indeed, the Consultant is aware of recent achievements (2010-2012) of boreholes that were equipped with handpumps of the HYDRO-INDIA type (more than thirty) in the town of Aribinda. Local technicians may have confused them with the INDIA type or may not have taken them into account. It is difficult to build a total guarantee system for handpumps when the brand/type of more than 90 handpumps is unknown.

3.2 ANALYSIS OF DRINKING WATER PROVISION

3.2.1 The access to water

Equipment rate

The equipment rate as understood and measured under IRC monitoring is 128% in the municipality of Gorgadji and 69% in Aribinda. This rate is defined as the ratio between the population theoretically covered by the different types on equipment and the total population of the locality or the zone under

consideration. These rates take into account in some cases the handpumps broken down and boreholes awaiting installation of equipment.

Functionality rate

Officially the functionality rate is defined as the ratio between the number of modern water points equipped with functional handpumps on the total number of water points equipped with handpumps multiplied by 100. A modern water point is called functional if it is likely to provide a minimum flow of 0.7m3 / h without failure for a period of more than 12 months. According to IRC monitoring data this rate is estimated in March 2014 to be 88.52% in Gorgadji and 89.42% in Aribinda. The comparison can be made in Table 3 below, the results of work of the Ministry in charge of Water of which most recent data (2012, 2013) were not available.

Table 3: Functionality rate of modern water points (PEM)

Year	Burkina Faso	Région du Sahel	Province and municipality		Province and municipality	
			Séno	Gorgadji	Soum	Aribinda
2006	79	59	58	69	56	53
2007	80	63	64	70	60	53
2008	81	72	69	78	69	67
2009	82	72	73	82	69	67
2010	82	75	76	76	71	72
2011	85	84	86	92	81	75

Source : 2011 Annual drinking water statistics

Access rate to water

The above given equipment and functionality rates, although interesting, do not specify the level of access to water. In the MDGs the notion of access rates allows among other things comparisons in certain cases. The access to water rate results from a multi-parameter calculation which takes into account:

- The population in the current year,

- Standards assigned to modern water points (PEM)
- The life expectancy of the equipment (only PEM of 30 years old or less are considered)
- Quality standards (nitrate and conductivity) and
- The distance to reach modern water point.

The calculation performed with the GIS MDG application results in Table # 4 below which was taken from the statistical yearbook issued by the Ministry of Water. Analysis of the two tables shows the positive trend from year to year rates. The situation of the municipalities of Gorgadji and Aribinda is not unique to Burkina Faso, which is struggling to achieve the Millennium Development Goals (MDGs).

Table 4: Rate of access to water

Year	Burkina Faso	Région du Sahel	Province and municipality		Province and municipality	
			Séno	Gorgadji	Soum	Aribinda
2006	51.5	35.08	38.65	25.33	35.79	32.33
2007	52.82	35.03	37.97	25.78	36.16	32.83
2008	53.99	33.83	35.31	28.04	35.94	32.08
2009	54.88	35.19	37.24	28.54	36.46	31.59
2010	56.63	42.07	46.50	39.61	40.68	35.16
2011	58.5	42.93	48.02	38.04	41.13	35.48
2012	63.0	51.6	58.7	44.3	48.8	41.29

Source : 2011 Annual drinking water statistics and non-validated data of 2012

The qualitative increases in terms of both functionality of modern water points and that of rate of access to water in 2011 can in part be explained by the program of realising boreholes funded by ADB in the four Sahel Region countries.

In order to establish a good water service in the municipalities, there is scope of combining the guidelines issued by the PN-AEPA and taken into account in the calculation of access to water rates. Planning new facilities will incorporate the distance to reach an modern water point. In order to come to a profitable total maintenance guarantee package, a critical number of participating installations is necessary. The following financial analysis below will highlight this aspect.

3.2.2 Water quality

Throughout the handpump park of the two municipalities, only 59 handpumps were recently analysed, among which 31 in Aribinda and 28 in Gorgadji.

The water quality assessment made of these handpumps shows that (according to WHO standards) the water quality is good for 27 handpumps in Aribinda or 87% (27/31) as well as for 26 handpumps in Gorgadji or 93% (26/28). See Table 5 below.

One has to take into account the low proportion of handpumps analysed (Aribinda: 31/188 or 16.5%; Gorgadji: 28/108 or 26%). This makes it possible to form an idea about the handpump water quality in the two municipalities concerned. Further investigations could be carried out on the sites of poor and average quality, if possible, to identify possible factors pollution and remedy if necessary (disinfection, technical solutions etc.

Table 5: Water quality

Municipality	No. of handpumps analysed	Good quality	Average quality	Poor quality
ARIBINDA	31	27	2	2
GORGADJI	28	26	1	1
TOTAL	**59**	**53**	**3**	**3**

Source : IRC

3.3 USERS CAPACITY TO PAY

On the basis of the 6 month follow-up conducted in two municipalities with support from IRC, maintenance needs and the ability of users to pay was analysed in two communes: Monitoring results estimate maintenance needs of 1,632,800 F CFA in the municipality of Gorgadji and 2,731,850 CFA in the municipality of Aribinda. They also show in Gorgadji an average handpump repair cost of 18,600 FCFA and 28,600 FCFA the cost of repairing a handpump having known more than one breakdown. In Aribinda, these costs are respectively 13 554 FCFA to repair a single breakdown and 36,147 FCFA to repair a handpump having known more than one breakdown.

The analysis also reveals that the financing capacity exists. Household contributions collected between October 2013 and March 2014 indicate that the municipality of Gorgadji has nearly 2.5 million FCFA available. In Aribinda this figure is 15 million FCFA. As we shall see, even after assuming maintenance

costs, both municipalities have surpluses that can be allocated to preventive maintenance, or rehabilitation work.

3.3.1 Gorgadji

At Gorgadji, there is a municipal funding capacity of nearly one million CFA for the period indicated (Table below).

Table 6: Financing capacity of Gorgadji

Gorgadji (FCFA)	4th Quarter 2013	1st Quarter 2014
Contributions from users	1,250,000	1,249,900
Maintenance costs (curative)	134,700	1,481,600
Finance capacity	**817,850**	

At Gorgadji in 6 months, the amount available is equivalent to 25-30 handpumps. In one year, it could finance the rehabilitation of one handpump (all other conditions remaining equal).

Table 7: Profile of contributors from Gorgadji

Contributions in Gorgadji	**4th Quarter 2013**	**1st Quarter 2014**
Number of households	3,462	3,853
Number of contributing households	1,248	933
Average contribution of households	970 FCFA	1,149 FCFA
Number of handpumps with contribution	59 out of 114	
Number of WAU handpumps with contribution	13 out of 22	
Number of non-WUA handpumps with contribution	46 out of 92	

Looking more closely at the origin of contributions (see table above) shows that the number of paying households decreases over the period, but the average contribution increases by about 100 CFA. This can be explained by seasonality, which ensures that people need less water from improved sources.

Indeed, they have partially access to traditional and natural sources, which are abundant due to the rainy season. Some observations are required for analysis:

- Contributions per handpump contributions vary between 1,500 and 150,000 FCFA (with livestock for 80%);
- 24% of handpumps are managed by the WUA and accounted for 19% of revenue;
- 42% of households have contributed have done so through the AUE: their contribution is three times lower (600 vs 1900);
- The handpumps managed by WUAs collect on average of 2.3 times less than the others (23,500 vs 56,000).

3.3.2 Aribinda

At Aribinda, there is a communal funding capacity of nearly 13 million CFA for the period indicated (Table below). In six months, the surplus could finance the rehabilitation of eight handpumps (all other conditions remaining equal).

Table 8: Funding capacity of Aribinda

Aribinda (FCFA)	4th Quarter 2013	1st Quarter 2014
Contributions from users	8,721,300	7,293,858
Maintenance costs (curative)	683,250	2,048,600
Finance capacity	12,893,308	

The same observations apply in Gorgadji; fewer households contribute but those who do, contribute more. To this is added the following analysis (from Table 9):

- Contributions per handpump vary between 3,750 and 150,000 FCFA;
- 51% of handpumps are managed by WUAs, totalling 55% of revenue;
- 67% of households contributed to the WUA: their contribution is equivalent (1009 vs 1103);
- Handpumps managed by WUAs collect on average 2 times more than others (4,900 vs 27,000).

Table 9: Profile of contributors from Aribinda

Contributions in Aribinda	**4th Quarter 2013**	**1st Quarter 2014**

Number of households	12,955	15,018
Number of contributing households	8,201	6,326
Average contribution of households	1,277	1,812
Number of handpumps with contribution	138 out of 202	
Number of WAU handpumps with contribution	82 out of 104	
Number of non-WUA handpumps with contribution	56 out of 98	
Number of handpumps invoicing per volume	20	

Some general observations arise:

- Not all households contribute. They are more likely to contribute to handpumps, which are managed by the WUA than when managed by a third party. Handpumps managed by WUAs collect more contributions than those that are not (60% for Gorgadji and 78% for Aribinda). WUAs seem to facilitate households giving contributions;
- The contributions of households increase, even if fewer households contribute. Contributions vary depending on types of breakdowns, but overall a surplus emerges at the village level;
- At Aribinda the handpumps managed by WUAs report more than half of revenue. In addition, households using handpumps managed by the WUA pay more. This is not the case in Gorgadji;
- operating surplus of Gorgadji is 817.850 FCFA while it is 12,893,308 FCFA in Aribinda. For the time being this excess money is not being used.

These findings indicate that maintenance of TDC can be exploited, and that people are able to contribute financially. It remains to be seen how the service can be improved, and in the following parts of the report we will addresses this question.

IV. STATE OF MAINTENANCE PLACES

As mentioned above, the access to water rate is the indicator used on the MDGs to qualify the water service. At the national level the goal is to move from a rate of 60% in 2005 to 80% by 2015, the time horizon of the MDGs. The government and its partners have undertaken a great effort to equip the

different localities of the country. However, maintenance does not automatically follow in some villages, which is compromising access to water. The Application Reform Program (PAR) has developed the main tools for maintenance and provided a clear institutional framework for it. Before addressing the current situation specifically in the area regarding this study, we recall an experience of guaranteed total maintenance, unique to our knowledge, conducted under the SOUROU NAYALA project.

4.1 SERVICE AND MAINTENANCE SYSTEM OF THE SOUROU NAYALA PROJECT

The SOUROU NAYALA village water project, funded by KFW is a water project in Burkina, which tried in its consolidation phase in 1999 to implement a total maintenance guarantee system for all handpumps in the project area. This system consisted of establish contracts between an operator (OH&VS) and Water Point Committees (CPE) for a 5-year period, after the warranty period of one year after installation of the pump. The contract provided fixed annual payments of 60,000 FCFA in return for which they would get a guaranteed proper functioning of the pump, regardless of actual repair costs and the fact that intervention costs would gradually increase over time. This contract included two preventive maintenance services per year and corrective maintenance (repair) of the pump within 48 hours of failure. The system showed positive results during the first four years of operating, but a significant drop in income in the fifth year. The system of total guarantee contracts experienced difficulties that have led to its shutdown a few months after the end of his term in 2006. Some factors are responsible:

- The advent of reform of the maintenance system, which involved new actors (local authorities and WUA);
- The coexistence of different maintenance systems (communal maintenance service and total guarantee in the same project area) sometimes resulting in using money collected by the CPE for repairs under the total guarantee system for pumps outside the total guarantee system that were poorly maintained;
- Demotivation of AR that have been faced with the lack of breakdowns on handpumps due to the good performance of preventive maintenance of handpumps, thus depriving them of additional resources;
- The CPE not being recognised legally.

4.2 THE REFORM APPLICATION PROGRAMME

4.2.1 Objectives and principles

In rural and semi urban areas, significant efforts have been made to equip each locality, hamlet or neighbourhood with drinking water points. However, the rate of failure and abandonment of handpumps remained high. Given these facts the authorities, conducted a discussion on the strategy to be implemented to improve the policy of the sub-sector water supply in rural and semi-urban areas, which has led to the adoption of Decree No. 2000-514 / PRES / PM / MEE of 03/11/00 concerning reform of the system of management of drinking water supply infrastructure in rural and semi-urban areas.

The objective of this reform is to significantly improve the operation of equipment for drinking water in rural and semi-urban areas. For its implementation, the reform is based on the following principles: • The emergence of Water Users Associations is legally recognized in every village;

- The involvement of operators in the management of water supply infrastructure;
- Accountability of municipalities to whom the government transfers the project management of infrastructure for providing drinking water of the town;
- Taking into account the social nature of water (availability, equity, quality and accessibility);
- The harmonization of the management of drinking water supply infrastructure for integrated management of different water points of the village;
- The application of user-pays and thus the sale of water;
- The standards for drinking water.

4.2.2 Institutional arrangements

a) Project management and contracting authorities

The reform should be seen in the context of the integral communalization. The management system proposed by the Joint Programme dedicates the municipality as owner of the drinking water infrastructure and as contracting authority for the management and maintenance of drinking water infrastructure.

- For handpumps, the program encourages the continuation of community management with operators from the area but provides a formalization of the management structures and a delegation of the management and maintenance of handpumps. The system is based on:
    - The delegation by the municipality of water service to the Associations of Water Users (SEA) formed in each village and legally recognized
    - The sharing of revenue from the sale of water at the WUA to cover the costs of monitoring, maintenance and contribution to the renewal of handpumps;
    - Monitoring equipment in a regular manner (by artisans or businesses), paid by the municipality from fees paid by the WUA;

- The repair of pumps repair by a service technician under the terms of a contract signed with the municipality (scales of parts wear, spare parts and interventions), borne by the WUA;
- The control of funds and the management of handpumps by the municipality.

b) The role and responsibilities of key players The roles and responsibilities of key actors can be viewed in the diagram below, from the work of RAP in 2000.

The following description of roles is an extrapolation.

The state

In the context of decentralization, the state delegates its powers in the field of drinking water to local authorities. The DREAHAs play a key role in the implementation of the reform at the regional, provincial and county level: as effect the Reformation, organization of information activities, Education and Communication (IFC), support / advice to municipalities, approval of maintenance personnel, coordination of the various stakeholders in the regional area.

The municipality

Its role is:

• Establish a municipal drinking water development plan;

• Seek external funding from projects, NGOs and other stakeholders;

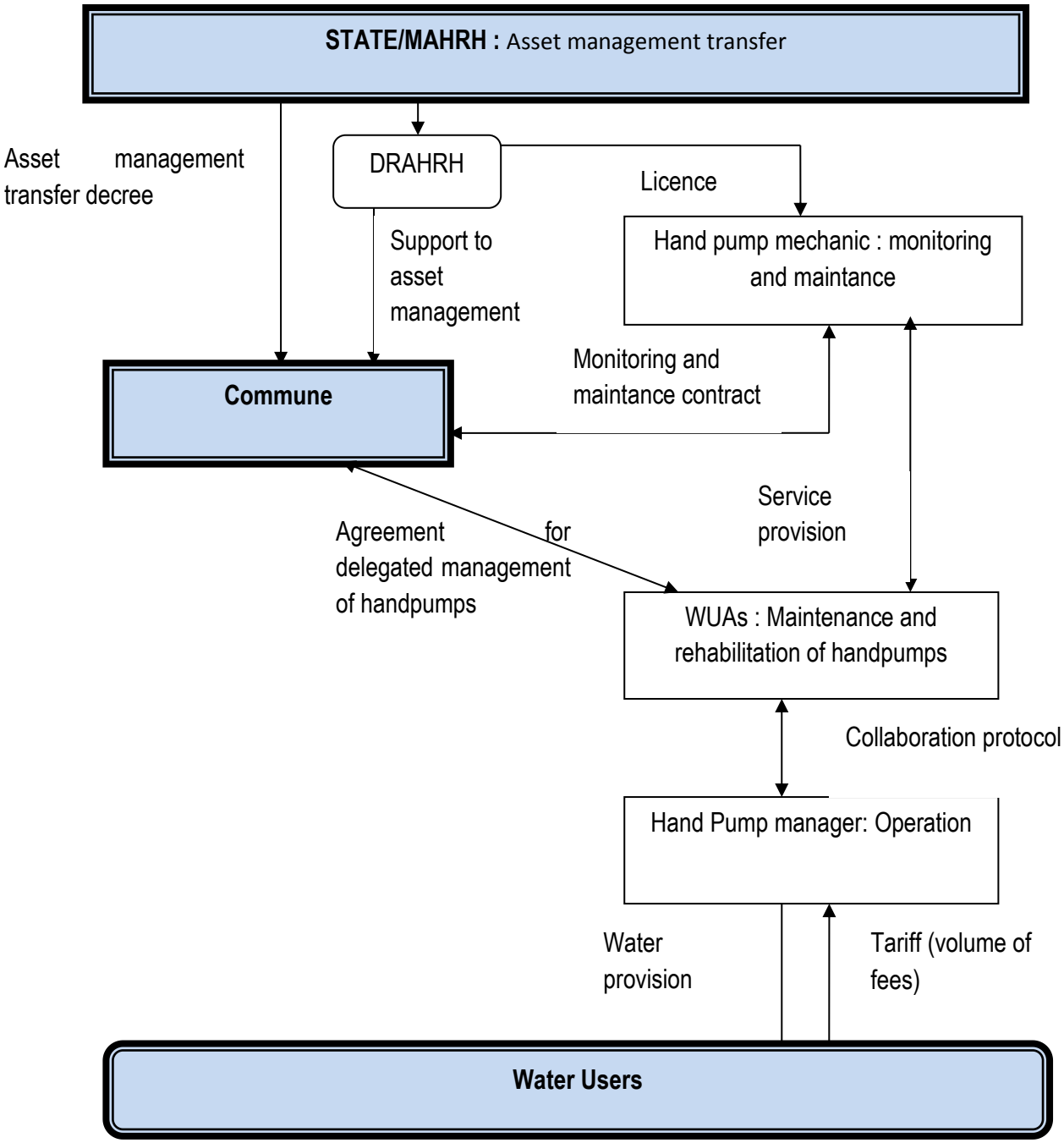
• Manage its equipment park in a sustainable way according to the principles of the Reform based establishment of WUAs in each village and operators with which they sign contracts.

The municipality relies on the WUA:

It has delegated the management of water services to the WUA;

- WUAs select maintenance personnel responsible for the maintenance and monitoring of municipality's equipment (regular monitoring rounds) and responsible for reporting about the maintenance state of the equipment (monitoring report);
- Municipalities pay maintenance personnel's visiting rounds from specific fees paid by WUA for this purpose;
- Municipalities set the minimum price of water at the municipal handpump.

Figure 1 : Asset management transfer mechanism



The Water User Association (WUA)

The WUA is associated with the municipality:

- All decisions relating to the modification of the village's infrastructure;
- It is mandated by the municipality for the management of handpumps and other simple structures as part of a delegation agreement of public water services.

In turn a WUA:

- Mandates pump managers (CPE or any other natural or legal person of their choice) to operate the facilities;
- Sets the water price based on the minimum price set by the municipality and determine the method of payment of water (volume, in-kind or cash contributions, etc.);
- Shares revenue from the sale of water, puts it into a savings account and manages this fund to cover the costs of monitoring, maintenance and renewal of handpumps;
- Calls municipal maintenance personnel for repairs and pays the cost of repairs in line with the contractual arrangements.

Private operators

The reform attaches great importance to the involvement of private and voluntary sector to support the municipalities in the area of rural and semi-urban water supply. For the handpumps the municipality signs contracts with authorized regionally approved maintenance staff who ensure:

- Regular monitoring of the municipality's handpump park and report on technical condition and management;
- During the monitoring visits, provide technical advice to the head of the WUA and the handpump manager on the maintenance to be done on the pumps;
- Repairs on request of the WUA who pay on the basis of a scale accepted by the municipality.

4.3 MAINTENANCE STATUS IN THE TWO MUNICIPALITIES

The municipalities of Gorgadji and Aribinda form part of the area covered by the Application Reform Programme (RAP).

As such they have benefited from investments that were made as accompanying measures of the program to encourage municipalities and operators to engage in the Reformation. These municipalities are committed to managing their water infrastructure in a sustainable manner consistent with the principles of the Reformation based on WUAs and operators with whom contracts were signed.

In view of the RAP objectives and the foreseen role of actors in the maintenance chain, much has been done on establishing structures and instruments in both municipalities. The performance of the system is described below with a presentation of strengths and weaknesses.

4.3.1 Presentation of the current maintenance system and its weaknesses

WUAs at the village level pay for locally done repairs from contributions collected in the village. WUAs are pay into a shared fund to pay for preventive maintenance of handpumps, which is managed by the municipalities under a contract that delegate handpump management to WUAs.

The majority of WUAs formed in Gorgadji and Aribinda under the Reform have not yet been fully renewed.

The Reform advocates renewing WUA every 2 years in accordance with the governing regulations. In Aribinda fifteen (15) WUA on a total of 48 were renewed. In Gorgadji all sixteen (16) WUA in 16 villages were renewed in 2013. Twelve out of sixteen have been installed officially by the Mayor of Gorgadji.

It should be noted that a significant proportion of the members of Executive Offices of WUAs can neither read nor write, which is a challenge to their performance especially for the positions of President, Secretary General and Treasurer.

Preventive maintenance is performed 2 times / year by authorized maintenance personnel that are related to the municipality through a maintenance contract. The municipalities of Aribinda and Gorgadji currently each have two (2) authorized maintenance personnel.

However, this operation was not carried out in 2013 in either of the two municipalities because of the low rate of contributions in relation to the number of handpumps (24% in Aribinda and 30% in Gorgadji).

There is also no cooperation protocol between handpump managers and WUAs in the town of Aribinda which is contrary to the principles of the Reformation. The financial management of corrective maintenance is left to the WUA in his preferred area.

However, we note a weak influence of WUAs on handpump managers it the two municipalities; 54.4% in Gorgadji and 50% in Aribinda which thereby causes the persistence of a dual community maintenance system based only on corrective maintenance (repairs) and only the one implemented by the Reformation.

4.3.2 Availability of spare parts

The two municipalities do not have locally managed spare parts stocks.

Maintenance personnel buy parts from local dealers based in DORI or DJIBO or from authorized distributors from the capital, thus extending the time needed to secure supply parts for maintenance.

4.3.3 Functionality of the equipment

The functionality rate of the handpumps in March 2014 was 89.42% in Aribinda (186/208) and 88.52% in Gorgadji (108/122).

Reasons for non-functionality of handpumps are in 2011 largely due to absence of spare parts, according to the artisans.

During our monitoring, we found the following, which means a significant improvement:

- Overall, the delays are small and a large majority of handpumps is repairs within 3 days, in line with regulations;
- The handpumps which remain broken down for long periods are for the most dried;
- The problem is repetitive failures on a small number of handpumps, caused by either a construction problem, the diagnosis of the cause of failure, or the quality of parts used in repairs.
- Users mobilize themselves to raise money only at the time of failure (more regularly for WUAs) and the required time increases the delay of the repair.

4.3.4 The capacity of maintenance personnel

The maintenance personnel sometimes lack the necessary expertise and experience difficulties solving problems during their interventions. However, they manage somehow to stay within the intervention deadline. They cannot yet make a living on this for now. They do not renew their tools for the most part but they are of good will and motivated.

4.3.5 Strengths and weaknesses of the current system

Strengths

- The handpump functionality rate is still satisfactory despite the disharmony between current maintenance management systems (with and without WUA)
- The Reform system allows maintenance personnel to live from its activity;

Weaknesses

- Lack of preventive maintenance in the 2 municipalities in 2013
- The average annual pump maintenance cost of 75,000 FCFA as recommended by the Reform appears to be below the actual cost, given that the average age of municipal handpumps is 16.19 years in Gorgadji and 17.61 in Aribinda.

According to the norms, standards and access to drinking water and sanitation developed by DGRE indicators, handpumps of over 15 years have to be rehabilitated. In addition, boreholes of more than 30 years must be renewed. The age of boreholes and specifically the handpumps may affect the failure

rate especially if preventive maintenance is insufficient or when a handpump has not been rehabilitated after 15 years.

V. PROPOSED MAINTENANCE STRATEGY

In view of the persisting difficulties in handpump maintenance, despite efforts by different actors and based on the experience of the water point management by private operators in the Sahel region, our proposal is based on the idea to sign contracts with private maintenance personnel from the perspective of making drinking water a sustainable local service.

This strategy aims to promote interest and involvement of the local private sector in the sustainable management of handpump maintenance through a system of total guarantee.

Total guarantee is defined as providing full coverage of handpump maintenance and repair during a specified period. This care includes preventive and corrective maintenance of the pump for a specified area of use.

It should be remembered that this approach is not new in Burkina Faso. It has already been implemented by the SOUROU NAYALA village water project to which we return to draw lessons.

5.1 JUSTIFICATION OF THE NEW MAINTENANCE STRATEGY

The need to ensure sustainable drinking water infrastructure in the municipalities of Gorgadji and Aribinda justified this approach on the basis of the following findings:

- Difficulty of some WUA to meet their repair costs due to the absence of revenue sharing in case of corrective maintenance, the latter being assigned to each WUA in the Reform
- Non availability of spare parts at the local level, which that can extend the duration of handpump breakdowns
- Disparity in terms of financial contribution for access to water
- Obsolete pumps in both municipalities (average handpump age 17 years)
- No harmonized handpump management system within the municipalities despite the efforts of the Reform
- Maintenance personnel being unable to renew their working tools despite previous contributions by various projects and water supply programs
- A guarantee of more regular and better pay, better working tools and transport facilities for maintenance personnel when entering into employment of an operator.

5.2 START CONDITIONS FOR TOTAL MAINTENANCE GUARANTEE

A number of conditions must first be met in the framework of total maintenance guarantee. We indicate the following six:

- A fleet of pumps with close to 100% functionality
- Sufficient density of pumps in an area to allow easy and less expensive coverage
- A sound spare parts management to avoid failures on the same elements
- An effective implementation of WUAs in all villages in the municipality to ensure clients seeking maintenance service
- The transfer of all community handpumps to the WUA for their inclusion in the maintenance contract
- Finally, a strengthening of the technical and operational capacities of maintenance personnel for quick and effective interventions.

5.3 ORGANISATION OF THE TOTAL GUARANTEE SYSTEM

The implementation of the total guarantee system should be based on the following aspects:

- Identification of different actors (WUAs, private operators, municipalities and Administration)
- A clarification of the duties and responsibilities of all actors
- The contracting of services between the different stakeholders
- Homogenization of the revenue collection system.

5.3.1 Actors and their roles

Water User Associations

- Organise collection of contributions
- Payment of contracts
- Starting a request for intervention
- Maintain the surroundings of boreholes and sanitation
- Performs all other duties assigned by the reform

Private operators

- Collect the amounts agreed with the WUA
- Provide spare parts and ensure repairs
- Ensure proper functioning of the pump

- Manage the activities of maintenance personnel.

Maintenance staff

- Carry out preventive maintenance visits
- Repair of handpumps
- Carry information from the villages
- Get paid by the private operator for his services (preventive maintenance and repairs)

Municipality

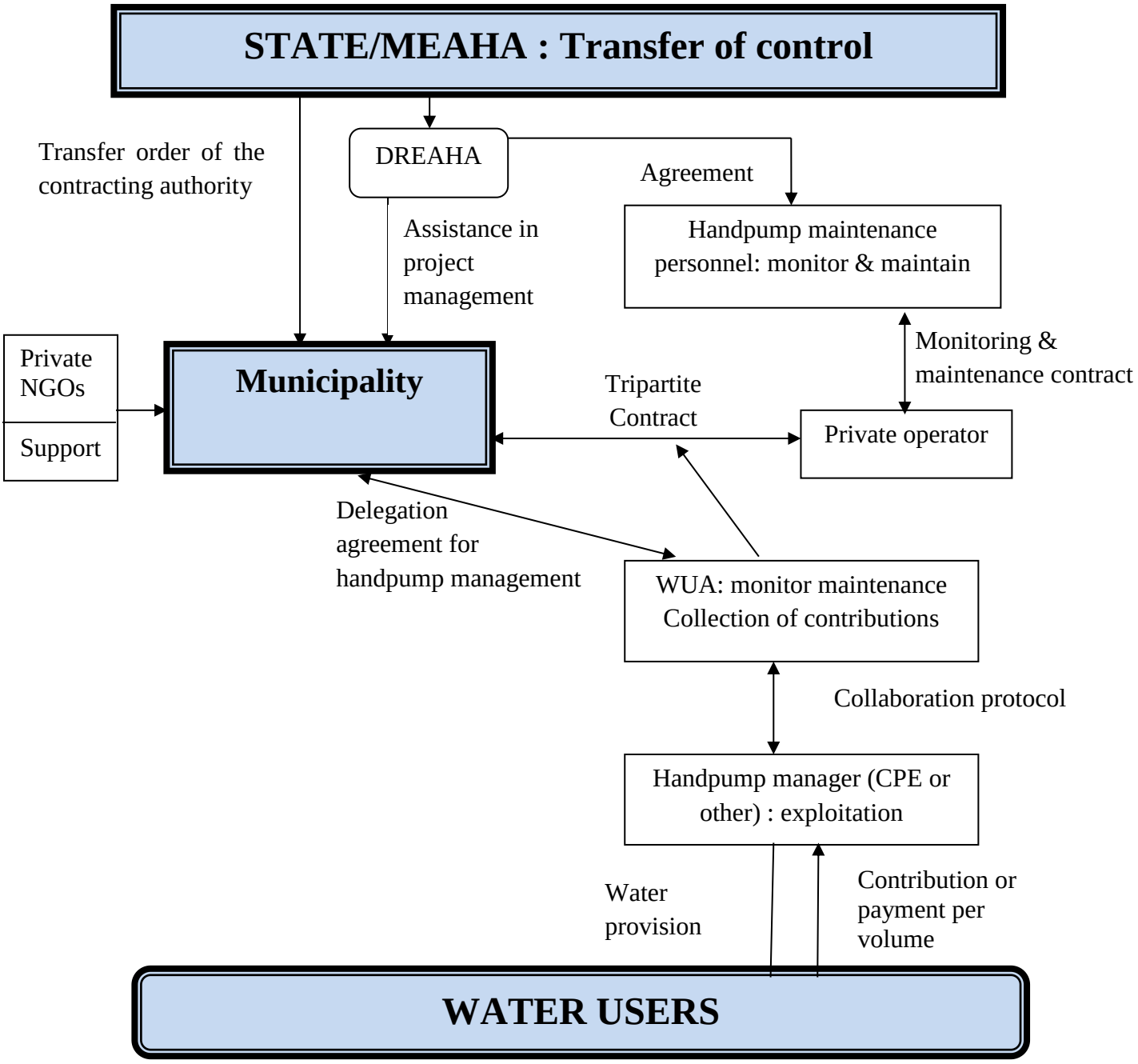
- Monitoring compliance with the tripartite agreement and the delegation agreement

DREAHA

- Technical and financial monitoring of involved parties.

The organogram in figure 2 below is proposed for maintenance. It is based on figure 1 of the PAR 2000.

Figure 2: Proposed organigram for handpumps under total maintenance guarantee.



Source : FASO HYDRO

5.3.2 Functioning

The legal context in which the relationships between the actors are exercised needs to be discussed.
In annex 3 is attached the tender for hiring the private operators in charge of guaranteed total maintenance. This file contains, among other things, the proposed maintenance agreement between the municipality and the private operator. In addition, the strong relationship between the WUA and the municipality in the context of the agreement for delegation of handpump management is described. Finally, the maintenance personnel who receive a contract from the private operator become agents of the latter during the period of contract. He holds the approval of DREAHA for services previously recognized by the municipality. Working in the field under instructions of the private operator and upon request for intervention (even verbal) by the WUA, he is required to sign with WUA a description of the service performed. It can then be established:

- That the service agreement is a tripartite agreement signed by the municipality, the private operator and the WUA. Given the number of WUAs, the contract will refer to them, be signed by concerned parties and contain their contact information.
- That the contract is based on the relevant provisions of the Convention handpump management delegation between the municipality and the WUA. In its terms of settlement, the payer (here the SEA) will be specified, the payment method and frequency (an advance as a percentage at the time of signing and the balance at the end of each management contract year).

Note that there is a tendency in contractual relations to not fully take into account the terms of the handpump management delegation agreement. This will be reviewed in order to adapt to the new situation, the total maintenance guarantee. The consultant has therefore attached a proposal for review of the text of this agreement.

5.3.3 Modalities and intervention delays

The modalities, intervention delays and expected advantages are as follows:

- Preventive maintenance in accordance with the service life requirements by the manufacturer (2 times/year) and systematic replacement of worn but not yet broken parts.
    - Advantage: Number of breakdowns reduced
- Continuous availability of sufficient amounts of guaranteed quality spare parts
    - Advantage: breakdowns repaired correctly
- Curative maintenance (repair) effectuated within 24 hours of signalling breakdown

- Advantage: downtime reduced

- Systematic chlorination during service of below-ground maintenance
  - Advantage: water of better quality

5.3.4 Guarantees on repairs and spare parts

It should be noted that most handpump brands installed in the area are now in the public domain (over 30 years) .The context of a free trade society in which we live is also a source of distribution of spare parts of poor quality. The warranty on spare parts can be sought only from suppliers whose reliability and quality of service are recognized. In all cases, the operator has no interest to provide parts that are not original, as it has the disadvantage of having to make multiple repair visits.

To provide better guarantees on repairs, the operator should focus on training of maintenance personnel so that they can provide high quality service. This is all the more necessary in the municipality of Aribinda in view of the recent introduction of VEGNET handpumps.

5.4 RISK FACTORS

Appreciation of certain results (collection of contributions) and those learned of previous similar projects, risk factors include:

- The need for greater responsiveness of the repair operator for corrective maintenance through keeping a local stock of parts, which may give additional cost (shop rent, watchman, store keeper)
- The impact of company operating expenses on the cost of public water service;
- Difficulties in collecting from WUAs in a timely manner.

VI. FINANCIAL ANALYSIS OF MAINTENANCE MANAGEMENT

6.1 ACTUAL COSTS OF HANDPUMP WATER

The current price of water follows from the reform of managing the water equipment infrastructure. The social character of water is put first to ensure affordability to all residents. Therefore, the calculated price should primarily cover operating expenses, leaving the cost of basic investment and renewal at the expense of public authority.

A household of 10 people must pay 2500 FCFA/year for access to drinking water delivered by the handpump. A handpump must serve 300 people, so 30 households. At rate of 20 litres/day per person, this equates to a pumped volume of 6,000 litres or 6 m^3/day or 180m^3/month, or 2160 m^3/year.

The mobilized contributions from consumer households are estimated at FCFA 75,000/year, giving a cost of about 35 FCFA per m3, assuming a consumption of 20 litres per day per person in a household of 10 people. The price of a 200-litre barrel comes to 7 FCFA and a 20-litre container comes to only 1.5 FCFA.

Seen in this light, one might think that the drinking water supplied by the handpump to the population in rural areas is low. However, it is very difficult to mobilise their contributions to help ensure continuous service. This is due to:

- The low perception of drinking water and its relevance to water-borne diseases;
- Low willingness to pay for drinking water on behalf of the vision that water is a gift of nature and therefore should not have a price as any other property
- The limited ability to pay for very poor households without income generating activities in the absence of regular and sustained income;
- Poor governance especially in the mobilization and management of financial resources contributed. This is most unfortunate when we see that diversions are legion and do not allow proper allocation of resources on the priorities they should cover.
- The rates of recovery of contributions are based primarily on the removal of monthly dues, quarterly or annual 500, 1000, 1500 FCFA. The water users act very slowly. The lack of advocacy and lack of trust can be a source of low motivation of users to pay their contributions.

6.2 CALCULATION OF TOTAL WATER COSTS

Water production equipment at village water requires a heavy investments with a life span up to 30 years for a borehole. Cost recovery under these conditions one has to take into account a relatively long service life. In this case, we will choose a 15-year horizon in the expectation that the structures have at least this lifetime. The model calculation will use this period to determine more realistically the cost per m3, which covers all expenses (basic investments, renewals, operating expenses). It is calculated by the formula:

LTC =

$$\frac{\sum_{t=0}^{n} I_t(1+i)^{-t} + \sum_{t=0}^{n} R_t(1+t)^{-t} + \sum_{t=0}^{n} CF(1+t)^{-t} - VR(1+i)^{-n}}{\sum_{t=0}^{n} V_t(1+i)^{-t}}$$

Including initial investment =

$$\frac{\sum_{t=0}^{n} I_t(1+i)^{-t} - VR(1+i)^{-n}}{\sum_{t=0}^{n} V_t(1+i)^{-t}}$$

Including renewal =

$$\frac{\sum_{t=0}^{n} R_t(1+i)^{-t}}{\sum_{t=0}^{n} V_t(1+i)^{-t}}$$

Including exploitation costs =

$$\frac{\sum_{t=0}^{n} CE(1+i)^{-t}}{\sum_{t=0}^{n} V_t(1+i)^{-t}}$$

LTC = long term costs

It = initial investment

Rt = renewal of investment

CE = operating costs

VR = residual value

VT = water sales of different periods

T = reference period starting at 0 (first year of the chosen period).

Calculation basis

The investment is based on a borehole with hand pump. The works were split according to their service life as follows: with estimated costs (in FCFA) See Tables 6, 7 and 8.

Table 10 : Costs for a borehole

Designation	Service life	Costs
Borehole without equipment	30 year	4 800 000
Concrete slab	15 year	225 000
Hand pump	15 year	1 200 000
Superstructure	15 year	900 000
TOTAL		7 125 000

Source: Estimates Faso Hydro June 2014

Operating costs are mainly based on (i) the costs of maintenance of heavy equipment (borehole, border, superstructure) at intervals of 5 years, (ii) the preventive maintenance of the handpump at least twice per year, (iii) the costs of curative maintenance (repair) of the pump upon the occurrence of a failure, (iv) the compensation of pump manager (v) miscellaneous expenses and contingencies. Tables 9 and 10 give details.

Table 11: Life span of investments and replacement costs in FCFA

Year	Borehole without equipment	Concrete slab	Handpump	Superstructure	Total
Costs	4,800,000	225,000	1,200,000	900,000	7,125,000
Life span	30 year	15 year	15 year	15 year	_

Source : Estimates FASOHYDRO. June 2014

Table 12: Depreciation of investments and renewal costs in FCFA

Year	Borehole without equipment	Concrete slab	Handpump	Superstructure	Total
0	160,000	15,000	80,000	60,000	315,000
1	160,000	15,000	80,000	60,000	315,000
2	160,000	15,000	80,000	60,000	315,000
3	160,000	15,000	80,000	60,000	315,000
4	160,000	15,000	80,000	60,000	315,000
5	160,000	15,000	80,000	60,000	315,000
6	160,000	15,000	80,000	60,000	315,000
7	160,000	15,000	80,000	60,000	315,000
8	160,000	15,000	80,000	60,000	315,000
9	160,000	15,000	80,000	60,000	315,000
10	160,000	15,000	80,000	60,000	315,000
11	160,000	15,000	80,000	60,000	315,000
12	160,000	15,000	80,000	60,000	315,000
13	160,000	15,000	80,000	60,000	315,000
14	160,000	15,000	80,000	60,000	315,000
15	160,000	15,000	80,000	60,000	315,000
Total depreciation	2,400,000	225,000	1,200,000	900,000	4,725,000
Residual value	2,400,000	0	0	0	2,400,000
Life span	30 year	15 year	15 year	15 year	_

Source : Estimates FASO HYDRO. June 2014.

The content of the various maintenance interventions is specified as follows:

1. Borehole without equipment: maintenance consist of: (i) the removal of the pump, (ii) blowing (cleaning mechanisms) and development, (iii) the disinfection of water the borehole, (iv) the reassembly of the pump in functional state
2. Concrete slab, superstructure: in the case of civil engineering structures, it is often a question of ensuring repairs by sealing cracks to prevent seepage of polluted water into the ground water. The maintenance also ensures cleanliness and hygiene of the drinking water.
3. Handpump : This concerns preventive maintenance and repairs to ensure continuous sustainable service.

Table 13: Maintenance and repair costs of equipment in FCFA

Year	Borehole without equipment	rate	Maintenance costs	Concrete slab, superstructure	rate	Maintenance costs	Handpump	rate	Maintenance value handpump	Total maintenance & repair costs
1							1,200,000	5%	60,000	60,000
2							1,200,000	5%	60,000	60,000
3							1,200,000	5%	60,000	60,000
4							1,200,000	5%	60,000	60,000
5	4,800,000	6%	288,000	1 125 000	8%	90,000	1,200,000	5%	60,000	438,000
6							1,200,000	6,25%	75,000	75,000
7							1,200,000	6,25%	75,000	75,000
8							1,200,000	6,25%	75,000	75,000
9							1,200,000	6,25%	75,000	75 ,000
10	4,800,000	6%	288,000	1 125 000	8%	90,000	1,200,000	6,25%	75,000	453,000
11							1,200,000	8%	96,000	96,000
12							1,200,000	8%	96,000	96,000
13							1,200,000	8%	96,000	96,000
14							1,200,000	8%	96,000	96,000
15	4,800,000	6%	288,000	1,125,000	8%	90,000	1,200,000	8%	96,000	474,000
	Total	-	864,000	Total	-	270,000	Total	-	1,155,000	2,289,000

Source : Estimates FASO HYDRO. June 2014

Table 14: Overview of operating costs in FCFA.

Year	Total maintenance & repair	Compensation Manager and other services	Various costs & unforeseen	Total operating costs
1	60,000	120,000	72,000	252,000
2	60,000	120,000	72,000	252,000
3	60,000	120,000	72,000	252,000
4	60,000	120,000	72,000	252,000
5	438,000	120,000	72,000	630,000
6	75,000	132,000	84,000	630,000
7	75,000	132,000	84,000	291,000
8	75,000	132,000	84,000	291,000
9	75,000	132,000	84,000	291,000
10	453,000	132,000	84,000	669,000
11	96,000	144,000	96,000	336,000
12	96,000	144,000	96,000	336,000
13	96,000	144,000	96,000	336,000
14	96,000	144,000	96,000	336,000
15	474,000	144,000	96,000	714,000
Total	2,289,000	1,980,000	1,260,000	5,529,000

Source: Estimates FASO HYDRO June 2014.

Various and unforeseen costs: 6,000 FCFA/month for communications and other unforeseen costs from the 1st to the 5th year; 7,000 FCFA for the 5th to the 10th year; 8,000 FCFA for the 11th to the 15th year.

Compensation for the handpump manager and other services related to water service provision: 10 000 FCFA/month for the 1st to the 5th year; 11,000 FCFA for the 6th to the 10th year and 12,000 FCFA for the 11th to the 15th year. Tables 11 and 12 provide details for the calculation of the costs per m^3.

Table 15: Updated costs of elements determining the cost of water (values in FCFA, volumes in m^3)

Discount rate	Using the basic investment	Using replacements	Exploitation charges	Total sale of water in m^3
0%	4,725,000	0	5,529,000	32,400

Source: Estimates FASO HYDRO June 2014.

Table 16: Costs of water per m³ (FCFA)

Discount rate	Using the basic investment	Using replacements	Exploitation charges	Total costs per m³
0%	146	0	171	317

Source: Estimates FASO HYDRO June 2014.

Table 17: Breakdown of operating expenses by element

Number	Designation	Costs in FCFA	%
1	Maintenance of borehole, borehole body , slab and superstructure	71	41,5
2	Remuneration of manager and other services related to water	61	35,7
3	Various and unexpected costs (communications, travel, etc.)	39	22,8
	TOTAL	171	100

Source: Estimates FASO HYDRO- June 2014

Hypothesis 1: support for all elements (basic investments, renewal, operating expenses): 317 FCFA/m³

Hypothesis 2: taking into account only operating expenses: 171 FCFA/m³

Eventual sale price with a gross margin of 20% or 205 FCFA/m³. The 200-litre drum could be sold at 41 FCFA and a 20-litre container at 5 FCFA.

The breakdown of the amount of 171 FCFA into the different components of the exploitation costs shows the following trends:

- 71 FCFA/m³ for the maintenance costs (borehole, slab, handpump and superstructure), or 41,5% ;
- 61 FCFA/m³ for compensation of the handpump manager, or 35,7% ;
- 39 FCFA/m³ for various and unforeseen costs (communication, transportation, etc.), or 22,8%.

6.3 ANALYSIS OF THE DIFFERENCE BETWEEN OLD AND NEW PRICING

The new assessment of the cost of water and price at the pump is based on a long term study on continuous service. It takes into account:

- Maintenance - Repair all the borehole works;
- The remuneration of managers and other services related to water service;
- The various costs and contingencies (communications, travel etc.);
- Gross margin for a potential operator and pay management fees for the service organization.

It is not focused only on the pump, but on the organization of the entire water service. If users do not have the willingness and ability to contribute to such levels, the question is who will pay the gap: in case the operating expenses not fully covered by contributions. Example see Table 14.

Table 18: Level of expected collected contributions, compared to the old system / handpump

Targeted annual revenue in FCFA	Contribution under former system	Gap FCFA	Total subsidy per handpump from the municipality
442,800	75,000	367,800	TDB

Source : Estimate FASO HYDRO – June 2014.

It should be noted from the table that the level of fee collection is 369,000 FCFA without 20% margin or 442,800 FCFA including 20% margin.

6.4 PARTIAL CONCLUSION

Excluding the costs of maintenance, repairs on heavy items such as borehole, concrete slab and superstructure, the situation of operating expenses is as follows in Table 15. The summary of operating expenses above excludes the costs of maintenance, severe repair works on the borehole. With this level of operating expenses, the expected household contribution is 351,600 FCFA/year or 11,720 FCFA/household. This is still far from the 2,500 FCFA suggested by the Reform. The gap to be covered is still there. Where can we find funding opportunities if:

- The state and financial partners already subsidize all core investments and the full rehabilitation of the handpump
- The municipality does not have the resources for such interventions
- NGOs already engaged in capacity building activities

Table 19: Breakdown of operating costs in FCFA.

Year	Total maintenance & repairs	Compensation of manager and other services	Various costs & unforeseen	Total operating costs
1	60,000	120,000	72,000	252,000
2	60,000	120,000	72,000	252,000
3	60,000	120,000	72,000	252,000
4	60,000	120,000	72,000	252,000

Year	Total maintenance & repairs	Compensation of manager and other services	Various costs & unforeseen	Total operating costs
5	60,000	120,000	72,000	252,000
6	75,000	132,000	84,000	630,000
7	75,000	132,000	84,000	291,000
8	75,000	132,000	84,000	291,000
9	75,000	132,000	84,000	291,000
10	75,000	132,000	84,000	291,000
11	96,000	144,000	96,000	336,000
12	96,000	144,000	96,000	336,000
13	96,000	144,000	96,000	336,000
14	96,000	144,000	96,000	336,000
15	96,000	144,000	96,000	336,000
Total	1,155,000	1,980,000	1,260,000	4,395,000

Source : Estimates FASO HYDRO June 2014.

Otherwise, we should look at providing safe drinking water to people through handpumps in its simplest expression of a minimum service built around the maintenance of the single handpump with no additional cost for organization of the system. Even in such a scenario, we will end up with an expected level of contribution expected of 92,400 FCFA/year, at least 3,080 FCFA/household.

6.5 THE MAINTENANCE SERVICE PROVIDER

6.5.1 The investment

The service provider will work with existing approved maintenance personnel accepted by the municipalities. There are currently two per municipality, and will be equipped with toolkits for working on different brands of pump. Investment for maintenance staff will be 900,000 FCFA each or FCFA 1.8 million for both. Depreciation will be done over 5 years or 360,000 FCFA/year. A motorcycle will be available to both. The acquisition cost is estimated at 450,000 FCFA for each or FCFA 900,000 for both. Depreciation will be done over 3 years; 300,000 FCFA/year. The overall investment is therefore 660,000 FCFA/year.

6.5.2 Operating costs

They are as follows in Table 16. From this table we can say that management fees relate to the intervention Quality Assurance / Support to the operator on site. They also cover the cost of the report. Furthermore, the

taxes are unavoidable for any formal business who settles somewhere. There are not only local taxes such as license payment but also various fees (CNSS, TPA, etc). The estimate could be refined once clarified the operator's activities a known in more detail. Incompressible operator charges reach 8,315,000 + 660,000 = 8,975,000 FCFA/year.

Table 20 : Operator's operation costs

	Type	Unit	Quantity	Unit price	Total
1	Personnel costs :				
1.1	Watchman	Month	12	15 000	180 000
1.2	Storekeeper	Month	12	60 000	720 000
1.3	Maintenance staff	Month	2x12	90 000	2 160 000
1.4	Supervisor	Month	12	200 000	2 400 000
Total personnel					**5 460 000**
2	Operation costs				
2.1	Local store	Month	12	20 000	240 000
2.2	Transportation	Month	12	75 000	900 000
2.2	Management costs	%	25	5 460 000	1 365 000
2.4	Fees and taxes	FF	1	350 000	350 000
Total operation costs					**2 855 000**
TOTAL					**8 315 000**

Source : estimates FASO HYDRO- July 2014

6.5.3 Presentation and analysis of water pricing scenarios in connection with the proposed maintenance service

Scenario 1: constant price of 75,000 CFA for maintenance described in the Reform

Based on annual fee of 75,000 FCFA/year/pump.

Amount allocated for maintenance is 60,000 FCFA after deducting:

- 5,000 FCFA to pay the municipality to support CCEA and communal Technician
- 10,000 FCFA as an initial contribution to the renewal of the borehole and rehabilitation of the handpump Margin on variable costs: 60,000- 25,000 FCFA (supply of spare parts) = 35,000 FCFA

Total operator's costs: 8,975,000 FCFA

Number of handpumps to maintain = 8,975,000/35,000 = 256 handpumps

Table 21 : Working basis for scenario 1

No.	Description	Costs in FCFA	Percentage	Observations
1	Water service contribution per year 75 000 FCFA	-	-	
2	Support for municipal technician and municipal Water and Sanitation Committee	5,000	6.7%	
3	Initial contribution to handpump renovation	5,000	6.7%	75,000 :15 = 5,000
4	Initial contribution to new borehole	5,000	6.7%	150,000 :30 = 5,000
5	Spare parts for handpump under total guarantee	25,000	33.3%	
6	Margin on variable costs	35,000	46,7%	
7	Incompressible operator's costs	8,975,000		
8	Minimal number of handpumps to break even	256		

Source : Estimates FASO HYDRO- July-August 2014

Contribution per household per year: 2,500 FCFA

Scenario 2: Taking into account all operating costs

Operating expenses are defined as follows:

- Maintenance-Repair of all borehole equipment (including maintenance costs, repairs heavy items)
- Compensation handpump manager and other services related to water service
- Various and unexpected costs (communication, exchange visits etc.)

Table 22 : Working basis scenario 2

No.	Description	Costs in FCFA	Percentage	Observations
1	Costs for water services per year 442,800 FCFA	-	-	Cost 171 FCFA/m^3 including margin of 20%: 205 FCFA/m^3
2	Support for municipal technician and municipal Water and Sanitation Committee	8,856	2%	
3	Provisions for large repairs (borehole, slab, superstructure)	75 600	17.1%	
4	Payment of managers and other services related to water provision services	132 000	29.8%	
5	Support to various costs of WUAs (communications, transportation, etc.)	84 000	19%	
6	Replacement of spare parts under total guarantee	46 492	10,5%	
7	Initial contribution to rehabilitation	8 856	2%	
8	Initial contribution to new borehole	8 856	2%	
9	Margin on variable costs	78 138	17,6%	
10	Incompressible operator's costs	8 975 000		
11	Minimal number of handpumps to break even	115		

Source : Estimates FASO HYDRO July-August 2014

Note that the assumptions of scenario 2 are based on the principle of full cost of water with a gross margin of 20%. These costs are averages over a period of 15 years. Their estimate differs from Scenario 1, which is an annual lump sum contribution of 75,000 CFA (for maintenance & repair of handpump).

Provisions for major repairs were made. The amounts to be collected for these positions will be paid to the municipality or to an account to be determined. It could be the same for initial contributions for realization of new boreholes and rehabilitation of handpumps. The number of handpumps estimated as the minimum threshold of profitability for the operator is obtained by dividing the incompressible expenses 8,975,000 FCFA (taking into account the depreciation of tools of maintenance staff) by the contribution margin is 78,136 CFA francs = 115 handpumps. This scenario (i) the contribution per household is 14,760 FCFA/year; (ii) the sale price of the water volume is 205 FCFA/m^3, or 41 FCFA per 200-litre drum and 5 FCFA per 20-litre container.

Scenario 3: Taking into account only the maintenance-repair of all borehole structures

The maintenance-repair concerns:

- The body of the borehole every 5 years with the operations of removing the pump, disinfection of the borehole and installation of the handpump;
- Maintenance of the slab and superstructure;
- Preventive and corrective maintenance of the handpump.

Table 23: Working basis scenario 3

No.	Description	Costs in FCFA	Percentage	Observations
1	Costs for water services per year 189,120 FCFA			
2	Support for municipal technician and municipal Water and Sanitation Committee	5,494	3%	
3	Provisions for large repairs (borehole, slab, superstructure)	75,600	41.3%	
4	Replacement of spare parts under total guarantee	34,593	18,4%	
5	Initial contribution to rehabilitation handpump	5,494	3%	
6	Initial contribution to new borehole	5,494	3%	
7	Margin on variable costs	56,245	29.7%	
8	Total incompressible operator's costs	8,975,000	-	
9	Minimal number of handpumps to break even	160	-	

Source : Estimations FASO HYDRO July-August 2014

Contribution per household: 6,304 FCFA/year

Table 20: Recapitulation of scenarios

	Service costs	Margin variable costs	Total operator's costs	Break-even threshold # of handpumps	Annual contribution per household	Responsabilities
1	75 000	35 000	8 975 000	256	2500	Preventive and curative handpump maintenance
2	442 800	78 138	8 975 000	115	14 760	Repair-maintenance of all borehole equipment and other water service costs
3	189 120	56 245	8 975 000	160	6 304	- Borehole - fitting handpump - maintenance of slab and superstructure - preventive and curative maintenance of handpump

Source : FASO HYDRO- July-August 2014

Note: The assumption of costs does not take into account the basic investment and renewal. This price is 171 CFA plus gross margin of 20% (see text below table 13).

Analysis of advantages and disadvantages per scenario

Table 21: Advantages – disavantages per scenario

Scenario	Avantages	Disadvantages
1	- Minimal contribution by water users	- Difficult to confine the intervention at one single municipalityin view of the high number of handpumps needed to achieve profitability - Not taking into accountother costs of water (management compensation, costs for the activities of WUAs etc. - Difficult to achieve a continuous and sustainable water supply of water, no substantial margin for the service organization.
2	- Liability for a wide range of costs that are included in the price of water. - Provides full support for the factors which contribute to establishing a maintenance system for continuous and sustainable service. - Creation of provisions for major repairs (maintenance of borehole, slab and superstructure)	- Adapts easily to the system of collecting contributions (sale per volume). - Sampling for organization of water service understate margins for the operator (number of handpumps maintains relatively high, possibly only profotable in Aribinda, no interesting for Gorgadji) - Requires separate handpump maintenance and major repairs where two accounts receive contributions. - The contribution per household is relatively more than foreseen in the Reform.
3	- Provides maintenance for equipment needing major repairs, provides funds in anticipation of repair and maintenance	- The contribution per household is relatively more than forseen in the Reform. - Margins are just average for an operator who requires a fairly high number of handpumps (190) and this is only possible in Aribinda. - Requires separate handpump maintenance and major repairs where two accounts receive contributions. - No single municipality can on its own find an interested operator, more are needed to participate.

Source : Analysis FASO HYDRO July-August 2014

Partial conclusion

During the workshops on 24 and 25 July 2014 on the topic held in Ouagadougou, there was an inclination towards scenario 1. Most important reasons given were that in the relatively poorer areas in Burkina Faso and the in particular in the Sahel, it would be difficult to increase the price of water and bring to a high level even if it can give better opportunities to establish services of sustainable quality. It would take time for sensitization leading to:

- A good understanding of drinking water and its relation to health;
- Awareness to establish a willingness to pay for permanent water supply;
- Development of income-generating activities to build the capacity to pay for drinking water;
- The gradual acceptance of the principle of buying water per volume.

6.6 PROPOSITION FOR THE COLLECTION OF CONTRIBUTIONS/CHARGES

The consultant proposes:

- The effective establishment of WUAs in each village and capacity building of its staff members;
- Information-sensitization of the population to reach a good perception on drinking water;
- Information - raising the prices consistent with a continuous and sustainable water services;
- Identification and assessment of contributions as function of the service level and in line with people's capacity to contribute in each locality
- The sale of water per volume for equity and ease to maintain permanent funds;
- Tariffs are to be defined based on conventional containers used by populations and on a consensus;
- An system to ensure optimal and transparent tariff collection based on collection agreements and financial circuits available.

Once defined the level expected under the terms of contribution adopted (direct sales volume, contributions, grants, if any, etc.) recipes, different tools will be developed to better track collection (fees, sales revenues and possibly grants balance exploitation etc.)

6.7 EXPECTATIONS OF MAINTENANCE OPERATOR FOR PAYMENT OF EXPENSES BY WUA

WUAs are formed across each village in a given municipality. WUAs therefore act individually without any principle of network. The municipality is the only binding factor, which that must be consolidated in case we want to move towards a network for pooling maintenance services.

If this framework is not in place, the operator could simply require that each WUA directly pays for repairs (curative maintenance). This option may be the one used as a first step.

One could also think of a mutual fund to which WUAs contribute. This fund will be under the responsibility of a WUA federation in each town to facilitate the release funds for rapid repairs.

6.8 FINANCIAL SYSTEM

The financial system consists of two stages:

Stage 1

1. Direct relationship between maintenance operator and each WUA.
2. The WUA collects money and pays its contribution either by filing or by transfer into the account of the maintenance operator at the local micro-finance institutions
3. Payment of the operator:
4. 60% of the annual amount of the contract at signing
5. 40% or the balance six months later

Stage 2

1. Establishment of a federation of WUAs
2. Benefits to the operator having a single point of contact designated by his peers
3. Creation of a joint federal fund in a micro-finance institution
4. Direct payment of the operator by the federation operator

VII. FEEDBACK FROM TECHNICAL STAKEHOLDERS

Following the development of IRC's proposal on the professionalization of maintenance (Chapters IV to VI) two sharing and follow-up workshops were organized in July 2014 and June 2015. These workshops targeted technical stakeholders, who had the opportunity to discuss the different scenarii, their relevance and implications, as well as propositions for their implementation and contracting.

In the light of these exchanges, and given the scope of the proposals at municipal level, stakeholders agree to focus scenario 1. Indeed, this scenario respects the spirit of the Reform and does not involve changes in current pricing. However, it involves two difficulties:

1. Confining the operation in a single municipality given the high number of hand pumps required to acheive profitability;

2. Not taking into account other related costs to the water service (compensation for hand pump managers, management fees of WUA activities, etc.) that could have contributed to the local economy.

7.1. How to operationalize scenario 1?

With the number of hand pumps needed to break even and with the commitments expected from the operator, Scenario 1 is compatible with the level 2 mechanics' certification. This certificate is issued by the DRARHASA and is necessary for a municipality to contract a professional hand pump mechanic.

The "level 2" certificate may be granted to any company registered in Burkina Faso or to any association or NGO installed and officially represented in the region and having the organizational and technical capacities to intervene in several municipalities. According to DGRE, "Level 2" certificate implies that the mechanics:

- Has the organization and capabilities needed to install, rehabilitate and maintain hand pumps at a regional level (at least two or three municipalities or between 200 to 300 hand pumps);
- Has access to necessary equipment (tools, spare parts and transportation mean).
- Can work with "level 1" mechanics to maintain municipal hand pumps.

Typically, the services expected of a « level 2 » mechanics are:

- To ensure regular preventive and curative maintenance of municipal hand pumps
- To intervene within 48 hours after being informed by the WUA, according to the price list agreed with the municipality;
- To respect the terms of references agreed with the municipal authority (deadline, schedule, quality and origin of replacement parts ...);

- To advise WUA and hand pump managers in their roles and to provide support to municipalities and « level 1 » mechanics, etc.

The full list is available at the DGRE. An authorized « level 2 » mechanics can implement scenario 1.

7.2. Suggested contractual form

Contributing stakeholders have agreed on the three key players for scenario 1's operationalization:

A federation of WUA

Ideally, a federation of WUA could facilitate interaction with the service provider. The management of such a federation should be under the responsibility, the control and the supervision of the municipality. Since the municipality contracts with the operator, but as it repies on WUA to ensure the collection of contributions and the reporting of breakdowns, it must be the coordination body.

The service provider (operator)

The « level 2 » mechanics is contracted by the municipality and performs maintenance works.

The municipality

Or alternatively, the regional Council of municipalities who then delegates operations to the federation of WUAs.

The federation of WUAs is the biggest change to the current implementation. Furthermore, the proposed financial circuit is as follows:

- WUAs pay back the hand pump tariffs to the Federation,
- The federation pays the service provider,
- The federation pays a contribution to support the municipal technical service,
- Funds for rehabilitation and contribution for new acquisition are kept in each WUA account or in federation's account,
- Each WUA keep their bank account to secure households contributions collected.

The contractual terms and the financial system must be reviewed and adapted case by case, in accordance with legal and administrative provisions.

7.3. The risks associated with the implementation of the proposal

At WUA level

Two main risks are identified at this level:

- Populations are reluctant in paying their contribution because of misunderstanding of the principle of this form of maintenance management
- Dysfunction of WUA linked with the set-up of a federation.

Several mitigation measures should be considered:

- Continue the effective implementation and capacity reinforcement of WUAs;
- Raise awareness and provide information to populations to change their perceptions on drinking water and on water prices;
- Identify and assess household contributions based on the expected level of service and contributory capacities of users in each municipalities;
- Facilitate the sale of water by volume for greater equity and to make a continuous cash flow;
- Support the organization of optimal and transparent revenue collection based on the choice of the financial system.

At municipal level

At the commune level, three risks were identified:

- Uncertainty about the state, the potential and the quality of the infrastructure and the availability of the underground water resource;
- Low capacity of the municipality to put infrastructure in good condition before handing its management over to a service provider;
- Conflicts between local mechanics already operating in communities and an « estranged » operator possibly coming from outside the region.

Risk mitigation at the municipal level can be considered as follows:

- Strengthen support to municipalities for contracting and monitoring of « level 2 » mechanics interventions;
- Integrate rehabilitation costs in the cost of maintenance;
- Supporting local mechanics to become more professional to reach « level 2 ».

One question remains: the assessment of the availability of the water resource. How to ensure that it is available? Or, if appropriate, how to sign contracts with a service provider in the light of this uncertainty?

7.4. Next steps

The next steps consist essentially in findings and ongoing discussions with policy makers on the one hand, and on the other, to experiment this proposal in one or a group of municipalities. In doing so, the contract and its legal formalization, the financial circuits, and clear and specific control mechanisms and sanctions will need to be refined.

The experiment of this modality asked to focus on an outreach strategy at the local level, otherwise its success could be jeopardized.

Finally, IRC undertakes to forward its report to the DGRE for possible use in developing the post-2015 National WASH program.

VIII. CONCLUSION

The study used information provided by IRC in the monitoring and evaluation of public drinking water services in the municipalities of Gorgadji and Aribinda. The study also used the 2011 Statistical Yearbook of drinking water and some data not yet validated in order to get a better idea of the number of equipment, functionality and rates of access to water.

This analysis shows that a better understanding of the condition of the park of equipment is needed and that future planning through the PCD-AEPA should move towards better access to water, despite the efforts in recent years.

Regarding the main preoccupation of the study, namely the total guarantee maintenance system, it is clear that there are significant financial requirements. Indeed, the price for water, even from handpumps, must be determined and set at a level that allows the establishment of a continuous and sustainable water service. It requires maintenance of assured through a responsive, well-functioning maintenance service organization with competent staff using good quality spare parts.

This quest for professionalism comes at a cost to which the communities should be sensitized. First, the water resources should be adequate to support water services. Secondly, to pay to sustain the water service is a gain compared to episodes of illness in case of termination of service.

The study outlines scenarios of water prices through the expected user household contributions per handpump. In view of the requirements for establishment of a total guarantee maintenance system, handpump fleet size requirements seems to be too high for one municipality to generate returns sufficient to motivate an operator. This system must be based on several municipalities and with the risk of complicating negotiations between mayors and maintenance operators. Moreover, since the technical stakeholders seem to favor Scenario 1 (according to the Reform), it is mandatory to go through intermunicipal and this may extend the negotiations for a possible agreement between the service authorities and providers. If multi-municipality can be considered for later, one must for now retain the idea of an operator per municipality with contribution levels adjusted to its feasibility.

A good understanding and transparency at all levels is essential for proper implementation of such a modality, and more generally for the professionalization of hand pump maintenance. Indeed, mistrust relationship between a service provider and users accustomed to a "community" management may be enough to sabotage a professional management.

Annex 1. Overview of handpumps at Gorgadji

Year of establishment	#	ABANDONED BOREHOLE	POTENTIALLY FONCTIONING BOREHOLE	AGE	TO BE RENEWED	TO BE REHABILITATED
1974	6		6	40	6	
1975	1		1	39	1	
1977	1	1	0	37	1	
1980	3	2	1	34	1	
1981	1		1	33	1	
1984	1		1	30	1	
1985	3		3	29		3
1986	5		5	28		5
1987	2		2	27		2
1988	6	1	5	26		5
1989	6		6	25		6
1990	3	1	2	24		2
1991	4	2	2	23		2
1993	3		3	21		3
1994	1		1	20		1
1995	9		9	19		9
1996	3		3	18		3
1997	3		3	17		3
1998	2		2	16		2
2000	1		1	14		
2001	1		1	13		
2002	1		1	12		
2004	7		7	10		
2005	2		2	9		
2006	1		1	8		
2007	4		4	7		
2008	1		1	6		
2010	9		9	4		
2011	22	1	21	3		
2013	5		5	1		
UNKNOWN	5	1	4			
TOTAL REALISED	**122**	**9**	**113**		**11**	**46**

BOREHOLES REALISED	**122**
ABANDONED BOREHOLES	**9**
POTENTIALLY FUNCTIONING BOREHOLES	**113**

Annex 2. Overview of handpumps at Aribinda

YEAR OF ESTABLISHMENT	#	NOT EQUIPPED BOREHOLE	ABANDONED BOREHOLE	DRYING UP BOREHOLE	POTENTIALLY FUNCTIONING HANDPUMPS	AGE	TO BE RENOVATED	TO BE REHABIL-ITATED
1974	1				1	40	1	
1975	3				3	39	3	
1979	6	1			5	35	6	
1980	2				2	34	2	
1981	1				1	33	1	
1982	3				3	32	3	
1983	2				2	31	2	
1986	6				6	28		6
1987	1				1	27		1
1988	3				3	26		3
1990	3				3	24		3
1991	2				2	23		2
1992	2				2	22		2
1993	33				33	21		33
1994	20				19	20		20
1995	7				7	19		7
1996	2				2	18		2
1997	9				9	17		9
1998	3				3	16		3
1999	1				1	15		1
2000	1				1	14		
2001	1				1	13		
2002	5				5	12		
2003	6				6	11		
2004	1				1	10		
2005	7				7	9		
2006	10				10	8		
2007	10	1		1	9	7		
2008	6				6	6		
2009	4				4	5		
2010	9				9	4		
2011	14				14	3		
2012	16		1		15	2		
2013	1				1	1		
2014	2				2	0		
INCONNUE	5				5			
TOTAL REALISE	**208**	**2**	**1**	**1**	**204**		**18**	**92**

BOREHOLES REALISED	**208**
BOREHOLES DRYING UP	**1**
ABANDONED BOREHOLES	**1**
NOT EQUIPPED BOREHOLES	**2**
POTENTIALLY FUNCTIONING HANDPUMPS	**204**