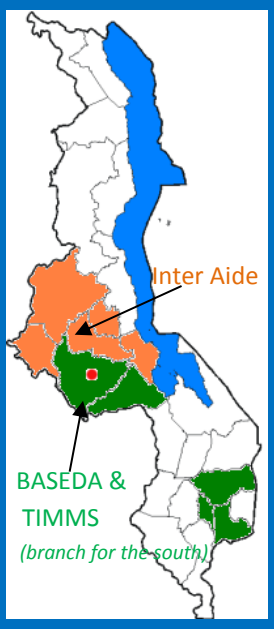
*September 2014*

# Security systems for Hand Pumps in rural areas of Malawi

Description of technical solutions to protect Afridev hand pumps from robberies and vandalism developed by Inter Aide and its local partner BASEDA in Malawi.

The majority of water supply infrastructures in rural areas of Malawi are wells or boreholes and **80% of the protected water points are equipped with Afridev hand pumps**. Such pump has been designed to be easily maintained at community level. This involves regular replacement of the fast wearing spare-parts in order to avoid major breakdowns. But it has also for consequence that it is easier for thieves to dismantle the pump and to steal elements.




Moreover, the interest for hand pump spare-parts is fostered by the local economic trend: the increase of importation taxes and devaluation of the local currency (Kwacha) lead to higher prices for the Afridev spare-parts - that are not produced in Malawi but imported from India -, therefore the temptation to steal and resale them is getting higher. A black market for pump spare-parts progressively grows and second hand parts can henceforth be regularly found in local markets.

**In several districts of Malawi, especially those nearby borders or close from big cities, communities are now affected by theft of spare parts of their hand pumps.** Especially at night, where water points are isolated from the villages and during rainy season when sizes of maize crops are high. **The cost to replace parts can be expensive, sometimes equivalent to the price of a new pump.**

There are no simple technical ways for rural communities to protect their water points, and some villages even decided to hire watchmen or to organize patrol of community police for surveillance. The protection of the pumps is therefore an important concern to sustain the water access in rural areas. To cope with this problem, **Inter Aide and its partner the local NGO BASEDA (including TIMMS its local branch for the south) designed and implemented various systems in their respective areas of intervention to avoid thieves to remove the different parts inside the pump**; systems that are tested and improved according to their efficiency and to the local capacities to produce it.

*This system proposed to the communities is part of a more global approach led by Inter Aide and partners concerning the support to services for the maintenance of water points:*

- *training and follow up of local technicians – Area Mechanics - for the repair or the checkup of hand pumps,*
- *development of a network of hand pump spare parts resellers through partnership with local shops.*

www.interaide.org/pratiques/sites/default/files/ia_operation_and_maintenance_of_rural_water_supplies_in_malawi-2008.pdf

*And also - Link to a study lead by Hydra on 15 innovative projects for the Access to Safe Water for the Bop.*

BASEDA

inter aide

# Systems developed:

*None of this system is infallible as it can be broken, but at least it complicates the dismantlement, it can discourage robbers; give them more difficulties and more time for villagers to react.*

*The bottleneck for the affordability of such system to the communities and its sustainability are padlocks that represent the most costly element and are the items that have to last long.*

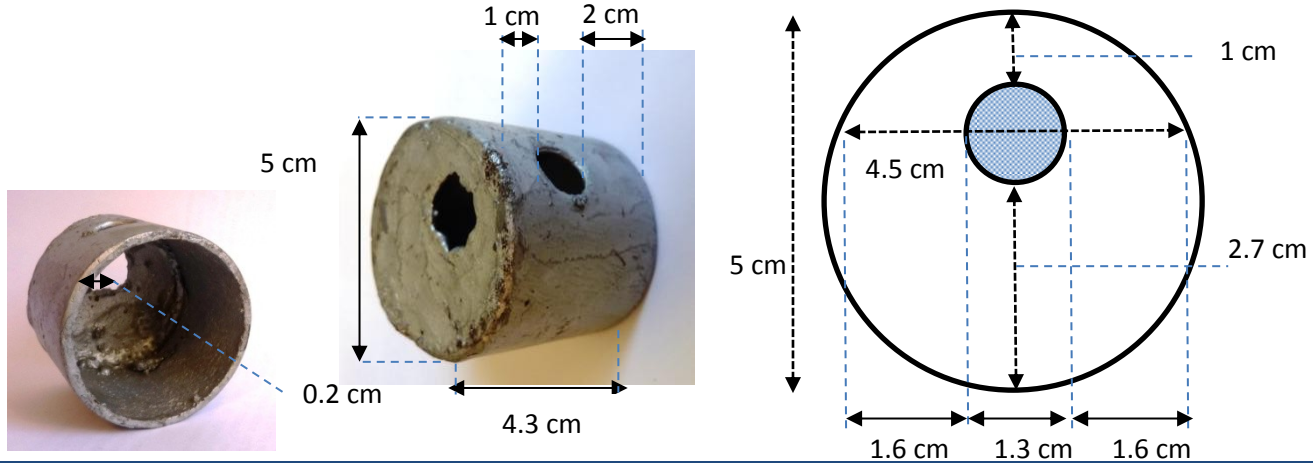
*This document is showing the evolution so far trough different options developed.*

## 1st system

**This system was first tested in 2008; the objective was to propose an option that can fit and be installed on existing hand pumps.**

| ***Description*** | |
|---|---|
|  | Three metal cups – *see pictures and technical scheme* - are designed to fit and cover the bolts in the head cover: two at each side of the pump arm and one for the bolt that fix the cover to the head.<br>After drilling a hole into the metal rim over the bolts, a lock can pass through the head cover and cups, preventing access to the bolts of the fulcrum pin and thereby preventing removal of the head cover. Four locks are used: one at each side of the head cover, one in front of the pump and a fourth one between the head and the pedestal. |
| ***Advantages*** | ▸ The installation can be done **<u>in situ</u>** (for example by local artisans - *Area Mechanics)* the head cover does not need to be removed. Therefore there is no exposure of the borehole to the environment and no risk of contamination.<br>▸ Once cups have been manufactured, the capacity required to install this system is lower. So, potentially a technology that communities can easily acquire. |
| ***Disadvantages*** | ▸ Need a drilling machine for the hole on the hand pump to install the padlocks. *The project provided a portable drilling machine to Area Mechanics in charge of hand pump maintenance.*<br>▸ Need to manufacture the cup. *Although it can easily be manufactured by local welders.* |
| ***Cost*:*** **8 300 MKw** (15,40 €) * to link with currency evolution | - 4 padlocks x 2000 MKw/unit = 8000 MKw<br>- Security contract = **300 MKW** (includes manufacturing and transport)<br>Total : **8 300 MKw** (15,40 €) |

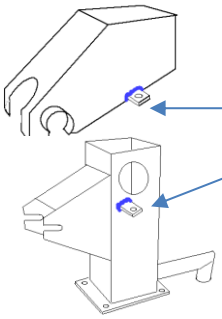
***Technical details of the frame***

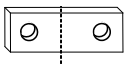


## 2nd system

**This solution is mostly promoted for new wells or boreholes that can directly be equipped with Afridev hand pumps upgraded with such option. But local welders have also been trained by BADESA to install it on the pump heads that local technicians - *Area Mechanics*** (in charge of the maintenance of hand pumps for a catchment area) **can bring.**

### *Description*

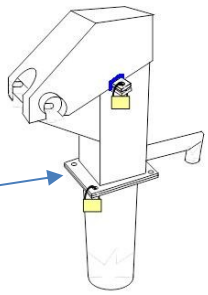





Metallic parts 0.8 cm thick are welded each side of the head cover and of the pump head*. This allows the installation of two padlocks to prevent that anyone removes the head cover.

One of the four bolts between the pump head and the pedestal is replaced by one padlock.

**Iron pieces can easily be found as similar ones were used in local maize mils – picture below.*



| | |
|---|---|
| ***Advantages*** | ▸ **Basic and simple** ▸ **Easy to manufacture** (no difficulties linked with finding a drilling machine). |
| ***Disadvantages*** | The welding imposes to carry the pump head and the pump head cover to a blacksmith. The pump cannot be used during that time and there are risks of contamination as the pump is open. |
| ***Cost*:*** **8 500 MKw** (16 €)<br><br>with cover option (3): **11 500 MKw** (21,5 €)<br><br>* to link with currency evolution | Local blacksmiths have been trained to manufacture such system.<br>When the communities are able to carry the pump head directly to the welder that have been referred by the Area Mechanics (AM), it will cost about 1500 to 2000 MKw. But villagers can also contract the AM (Security contract) to manage the transportation for them; it will then include an additional cost of 500 MKw.<br>- 3 padlocks (2000 MKw x 3) = 6 000 MKw<br>- **Security contract:** welding - 1500 – 2000 MKw (2,8 € to 3,7 €) + transport – 500 MKw<br>Total max. : ***8 500 MKw*** *(16 €)*<br>*Includes pump transportation and* welding (linked with distances)<br>Where it is easier to find welders, the Area Mechanics are just advising the communities and are facilitating the link with blacksmith and suppliers. |

### *Options for this system*

**1)** Instead of removing a bolt between the pump head and the pedestal, one can drill a hole to install the padlock but drilling machine are not available everywhere.

**2)** Iron bars can be used instead of metallic parts,
It becomes simpler: no need for exact specifications, as long as two loops are effectively welded.

**3)** **The protection can be increased by <u>installing metallic covers</u>: it prevents the system for being forced with pliers and it also protects the padlocks from the rain and therefore from the rust.**

**Additional cost: 3 000 MKw** that includes material, welding and transportation (=> **Total cost = 11 500 MKw**).

## 3rd system

**This newly tested solution presents the advantage that it can be installed in situ and it is cheaper - only 1 padlock required (*padlocks have to be renewed as it rust*). It is sales in spare parts shops.**

### *Description*

It consists of installing a frame made of welded iron bars. This frame allows:

- blocking the access to the nut of the head cover,
- fastening the head cover to the pump head and pedestal by one loop at the base where one can fix a padlock.

This option combined in 1 element the advantages of previous systems:

### *Advantages*

- **Cheaper,**
- **Only one lock is required** (also less risks of losing a key),
- **Easy to install**: can be done **in situ** - only need to remove the cover as it has to fit exactly,
- Once frames have been manufactured, the capacity required to install this system is lower. So, potentially a more appropriate technology for communities,
- No drilling required and therefore no difficulties linked with finding a drilling machine.

### *Disadvantages*

Need precise measurements to realize the frame : It has to block the head cover and avoid that someone released the system through passing a lever.

### *Cost**

**5 500 Kw** (10 €)

* to link with currency evolution

- 1 padlock = 2 000 MKw
- Cost of the frame for the communities = **3 500 MKw.**

Tot.= **5 500 MKw**

*It cost 3200 MKw to manufacture, either it is sold to the shop or it is a service proposed by area mechanics - they can make a profit of 200 MKw.*

### *Option*

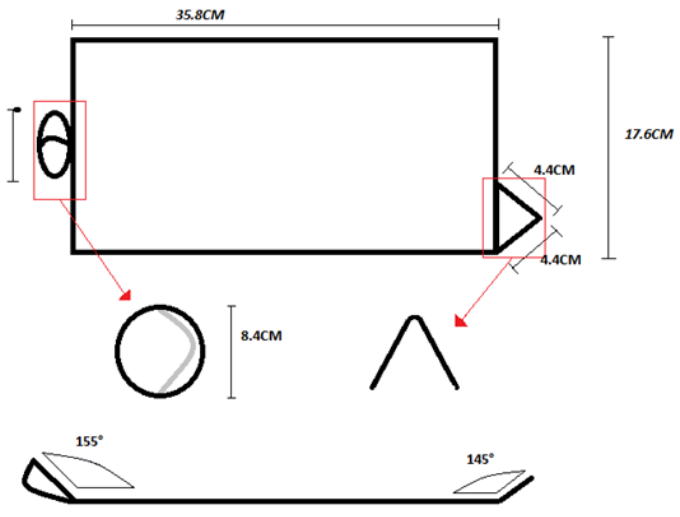
Total cost:

**7 500 MKw**

(14 €)

**It is possible to propose to the communities, reinforcement of the security by adding pieces of iron bars at the level of the access to the padlock and to the nut of the head**

### *Technical details of the frame*




**Materials:**

- Iron bar (Ø 12 mm) of 1.5 m

## Additional means of security:

To increase security BASEDA launched the spread of alarm padlocks. Some partners shops are already proposing this item for sale. It can be inserted in the protected frame as described in option 3 of the 2nd system or the similar one for the 3rd system. The efficiency and durability of such system toward the rain will be tested and the follow up of sales will tell if water points' users are interested by this option and are ready to pay more to secure their system.

These different products and systems contributes to diversify and to foster the business of the Area Mechanics and partners shops:

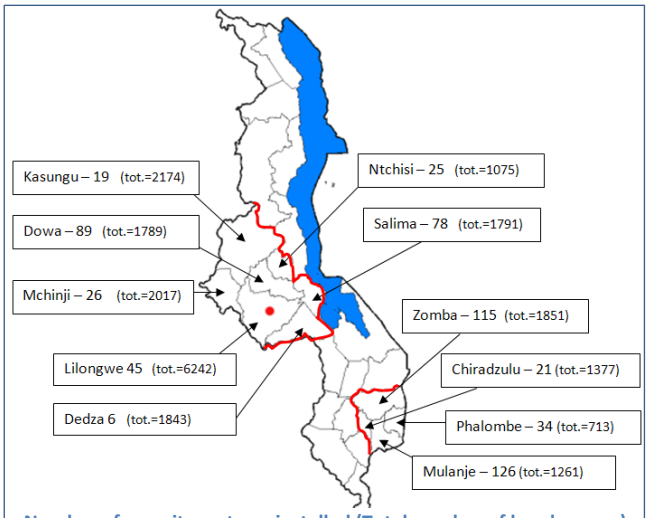
The AM can propose different range of services to the communities – hand pump *repair* and/or *maintenance* (*3 check-up a year*) contracts + **a security contract**. In addition, it gives them more legitimacy and less suspicion on their interventions.

It prolonged their link with the spare parts resellers as security systems are gradually available in the shops. It's also possibly a new source of incomes for local blacksmiths.

## Results:

The map hereafter lists the number of pumps equipped with security systems. Almost **600** water points have been secured so far since 2009 by the Area Mechanics, representing potentially 150˙000 beneficiaries (*ratio of 250 users per water point according to the national guidelines*).

As for now, less than 5% of the pumps are equipped with such systems in the areas where Inter Aide, BASEDA and TIMMS are working. This is therefore an opportunity to develop such local small businesses that at the same time represents a smart solution to tackle the problem of thieves.



Number of security systems installed (Total number of hand pumps)

*N.B. : total number of hand pump provided by MoIWD except for Dowa, Kasungu, Mchinji, Ntchisi, Salima where an inventory has been conducted by AM.*

**Replacement cost for the pump assembly can reach approximately 150˙000MKw (*280 €*): *based on a 30 meters deep borehole*.**

**It is therefore <u>13 times more</u> than installing the most expensive sec. system (2nd system with option 3) that cost 11˙000 MKw - *20 €*.**

| Cost to replace parts | Time for villagers to collect money |
|---|---|
| 150 000 MKw<br>*280 €* | 2 years and a half |

| Cost of sec. systems | Time for villagers to collect money |
|---|---|
| 11 500 MKw<br>*16 €* | **2 months** |

Water point committees can collect from households between 20MKw and 100MKw on average in a month (*4 to 20 cents*). Considering one water point – 250 users, almost 50 households, **in one month can be collected 5 000 MKW.**

**It would then require 30 months for the villagers to be able to collect the whole amount if the water point has been seriously vandalized, <u>compared to 2 months to have the money for a security system</u>.**

Furthermore, when a hand pump has been vandalized, apart from the important amount of money to collect, reasons why communities could hesitate to renew it, is the fear of continued theft and the risk that it will happen again.

## Limits, challenges and way forward:

As mentioned before, all those systems do not guarantee 100% that the pumps are totally safe. A determined thieve can find a way to break it. In addition, **the padlocks required to be maintained or replaced from time to time as rust can blocked it** (*maintenance can be include in a general routine of prevention of the water point*).

**It is necessary to sensitize water points' users to the importance of protecting their pump and investing in security systems:** most of the time, it is only communities who have experienced theft in the past or who are close from other water points that have been vandalized, who are willing to invest in security system. The more vulnerable areas are those who are close from big towns (Lilongwe or Blantyre) or from borders.

The concern of vandalism is shared by all authorities and Water Institutions. But it remains difficult for them to manage such issue. In certain districts, like in Ntchisi, the Water officers of the Water Department are linking the communities with the police and traditional authorities. Punctual surveys have even been organized to watch if non-identified parts were sold in the markets. In any cases, all districts have been fully involved in the development of such systems and in particular in the trainings of Area Mechanics.

One option under study is the process of certifying spare parts suppliers by the authorities in order to guarantee that elements sold are brand new ones, but this required a control system which is difficult to implement.

It is interesting to note that this security challenge has been tackled by several organizations and that new installations are equipped by Afridev hand pumps designed with the 2nd security system option.

Security system installed in the village of Mongo, Chadza TA


Mr. Mussa blacksmith in Chadza TA, welded 12 security systems in 2013