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Impacts of small scale community water projects: The case of Elephant Pumps in Shinja resettlement area, Chimanimani district, Zimbabwe

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Abstract

This study analyzed impacts of the Elephant Pump project in Shinja resettlement area, Chimanimani district. Results of the 2005 baseline study by the Biomedical Research and Training Institute were compared to the 2012 conditions. Questionnaire surveys and focus group discussions were used to gather qualitative and quantitative data on selected impact indicators. Total vulnerability, expenditure levels, time savings, distance to water source, cultural pride and disease prevalence were assessed. Global Positioning Systems receivers were used to calculate and map distances between households and water points. The study established that the project has contributed to improvements in livelihoods. Reduced vulnerability occurred along with increased expenditure. Reduced distances to water sources complemented time savings. Reductions in stress levels, increased status and self-esteem, better family and community relations and increased ability to observe religious rites and customs were also realized. However, the project's impacts are rather contributory than attributory considering that there are other factors contributing to the changes.

Keywords: Impacts; Elephant Pump; Water projects; Baseline survey

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1. Introduction

Shinja resettlement area, like most communal areas in Zimbabwe is characterized by acute water shortages. Most of the households share water sources that often dry up during the day (BRTI, 2006). The drying up of water sources during the course of the year could be attributed to the predominance of shallow wells which can only last a few months after the rainy season ends. Conditions of water scarcity and the associated sanitation and hygiene problems are fairly well documented and are the reason why many development organizations seek to help address the situation (BRTI, 2006). While various responses and programmes have been devised, the problems still remain tough and obstinate.

In Shinja area, Pump Aid, an international trust, responded through an intervention aimed at providing clean and adequate water to vulnerable communities using a simple rope and washer technology known as the Elephant Pump (EP). The project's ideology is that by having access to clean and adequate water, communities will be less vulnerable to poverty and related problems. Thus, water provides an opportunity for other spill over activities that help in reducing the levels of poverty.

Social systems are fragile and extremely sensitive to change and any project directly related to them must be examined closely through social impact assessment so that their potential social benefits and costs can be determined (Rickson et al., 1990; Brudge, 1994a; Brudge, 1994b). This will facilitate sound project planning and management, as the appropriate measures will be taken to mitigate potential negative impacts and support positive impacts for sustainability purposes. In particular, consideration must be given to the effects of cumulative impacts of relatively small changes made over certain periods (Rickson et al., 1990). The term social change includes alterations in social relationships between persons and /or groups involved, for example, as a result of the Elephant Pump project, will beneficiaries have to change their style, pace, and/or standard of living? Will social cooperation and interaction patterns be changed? Will change be sudden or gradual? How does the proposed action fit with historical trends and participation in the project? How does the proposed change fit with cultural or normative expectations of behavior in the community? Social impact analysis should provide answers to these and related questions so that managers and decision makers of the organization reach more informed decisions.

There is a chronic deficiency of impact analyses of water related projects particularly in Zimbabwe. This has resulted in dismal failure of some projects to be sustainable for commendable periods of time. As such, a thorough analysis of the impacts of rural water projects would be a good complement to the existing organizational strategies and plans. The study becomes significant in that it reflects on the project's logic chain in terms of effectiveness, efficiency, relevance, sustainability and impact. It provides answers to the questions such as; why are some problems still tough and obstinate? Have we done things right as the implementing organization? Have we done the right thing? Is there anything we can do to build on what we have already done? Can we do better than this? Who should have been involved in this project? Will the people smile back at us? It will also generate ideas from lessons learnt and map the way for effective pre and post implementation management regimes that may lead to more sustainable alternatives for small scale water projects in Africa.

1.1. Impact analysis in the water sector

An impact is a significant or lasting change in people's lives brought about by a given action or actions (Finsterbusch et al., 1990; Taylor et al., 1990). The water sector is characterized by a relative shortage of impact analysis in three key dimensions. Firstly, existing impact analyses have not covered the full range of outcomes that water projects can affect. While one does see evidence on the impacts of these interventions on health outcomes, this is not the case for non-health outcomes (Esrey *et al.* 1991; Fewtrell and Colford, 2004). Only a few analyses demonstrate the impact of water projects on poverty, including incomes, consumption levels, education, or gender and ethnic inclusion.

Secondly, there has been little effective impact analysis of water projects. Effective is defined here as analysis that:

- has a large enough sample size to detect statistically significant effects of the water interventions with sufficiently high statistical significance and
- can credibly identify the causal impacts of a project on outcomes, not of other factors, by using a methodology that credibly simulates the counterfactual.

Randomization is an example of a methodology that can credibly simulate the counterfactual by means of a control group. By this definition of 'effective', there has been no effective impact analysis of water projects for non-health outcomes and only a handful for health outcomes (Zwane and Kremer, 2007).

Thirdly, there have been few impact analyses in a rural African context (Gramling and Freudenburg, 1992). Most impact assessments have been done on projects in the developed and other regions of the world and little has been done in Africa. Several studies by the World Bank and other institutions within the water sector tended to focus on aspects of water provision other than the causal impacts of rural water projects on outcomes. For example, the World Bank WSS Working Note Series and the World Bank WSS Discussion Paper Series had 16 papers between them as at September 12 2006, none of which dealt with the impact of rural water supply in Africa or elsewhere. This analysis contributes to the few analyses that have been done on the small scale rural water projects.

2. Methodology

2.1. Study area

The study was conducted in Chimanimani district ward 7 located in Manicaland province in the Eastern Highlands of Zimbabwe (Figure 1). The district, which is predominantly rural, is 155 km south east of the provincial capital Mutare and borders Mozambique to the East, Buhera district to the West, Chipinge district to the South and Mutare district to the North. The district is divided into 23 wards that are further divided into villages.

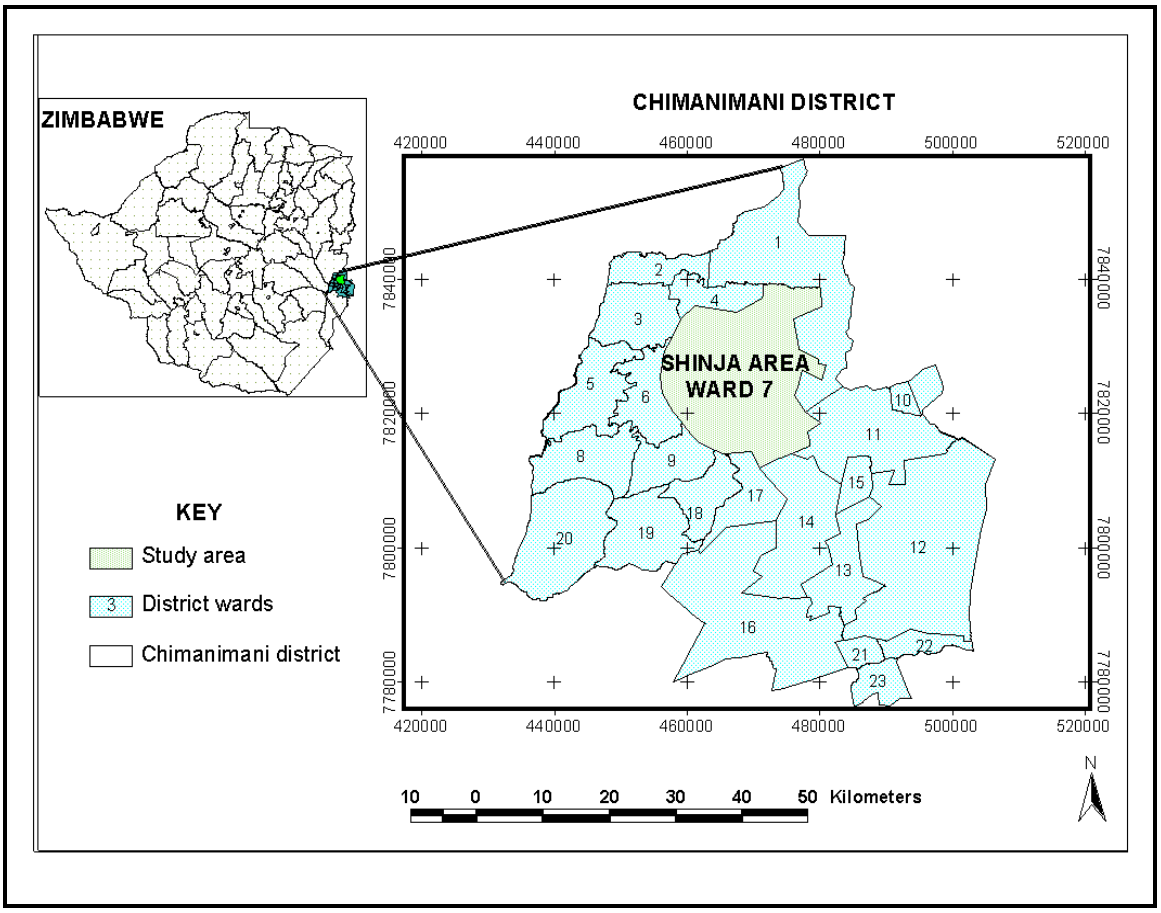

Figure 1. The study area, Chimanimani district Shinja area ward 7

Village 11 of Shinja Resettlement area ward 7 was established in 1981. Other settlers of the village came from the surrounding dry communal areas of Mhakwe, Chikwakwa, Nyanyadzi, Chayamiti and Shinja Communal area during the land resettlement programme of 2000 (Munyati et al., 2006). The villagers benefit from social amenities such as a rural business centre, Rural Health Centre, a secondary school and four primary schools. The main economic activity is agriculture, which is practiced along the riverbanks. The main types of crops that are grown in the land under irrigation are wheat, vegetables, tomatoes, sugarcane and onions. Though the village receives little rainfall, the soils are fertile.

2.2. Vulnerability Assessment

The Vulnerability Indicator Score was used to measure vulnerability, which was used to compare pre and post implementation status of households to determine the extent to which the project impacted on the people. This has been defined from all the eight contributing indicators, which were as follows:

- The number of meals the household usually had a day
- Number of children of school going age who were not attending school
- Number of family members not able to pay medical fees if sick/ill
- Number of children who did not have adequate clothing
- Household access to clean source of water
- Household access to toilet facilities
- Daily access to food
- Number of orphans

A total vulnerability score was defined by adding up all the individual indicator scores to come up with a Total Vulnerable Indicator Score (TVIS) (maximum possible score was eight). The TVIS was then defined into three categories (highly vulnerable, moderately vulnerable and less vulnerable) as follows and the lower and upper limits of each category were defined.

- Less Vulnerable - a TVIS below 50%
- Moderately Vulnerable - a TVIS of 50% to 75%
- Highly Vulnerable - a TVIS of above 75%

Each indicator was coded either one (1) if the household was commensurate with vulnerability status, or zero (0) if otherwise. The Total Vulnerability Indicator Score (TVIS) was defined as a summation of eight vulnerability indicators and it was expressed as a percentage. The maximum possible score was eight indicating a state of being highly vulnerable.

2.3. The most Significant change approach

The most significant change (MSC) technique was used to obtain data on impact and outcomes that we used to help assess the performance of the program as a whole. Essentially, it involved the collection of significant change (SC) stories emanating from the field level, and the systematic selection of the most significant of these stories by panels of designated stakeholders. The stakeholders included the headman, the local councilors and local agricultural extension officers.

2.4. Questionnaire surveys

The study involved the use of questionnaire surveys to get information from both the beneficiaries and non-beneficiaries of the Elephant Pump project. The study relied mostly on information provided by the local people to see the impact of the EPs. The questionnaire was mainly focused on reviewing the experiences, life style and other socio economic characteristics before and after the installation of the EPs.

2.5. Public meetings and Focus groups

In this study, we used some non-deliberative mechanisms for obtaining information from the public. The scoping phase of the study involved some public meetings in which stakeholders and other members of the community discussed their views about the project. Discussions with people of various socio-economic backgrounds established an understanding of how EPs impact on people of varying socio-economic status.

Focus groups were also designed to have representatives from the community who were considered a proxy for public opinion. In these, opinion about the Elephant Pump project were raised and discussed.

2.6. Interviews

Interviews were used to gain understanding of the social issues. This involved talking to key people in the community in order to discuss their knowledge, experience and understanding of the issues. These people were involved in the development of Elephant Pump activities, some were those that the community turn to in times of crisis or those who are seen as the heart of the community. Key people included health workers, traders, religious leaders, village chiefs, pastors and teachers.

2.7. Secondary data sources

The 2005 BRTI baseline survey report was used to understand the conditions within the resettlement area before the implementation of the EP project. These conditions were compared to the prevailing conditions in 2012.

3. Results and discussion

The study established that the EPs contributed to the improvement of life in Shinja resettlement area in many ways. It should be noted that the impacts were contributory rather than attributory. They include reduced vulnerability as calculated using the vulnerability indicator scores, reduced cases of water and sanitation related diseases, an increase in economic activities, socio-cultural upliftment, improved hygiene, time saving and improved access to food. Table 3.1 shows impact indicators and a description of the impacts realized after the use of EPs by the community.

3.1. Reduction in reported diseases

Table 3.1 shows that after the introduction of EPs, the recorded cases of water and sanitation related diseases declined. The reduction cannot be exclusively attributed to the use of these pumps as there are other conditions and interventions that might have also contributed. However, the community believes that the use of EPs in addition to the Primary Health and Hygiene Education programme that comes with the programme played a critical role towards the reduction in disease outbreaks.

Table 3.1. A summary of impacts of the Elephant Pump water project in Shinja area

Impact Indicator	Impact
Diseases	Significant reduction of water and sanitation related diseases such as: Diarrhoea Bilharzia Malaria
Economic activities	Increase in the number of water related income generating activities such as: Vegetable gardening Livestock watering Food vending
Socio cultural	Serving visitors with potable drinking water in clean cups and offer cooked food Improved dignity and pride Observance of funerals and other community gatherings
Hygiene	Clean utensils, cups and water storage containers Non recycling of water Reduced resource conflicts with neighbours Clean clothes
Time	Distance to a source of clean water significantly reduced Queuing for water significantly reduced Reduced time in filling a 20 litre container
Food	An increase in the number of meals per day An improvement in the quality of food

We statistically tested some collected data to verify this conclusion. By design, the EPs are installed close to homesteads. Field data was statistically analyzed to assess the relationship between distances walked to a source of clean water and reported cases of disease outbreaks.

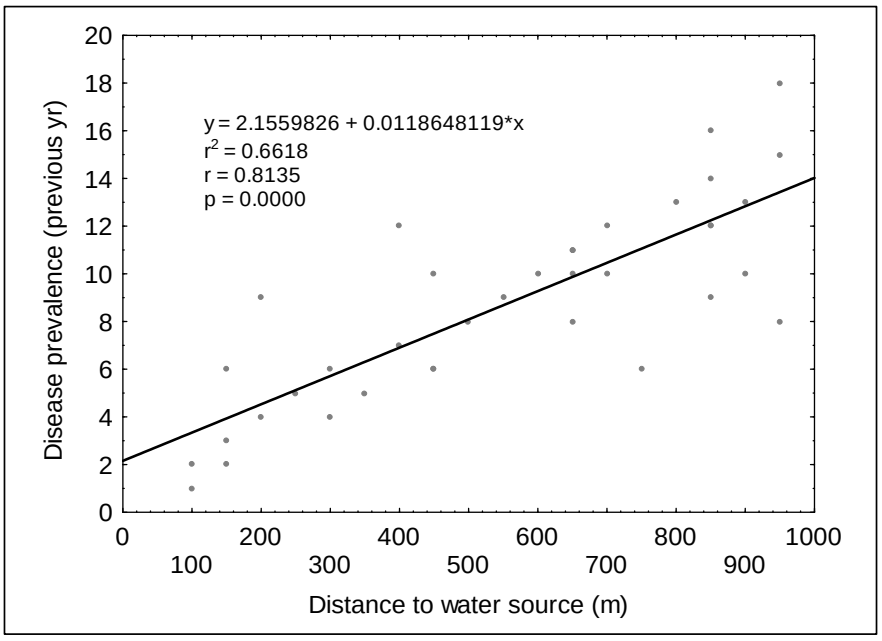

Figure 2. The relationship between distance and reported cases of water and sanitation related diseases

Figure 2 shows that there is a strong (r=0.8135) significant (p<0.05) relationship between distance to the water source and prevalence of water related diseases. Regression analysis revealed we are able to predict disease prevalence using distance to the water source.

Figure 2 also indicates that distance walked by communities to a source of clean water is a factor that contributes significantly to the prevalence of water and sanitation related diseases. As the distance to the water source increases, cases of water borne diseases also increase.

Distances walked to a source of clean water by individual households before installation of EPs differed significantly (p=0.000; α=0.05) with distances walked after their installation. Figure 3a shows that on average, households walked for more than 800 meters to a source of clean water before EPs were installed while after installation the average distance was reduced to approximately 350 meters.

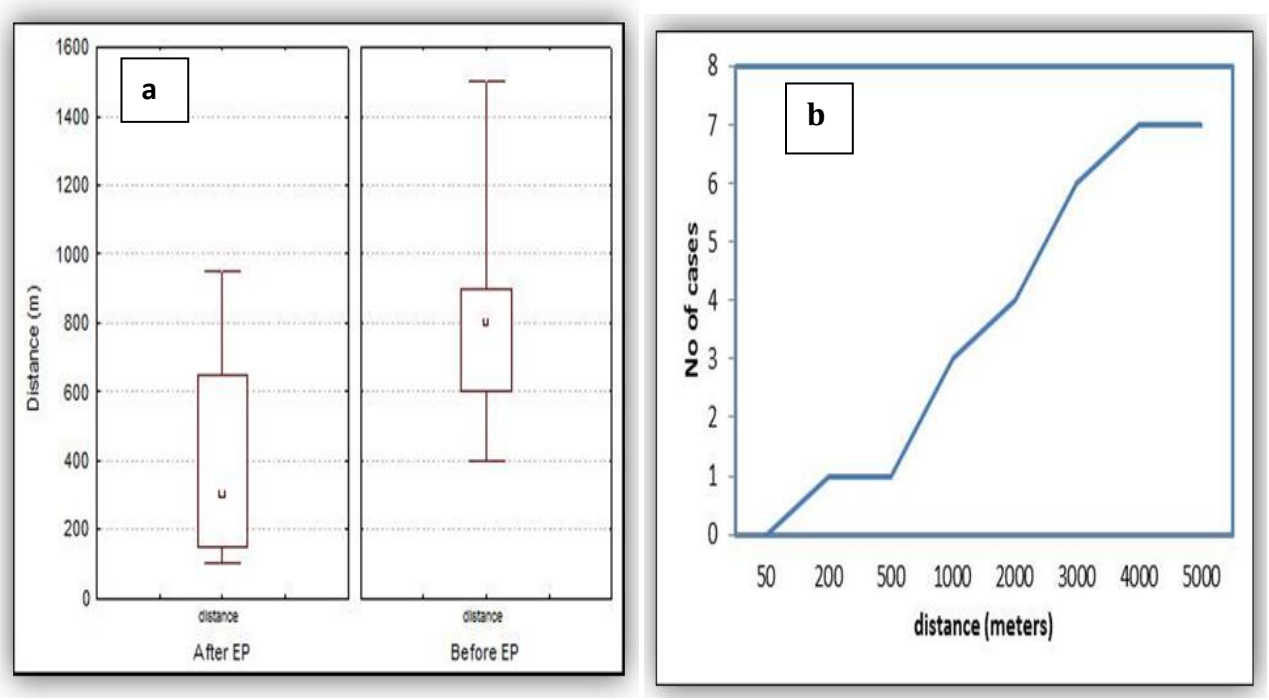

Figure 3. Distances walked before and after EP installation (a) and relationship between distance and reported cases of water and sanitation related diseases (b)

Figure 3b shows that as distance increased, the number of cases also increased. It was therefore established that the EPs' contribution to the reduction in distances walked by households implies a reduction in disease prevalence in the area.

This suggests that distance affects the quality and quantity of water. The furthest the people walk to fetch water the higher the vulnerability to water related diseases. Distance increases strenuousness in fetching water and negatively impacts on the quantity of water used. People tend to re-cycle the water that they

would have used for other purposes and they end up using contaminated water, which result in the development of water related diseases.

3.2. Time saving

Time is important in determining progress and development in any community as it dictates the type and extend of development activities. This study assessed the intervention's impact with regards to time saving. As shown in the preceding results, the EPs were installed closer to homesteads as compared with other sources of water in the community. This already has an influence on the time taken to fetch water. Figure 4 shows the average time taken to fill a 20 litre container from different water sources.

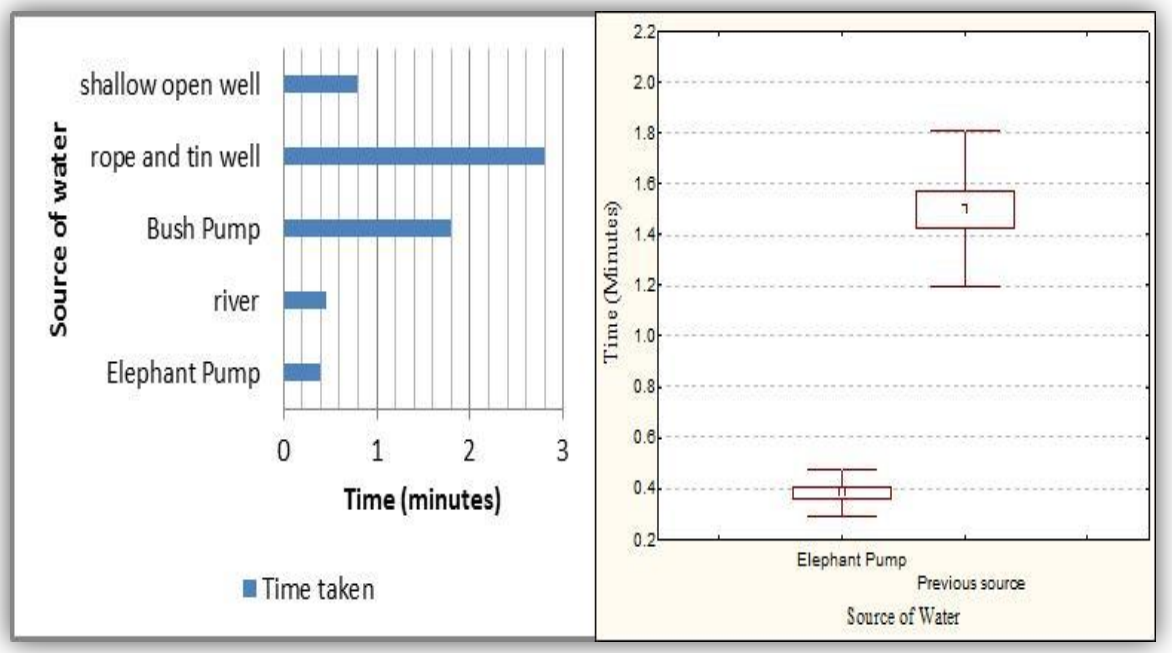

Figure 4. Average time taken to fill a 20 litre container from different sources (a). Differences in time taken between EP and other sources combined.

The time taken to fill 20 litre containers has been reduced. On average, each household uses 280 litres per day for domestic purposes. Thus the cumulative time saved per day by a household that previously fetched water from a rope and tin well is 33.6 minutes, which translates to 235.2 minutes of filling a 20 litre container per week.

Taking into account the distances walked to a source of water, it is apparent that the project significantly contributed in time saving. The majority (67.6%) of the respondents who previously used other sources reported that they take more than 30 minutes to fetch water from their sources. About 29.73 % of these respondents reported that they spend between 15-30 minutes to fetch water from these sources while only

2.7% claimed that they take less than 15 minutes to collect water from their sources. However, for the respondents who use EPs, most of them (47.1%) reported that they walk for less than 15 minutes to fetch water from their source. 29.4% of the respondents reported that they take between 15-30 minutes to fetch water from their source while only 23.5% spend more than 30 minutes to fetch water from the EP.

Statistical analysis revealed that, in terms of time taken to fetch water from the source, there is a significant ($p<0.05$) difference between time taken by the respondents before and after the installation of the EPs.

3.3. Shared responsibilities

The Elephant Pump project has encouraged sharing of responsibilities at household level. This has contributed to the off-loading of the burden of household chores from women who are culturally responsible for fetching water for household use. Interviews revealed that the Elephant Pump is easy to use and child friendly and this has resulted in an increase in the number of children helping their parents and guardians with water fetching responsibilities. This saves time for them to focus on other important household activities. Figure 5 shows that more children are now involved in water fetching activities in the area due to the introduction of the EPs.

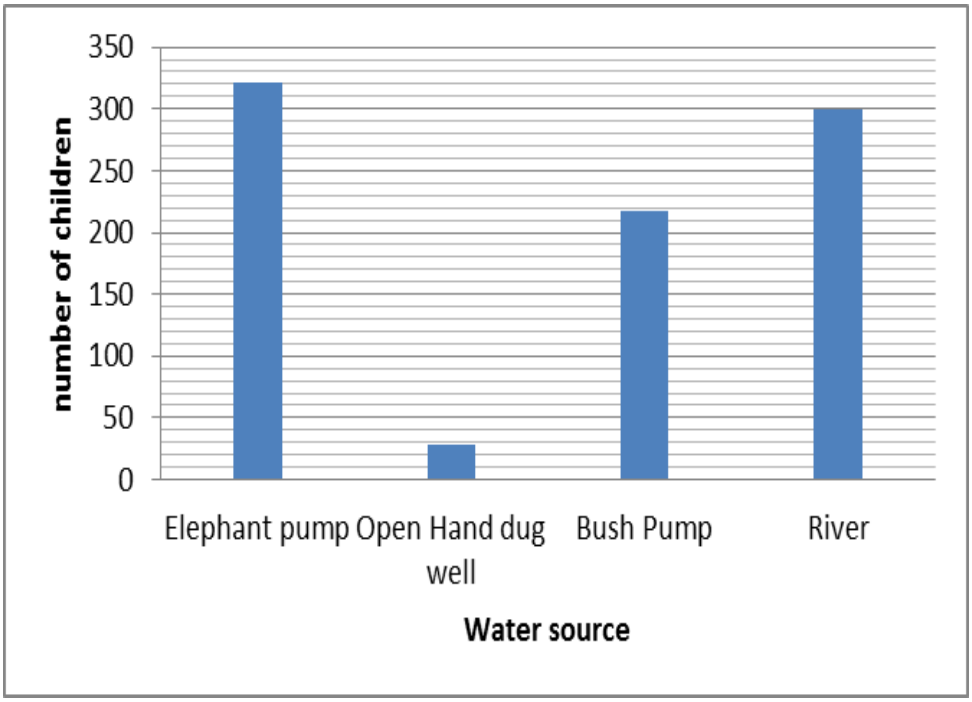

Figure 5. Children participating in fetching water according to type of water source

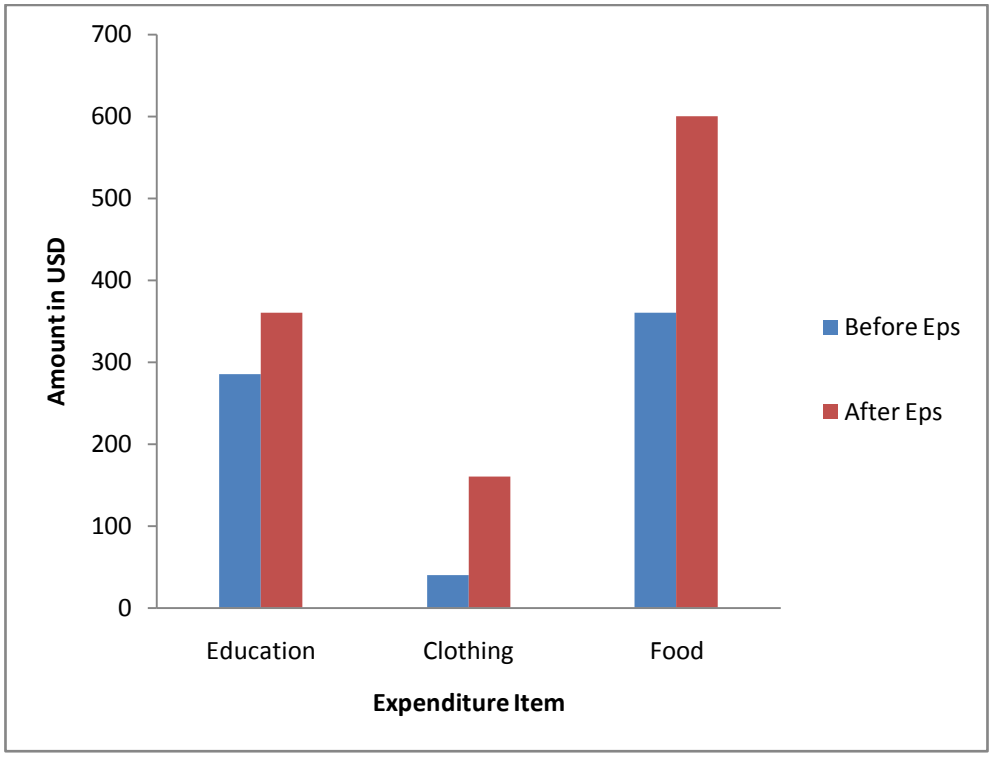

Figure 6. Expenditure on Clothing, food and education before and after installation

3.4. Income generation

It was observed that nutrition gardens are the only type of income generating projects in the village using EPs. Most of the respondents using the EPs for gardening reported that they have not made remarkable progress in terms of income generation from these gardens. They cited vulnerability to predation and lack of inputs such as seedlings and fertilizers as barriers inhibiting them from achieving much success in terms of gardening.

To assess the EP project's impact on the villagers' income, the study compared expenditure on clothing, food and education before and after the installation of the EPs. Although some factors may contribute to the differences, this study assumes that EPs play a greater role as they are the most recognizable intervention at the moment. Figure 6 shows expenditure before and after EP installation on education, clothing and food.

There was a significant change with regards the money spent on food. Although this may be attributed to a number of contributory factors, respondents indicated that the EPs provided them with extra time to do other lucrative jobs that contributed to an increase in income. This resulted in changes in terms of the quality and quantity of food they consumed.

3.5. Cultural impact

It was established that the EPs provide well protected and clean water. Culturally, the people in Shinja area derive satisfaction in giving drinking water to visiting friends and relatives. It was reported that prior to the establishment of the EPs project, people had challenges in accessing clean water to give to visitors. This compromised their satisfaction in providing clean drinking water to their visitors. Improved dignity and pride was also reported by the respondents.

3.6. Total Vulnerability

The eight indicators shown in table 3.2 were used to summarize household vulnerability. It is shown that before the installations of the EPs, most of the households were highly vulnerable while after the intervention the households are moderately vulnerable.

Table 3.2. Vulnerability of households before and after project implementation

Vulnerability indicator	Baseline condition (2005)	Vulnerability score	Condition after 7 years	Vulnerability score
Average number of meals the household usually had a day.	1	2	2	1
Average number of children of school going age who were not attending school.	3	3	2	2
Average number of family members not able to pay medical fees if sick/ill.	6	3	6	3
Average number of children who did not have adequate clothing.	5	3	2	1
Average access to clean source of water. (no=1, yes=0)	1	3	0	1
Average access to toilet facilities. (no=1, yes=0)	1	3	0	1
Average daily access to food. (no=1, yes=0)	0	1	0	1
Average number of orphans.	2	2	2	2
Total vulnerability		20/24 (83.3%)		12/24 (50%)

4. Discussion

The results of this study have highlighted that the EPs have significantly reduced the distance walked by people to fetch water for domestic use. This has positive implications with regards to time saving, labour

saving, gender equality, quality and quantity of water and distribution of labour amongst household members with respect to age.

Time saved could be used for other productive activities which may also contribute to the welfare of the people. If a household fetches water ones a day, on average it saves about one hour per day, five hours per week, and thirty hours per month and 180 hours per agricultural season. Time saved increases if household frequency to a water source increases. The saved time could be productively used in the cropping fields and other income generating projects that contribute to the alleviation of extreme levels of poverty.

The reduction of distance to the water source also significantly contributes to labour saving. Instead of having elderly people to go and fetch water, children could be sent to fetch water because the source of water is near. This saves labour which could be used for other productive duties in the household. At times children have nothing to do and spend their time on unproductive activities, thus, they cannot do some duties because they are too young or they are not able to do them. However with the EPs, at least they can go and fetch water without any constraints as their elders use their productive labour on the fields or other lucrative activities.

Gender equality is a sensitive social issue which is not easily acceptable in the rural settings. Focus group discussions established that gender equality is seen as a monster to the socio-cultural setting of the village and anyone who claims for it is taken seriously as an enemy to the people's culture and their society. This survey has revealed that by bringing the sources of water nearer to home, more males tend to participate in water fetching duties as the water can be easily drawn in hand held containers. This has some positive implications on the distribution of household duties with respect to gender. It relieves the elderly women of their duties as more males and children begin to participate in some of the duties.

Survey results revealed that distance has influence on the quality and quantity of water used by individual households. Through reducing distance walked by villagers to the water source, the EP project has positively impacted on the quality and quantity of water used by people in the village. At longer distances, the frequency of going to fetch water reduces and this reduces the amount of water used by the household. When the quantity of water used lowers, the quality also deteriorates as people begin to reuse the same water for many different purposes.

There has been an improvement in income levels of the people after the introduction of the project and this has been expressed by changes in expenditure on several items and commodities. The smaller percentage of people who have nutrition gardens revealed that there is potential for income generation using EPs if access to inputs and gardening equipment is provided.

The respondents (75%) see the EP project as sustainable as these pumps can be repaired using locally available materials and they are easy to repair. However, other community members thought improvements to the technology are required to ensure sustainability. It was also noted that the EPs in this area were done as technological trials, further improvements to the technology have been done. Overall, this study observed that, due to the availability of local materials to repair the EPs and due to easy of use and reparation, the project could be sustainable but measures should be put in place to ensure that the local people have the skills to repair the broken EPs and the communities should be able to routinely monitor these pumps.

5. Conclusions

This study has established that the EP project has significantly reduced the distance traveled by the villagers to the source of water. This consequently leads to the saving of much valued time which could be used in other lucrative activities which may positively contribute to the development of the community. The quality and quantity of water used for domestic and other purposes have improved. Incidences of water and sanitation related diseases have decreased. Improvement in school attendance, access to food and clothing was also noted. However, we conclude that the impact of the EPs are rather contributory than attributory given that there are other factors contributing to improvement of life in this resettlement area including food distributions, agricultural input schemes and training projects. The contribution of the EPs should be strengthened through capacity building in maintenance and repair of the pumps to ensure high functionality rate and continuous benefit of the community.

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