

IMPACT OF THE ROPE AND WASHER PUMP IN A WATER AND SANITATION PROJECT, RIFT VALLEY PROVINCE, KENYA

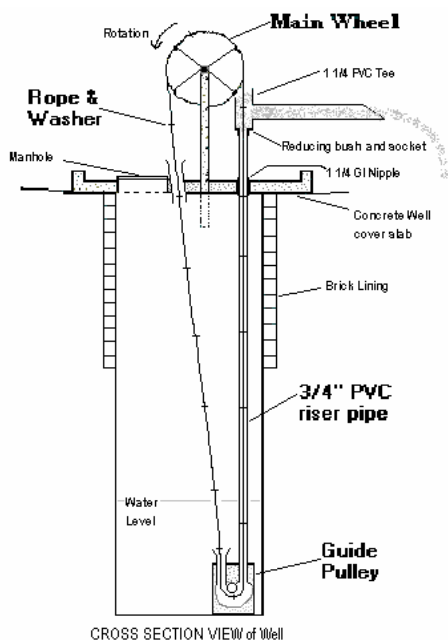
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Abstract

This study aimed to investigate the health and income impacts of the rope and washer pump in a water and sanitation project in Matharu, Kenya. Twenty-six rope and washer pump owners were asked a series of questions regarding their household health and income, both before and since having the pump. The study found that although the respondents perceived the decrease in diseases as a benefit of having a rope pump, a direct link could not be determined. This was due to the fact that other aspects of the water programme such as the introduction of SODIS for decontaminating drinking water and PHAST to improve hygiene practices could also have helped to decrease the incidents of disease in the area.

The pump provided good quality water with less than 10 faecal coliform counts per 100ml in 97% of water samples. The pump design was well suited to the provision of domestic water supply, is low cost, and as it was maintained by the owners themselves at a low cost. The rope pump saved users a considerable amount of time which was used for productive activities such as farming, selling produce and small scale irrigation.

The rope and washer pump has made an important contribution to the water and sanitation project in Matharu and to improving the quality of life of the people.



1.1. The Rope and Washer Pump

The rope and washer pump is a low-cost handpump capable of pumping water from up to 25 meters below ground. It has been in use in various forms all over the world for many years.

The pump is manufactured locally. Operation and maintenance for the pumps is low in comparison with other low cost handpumps and due to the simple design (see diagram below), can be done by the users themselves, with the few repairs and spare parts available from the local private sector (IRC 1995).

The success of the rope and washer pumps in Nicaraguan water projects (Bombas 2004) have helped to facilitate its introduction into water projects all over the world including, Ghana, Ecuador, Angola and Kenya.

Figure 1. Outline design of the rope and washer pump. The wheel is turned by manpower in the direction indicated and feeds the rope and washers down the well shaft and through the riser pipe to the discharge point. The washers are an exact fit with the riser pipe and force water up towards the surface.

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1.2. The Rope and Washer Pump in Eldoret, Kenya.

The rope and washer pump was introduced to Eldoret by the Christian Community Services (CCS), Water and Sanitation Project (WATSAN) in 1998. The aim of CCS is “to assist people to mobilize their own resources to alleviate their problems and meet their basic needs” (CCS 2004). The WATSAN project began in Matharu area in 1997 after the Integrated Rural Development Programme undertook a Participatory Rural Appraisal (PRA) in 19 project areas through which water was identified as a priority need by the communities (CCS 2004).

CCS facilitated the formation of six self help groups in the area with 40 – 60 members in all. The groups meet once a week to discuss and plan current and new projects with CCS staff attending every two weeks. Each group has a secretary who keeps records of the progress made by each member. At the time of writing, approximately 50 rope and washer pumps have been installed in the Matharu project area since 1998. Other initiatives include training group members in PHAST (Participatory Hygiene And Sanitation Training), to promote better hygiene practices such as, hand washing after using the latrine, and the implementation of SODIS (SOLar DISinfection of water) to disinfect drinking water.

1.3. Socioeconomic data of the Area

The source of income for the majority of families is from mixed farming, with the main crops being potatoes and maize. All families have small plots of land which vary in size from 1 to 5 ares. The average household family size in the area was estimated to be 7 people i.e., two adults and five children, by CCS staff. Before the CCS implemented the WATSAN project in the area, the main water sources were springs, streams and unprotected hand dug wells.

1.4. Objective

The objective of the study was to obtain the users opinions on the impact of the installation of rope and washer pumps, on the incidents of water related diseases and the time saved by households which use the pump. This data was used to identify the possible health and income benefits provided by having the pump.

2 Methodology

Twenty six rope and washer pump owners were visited and provided information for the questionnaires during a two week period. Due to time constraints only one project area was included, Matharu project area. A questionnaire, was filled in by the author at each well visited with the assistance of a local translator; it was designed with the assistance of CCS staff. There were 20 questions in three sections, health, time saving and design. Observation and interview were used to assess the sanitary situation.

Quantitative data on the microbiological quality in the well water was gathered by testing for faecal coliform using a DELAQUA water testing kit. Two water samples were taken at each well visited.

The discharge rates of pumps visited were taken and the time needed to collect water during the day.

3 Results

3.1 Health Survey

The number of cases of typhoid since the rope and washer pumps were installed dropped, Figure 2. Almost 70% of the people questioned reported having annual cases of typhoid when using their old unprotected sources of water, while only 19% reported that they still had annual cases of typhoid after having the pump installed.

Although most of the respondents did attribute the rope-pump with the eradication of typhoid, it can not be determined to be the sole or even main contributing factor based on this evidence. This is due to the fact that there are many other variables involved which could have an effect on incidents of diseases for the 26 people questioned. There are several aspects to the water and sanitation project in Matharu, such as the introduction of the SODIS, a water disinfection method, which 70% of people interviewed practice and is proven to reduce

the numbers of faecal coliforms in raw water (Burgess et al. 2004). Seventy percent of respondents have also had PHAST training and they are more aware of hygiene issues and how to improve hygiene in the home.

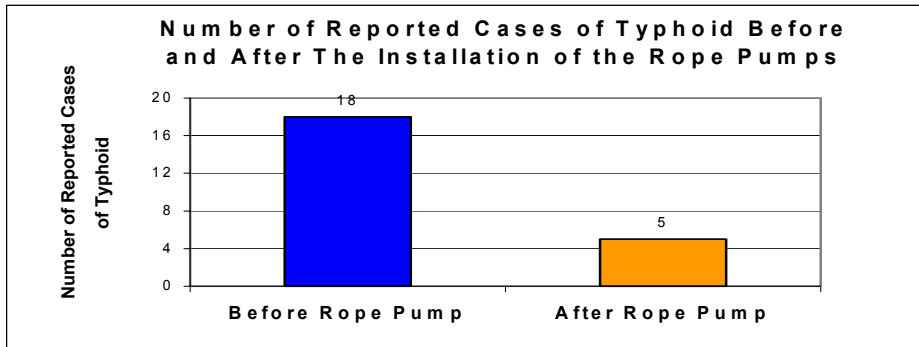
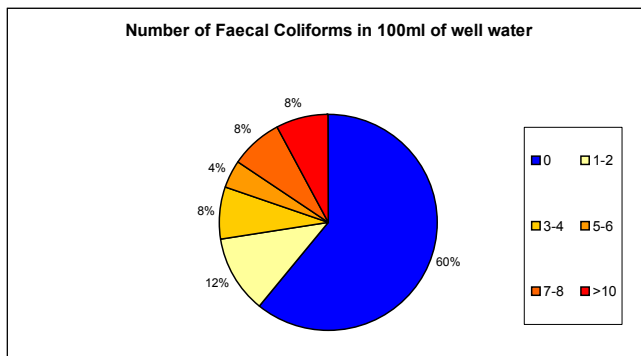


Figure 2: Bar chart shows the number of families who reported cases of Typhoid annually before having the rope pump (in blue) and the number of families reporting cases of Typhoid since having the pump installed (orange).

3.2 Design Survey

All wells have adequate levels of water in them, discharge in all wells was good ranging from 0.2 – 0.5 l/s. There was found to be no correlation between the well or water depth and discharge rates. It was thought at the beginning of the study that that these two variables may have some bearing on the discharge due to the greater depth increasing downward pressure on the washers and forcing more water down the riser pipe with increasing depth. This was not found to be the case, another variable such as wear on the washers could be responsible for the differing discharge rates although this was not investigated.

3.3 Water quality survey



The study was able to show that water quality is very good with 90% of the wells having faecal coliform counts below 10 in a 100ml sample, of raw well water. Sixty percent of the wells had no Faecal coliforms present, conforming to the stringent WHO drinking water quality guidelines of zero coliforms per 100ml (WHO 1997).

Figure 3: Pie chart showing the percentages of people with different numbers of faecal coliforms found in a 100ml sample of well water from each of the 26 wells tested, from 0(blue) to greater than10(red)

3.4 Sanitary Survey

Figure 4 Shows the level of hazard risk associated with the pumps and their protection. Sixty percent of users had a good level of protection with good condition of the concrete apron, drainage, fence and a distance of 30 meters or more between the well and latrine. This meant that the well was at a low risk of being contaminated by faecal bacteria. Only one well was at a very high risk and this was the same well owned by an independent respondent not involved with the project, who had a poorly designed well and no PHAST training. This well also performed badly in the water quality testing, with counts of over 200 in 100ml sample.

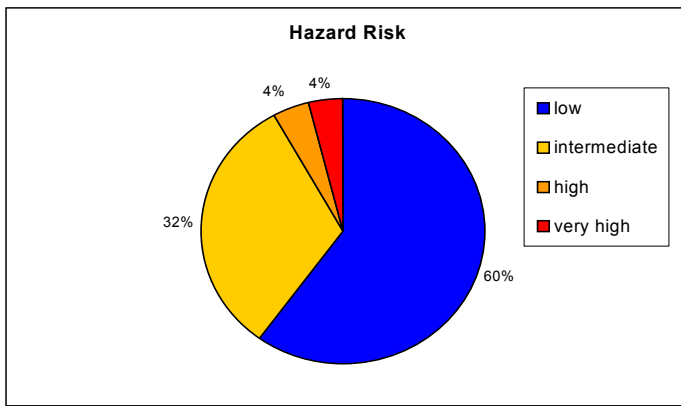
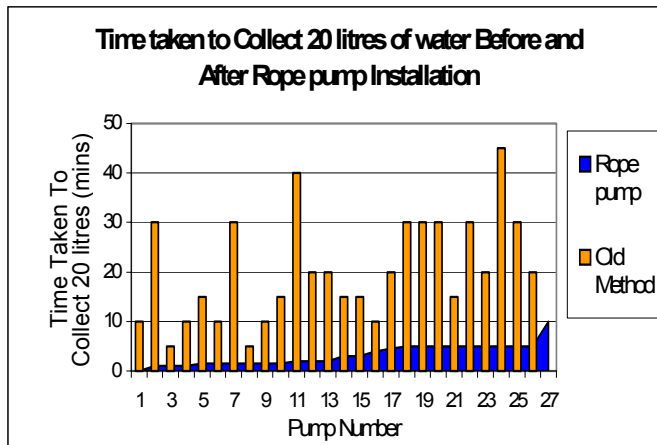


Figure 4: Pie chart showing the percentage of wells scoring low, intermediate, high and very high hazard risk, this is the risk that well water will be contaminated. This chart represents the results of the sanitary survey, the data for which was collected during the design survey.

3.5 Time Saving

One of the greatest benefits of the rope and washer pump project was the time saved by no longer having to fetch and carry water over long distances. As Figure 5 shows some Matharu residents had been taking up to 45 minutes to collect just 20 litres of water, a journey that was repeated several times a day. Even the slowest pump in this study could provide the same amount in less than 10 minutes with most pumps in less than five minutes. The actual pump rate was an average of 20 litres in one minute (0.3l/s) from water levels of 6 to 20m deep.



When questioned about time saving all respondents indicated that they felt they saved time by using the pump. They also indicated that this extra time was used in productive activities such as, household chores, tending crops or animals, selling produce and small scale irrigation.

Figure 5: Bar chart showing the time taken to collect 20 litres of water using the respondents old method of collection (orange) and the time taken to collect 20 litres of water using the rope and washer pumps (blue). Wells were assigned numbers randomly.

3.6 Water Usage

Project members reported increasing water usage, due to the water supply being in close proximity to the house and also as a result of PHAST training making them aware of the benefits of better hygiene practices. They commented that they no longer have to economise their water as they have done in the past.

The increased usage is also because more is now used for the irrigation of crops and livestock. This has greatly improved productivity according the respondents and means crops can be grown for a longer period, through the dry season and cattle are healthier.

Most families share their well with at least one of their neighbours meaning that the benefits of the rope and washer pumps have reached many more families than those directly involved in the project.

4. Conclusions

In conclusion, the rope and washer pump is a key part of the water and sanitation programme in Matharu. Although health benefits could not be attributed to its provision directly, the users of the rope and washer pump perceived it as being responsible for the health benefits they have received. Hygiene education and solar disinfection of water (SODIS) together with the rope and washer pump have provided the participants of the programme with lower typhoid rates in comparison with incidents of typhoid before the project began in 1997.

The design of the rope and washer pump is well suited to domestic and small-scale water provision in rural areas such as Matharu. The pump can be easily maintained and repaired by the user, spare parts are not specialised and can be produced in the local area. The water levels and discharge rates were good for all 26 wells in the study and protection from contamination was good in 90 % of cases. All respondents found the rope pump easier to use than their previous method of water collection.

The amount of time saved by having a pump indicates that there is a great opportunity to spend saved time engaging in income generating activities. Respondents indicated that time saved was spent in productive ways, working on land, tending animals, and selling produce. So, although respondents were unable to quantify this in terms of household income they perceived income benefits from the rope and washer pump.

5. Future work

Any future studies may want to consider focusing on the income generating activities which could be undertaken in the area due to the large amounts of time saved by having a handpump. As hygiene education is also being widely promoted in the project area, identifying changes in hygiene behaviour may be a more accurate way of determining the health impacts of the water and sanitation interventions in any future studies.

During the feedback meeting in Matharu, it was mentioned that the guide pulley used to guide the rope at the bottom of the well into the riser pipe was very rusty as it was made entirely of metal; it was suggested that a more durable material could be used. (A new non-rusting pulley has now been implemented- Burgess 2005) Other design points which could also be investigated were: using wind power to pump water, a battery operated motor to turn the wheel and making the pump easier to use for elderly and disabled people

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