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Community-based handpump maintenance

Dr A Abroabah-Cudjoe

ABSTRACT

The search for a simple, low cost but effective means of providing potable water for the world's millions who have no access to pipe-borne water has seemingly settled on the borehole/dug-well combined with the handpump as a solution. The handpump and the borehole/dug-well need however to be properly maintained if their long life, reliability and good performance are to be ensured. Maintenance systems in use on handpumps are the highly centralised and the fully-fledged decentralised community-based.

This paper looks at these systems of maintenance and examines the community-based maintenance which is of recent development. It emphasizes the need to integrate the maintenance function at all phases of the water supply project even the design conception stage.

INTRODUCTION

The combination of handpump and borehole/dug-well presents one of the best prospects of providing potable water to the over a billion people in the developing countries who thirst for it. The millions of handpumps in the rural areas, the intensive search for handpumps suitable for village level operation and maintenance (VLOM) and the host of pump-related activities being undertaken worldwide in response to the UN declared International Drinking Water Supply and Sanitation (IDWSS) decade (1981-90), give credence to the above contention.

The handpump-based water supply offers a simple, effective, low-cost technological option which, coupled with right type of planning, could be managed by the rural beneficiary (ref 1). To ensure its sustained reliable performance, the pump must be correctly operated and properly maintained. In the attempt to wean the rural people from the polluted but often fairly reliable water sources, a better alternative must be substituted otherwise, as is usually the case, they will be compelled to revert to the traditional, unhygienic water sources. Obviously pump design, operation and maintenance play a crucial role in gurantee-ing consistently available water supply and accordingly deserve the attention being accorded them worldwide and particularly in the West African subregion from where references to pilot projects are made in this paper.

HANDPUMP OPERATION

Any machine, regardless of its simplicity, needs to be properly handled for it to perform satisfactorily, provided it has been suitably designed. Unfortunately the handpump user is nromally not taught how to pump correctly and hence the mishandling of the pump contributes to malfunctioning and premature failure. Bearings and rods are the worst affected components. While it is possible to design a pump robust enough to withstand such abuse, it is nevertheless a better economic proposition to train the user. In the Divine World Mission project in Wenchi, Ghana, songs have been composed the words and rythm of which direct the user to pump correctly. Such a measure, taken when a pump is first introduced, is claimed to discourage children from misusing the pump, limit pump stroke and reduce the incidence of failure.

HANDPUMP MAINTENANCE

The objective of handpump maintenance is to optimise pump effectiveness through the use of conservation methods at low cost and thereby ensure its increased availability and good performance. Preventive and breakdown maintenance are the strategies employed on handpumps, but regardless of whichever strategy is adopted a system of maintenance, central or community-based, must be applied. The success of maintenance activity does not lie solely with the sytem used, its planning and execution but also with the maintainability of the pump built into it at the design stage. Maintenance cannot substitute for what a pump intrinsically lacks in design.

Central Maintenance System

Maintenance under the central system is performed by a team of mechanics operating from a district or regional base whence it moves out on request. Prior to the 1980s it was mostly used on handpumps in the developing countries where governments provided it free to the beneficiary communities which only had to report on pump malfunctioning and failure. The maintenance function was performed by a state enterprise, as does the

Ghana Water & Sewerage Corporation (GWSC) or by a private company, as SODICI, until recently, did on contract with the government of the Cote d'Ivoire. In the developing environment where problems of communication, spare parts acquisition, transportation and finance abound, the central system tends to concentrate more on breakdown and less on preventive maintenance.

Drawbacks which have characterized the system are notably high recurrent costs, long delays in effecting repairs, logistics problems, absence of community commitment and generally poor service. Consequently the central maintenance system has become less attractive and is being replaced by the decentralised system in many countries.

Community-based Maintenance System

The Community-based maintenance is a decentralized system, of recent development (1980s), in which the beneficiaries take direct charge of maintenance and other pump-related matters. It attempts to correct the shortcomings/defects of the central system, enable the beneficiaries acquire appropriate technical and managerial skills and help generate self-reliance in local management capabilities. If properly executed this system of maintenance can ensure better sustainability of water supply. Since its benefits accrue to the community as a whole, the inhabitants must be sensitized to the importance and need for maintenance at the very onset of any handpump-based water project.

MANAGEMENT OF COMMUNITY-BASED MAINTENANCE

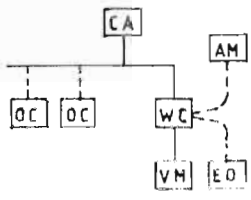
The responsibility for ensuring a well-maintained and reliable handpump devolves on the beneficiary community working through a committee which is the action group for day to day management. The Committee may manage water points only (Water Management Committee) or water and saintation points (Water and Sanitation Management Committee). Whichever it is, the committee is set up very early in the life of a project.

Water Management Committee

Organisationally the Water Management Committee, i.e. the Committee, constitutes an arm of the traditional politico-administrative system within which it operates (Fig.1). Its members are selected from and by the community based on the roles to be played and they include females, the prime users of water. Its size varies with the communities. In pilot projects in Ghana (Bolgatanga Community Water Supply and Management Project), Burkina Faso (Yatenga Project) and the Cote d'Ivoire 5 and 7 member Committees are used. The functions of the committee include

i. Eusure the effective maintenance/repair of handpump
ii. Ensure cleanliness in pump area
iii. Liaise with external bodies on pump-related matters
iv. Handle finances and keep accounts

The ability of the Committee to discharge its responsibilities and its success depend not only on the experience and skills of the members but more importantly on the consistent interest, cooperation and vigilance the community shows in its work. Skills in leadership and mobilization, experience on similar development projects, dependability, willingness to work voluntarily, etc. are some worthy attributes of a committee member. Generally whatever skills the members lack are supplied through training given by external organisations.



CA-Community Administration
WC-Water Management Committee
VM-Village Mechanic
AM-Area Mechanic
EO-External Organisation
OC-Other Committee

Fig.1. Organisation at Community Level.

Pump Mechanics

It is the mechanics who perform the hands-on pump maintenance work on a 2 tier structure. As currently practised there are 1 or 2 village mechanics (1st tier) who maintain the above ground pump parts and serve on the committee. The below ground parts are maintained by an area mechanic (2nd tier) who has responsibility for 20-50 pumps depending on their scatter in the operational area and also supervises the work of the village mechanics. The mechanics are selected on the basis of their skills and willingness to work and are remunerated in cash or kind for their service which is central to the maintenance function. While both tiers are needed initially, it is possible to envisage that ultimately, with training, the village mechanic can handle all aspects of pump maintenance.

The village mechanic's duties are

i. daily pump inspection for leakages and malfunctioning
ii. periodic servicing and repairs
iii. proper operation of pump
iv. report breakdowns beyond his ability to the committee and arrange for the area mechanic
v. report on general pump performance.

Female Involvement

The need to involve women on the management committee and in its work is paramount and

stems from their traditional responsibility in providing water for domestic purposes which task makes them and the children the main handpump users. They can, therefore with training, detect imminent faults faster and are more concerned about quick repairs and the cleanliness of the water point. In the Bolgatanga project (Ghana) females serve as treasurers and village mechanics on the management committee; their limitations arise from their comparative illiteracy and the demands of custom. No effort should be spared in encouraging female participation at the very onset of a project.

REQUISITES FOR COMMUNITY-BASED MAINTENANCE

For an effective community-based maintenance to be realised certain essential resources and inputs are needed amongst which are the handpump, spare parts, tools, management organisation, appropriate skills and funds. These requisites may be available in the community or have to be transferred thereto.

Handpump

Since the rural community is incapable of choosing the handpump it relies on the experts and in most West African countries the pump is donated free. Its selection however deserves prime and careful consideration because being the weak link in the water supply system it is prone to malfunctioning. A badly designed pump can thwart the best maintenance efforts, create frustration and resentment in the community and eventually become a liability instead of an asset. On the other hand a well designed pump minimizes maintenance frequency and costs while enhancing its acceptability. It is helpful if the pump is designed for local maintenance and in this respect the designer must be familiar with the environment of pump usage. The malfunctioning and premature failure of some pumps can be traced to bad designs resulting possibly from the designer's lack of an appreciation of the conditions of usage.

Prior to the 1980s there existed a dearth of data on the handling and usage of handpumps in the developing countries but since then, thanks to the worldwide UNDP/World Bank Project on Laboratory Field Testing and Technological Development of Community Water Supply Handpumps, much useful design information has been published which designers can utilize to good advantage [ref 1]

Some criteria to guide in handpump selection are

i. low capital, running and maintenance costs
ii. simple and appropriate design
iii. ease of and minimum maintenance using few tools and local skills
iv. spare parts interchangeability and availability at affordable prices.
v. in-country manufacture and possibly design
vi. light weight to facilitate manual handling.

Since no single handpump can be expected to possess all requirements, a selected pump is normally the result of a compromise. The VLOM pump offers the best prospects of satisfying them. Handpump types must be limited to a resonably good few to facilitate standardization of components/spare parts and their interchangeability while avoiding monopoly of supply. Many countries which have acquired various types of pumps through purchases, donations and grants have began limiting their types. In Ghana, the Nira (direct action), Volanta, Aquadev/ Afridev and India Mark II pumps are being evaluated for selection. The Volanta and Vergnet are popular in Burkina Faso while in Cote d'Ivoire, the Vergnet and ABI as well as their hybrid, ASM, are mostly used. The objective in all these endeavours is the search for VLOM pump.

Spare Parts/Tools

Prompt attention to repairs and maintenance are assured if spare parts/tools are available where and when needed and at affordable prices. Their unavailability has caused delays in repairs leading at times to the eventual abandonment of handpumps by the community. In the ideal situation the spare parts must be produced in-country and to ensure their availability where needed one or a combination of the following modes of distribution may be adopted

i. use of stores, distribution outlets, etc. already in existence under central maintenance
ii. use of national and provincial network of agents/dealers of pump manufacturers as in Burkina Faso
iii. use of private commercial outlets and individual salemen as envisaged in the Cote d'Ivoire.

Stable prices and a large variety of spare parts can be envisaged in (i) and (ii), though outlets may not be suitably sited. While outlets in (iii) could be very close to the user, private salesmen may be more profit-oriented and choose to stock mainly fast-moving spares in order to avoid locking up of capital for long periods. Furthermore, uniform prices cannot be assured countrywide. Just as with the handpumps, standarization and interchangeability of spare parts for pumps selected for use in-country provides inherent benefits.

Finance

Until very recently a rural community, particularly in West Africa, enjoyed potable water from the handpump practically with no financial encumbrances. With the introduction of community-based maintenance however, the community has to fund pump maintenance and possibly its replacement. While lack of money has often been cited as the main constraint to providing potable water, it is more the problem of its sound management.

The main source of funds used to cover maintenance and operation expenses is the imposition of levies on households or individual adults or on water collected, the modalities of which the committee determines. The estimate in Ghana for such expenditure in a pump community for the Bolgatanga project is a minimum of eighteen thousand cedis (¢18,000) per year (1US$=¢364, April 27,1991) while in areas under the GWSC central maintenance each household is levied ¢125.00 per year. At the pump the charge per bucket of water (14 litre) ranges up to ¢5.00. Similarly in the Cote d'Ivoire each community pays 55,000 CFA a year to the national Directorate of Water (1US$=280 CFA, April 27, 1991) and a Togolese community must have 35000 CFA in its account before a water project under CUSO, a Canadian organisaton, commences.

As long as there exists sustained water supply in the community, inhabitants honour the levies imposed.

EXTERNAL ORGANISATIONS

Organisations external to the community which may be national, international or non-governmental, are important actors in community-based maintenance though they are not actively involved in its actual delivery. They function primarily as catalists in community participation, help establish and nurture committees into maturity and serve as resource for the transfer of knowledge and skills, mainly at the pilot project stage.

After the pilot phase has moved to full-fledged country-wide maintenance stage, governmental organisations then assume these very responsibilities in addition to

i. executing policies on equipment standardisation, in-country manufacture/design of pumps/spare parts and their distribution.
ii. collection of statistical data
iii. fostering research and development activities
iv. supervising and monitoring the performance of the large number of committees. In Ghana about 47,000 communities qualify for handpumps and hence for committees.
v. stepping in to manage temporarily when a committee breaks down.

Maintenance activities at the community level can only succeed if parallel supporting activities are undertaken at the national level. In the developing countries where there is no tradition of maintenance it is important that national governments formulate policies on maintenance, create the necessary infrastructure and provide the resources for its delivery. It would be beneficial if the population (from policy-makers to the grassroots) were sensitized to the necessity and benefits to be derived from proper maintenance. The financial resources required to realise maintenance objectives could task the fragile economies of some developing countries particularly where foreign currencies are involved.

CONCLUSION

While community-based maintenance cannot claim to be the panacea for handpump maintenance problems it has nevertheless demonstrated, in pilot projects, its effectiveness and proved the capability of communities to manage it. It can be asserted that i) it provides a better option for handpump maintenance, ii) given the necessary inputs it can ensure sustainable water supply iii) the skills transferred to the community could be usefully applied in other development projects and iv) it elicits community commitment and generates self-reliance.

Its success however depends to a large extent on national supporting structures, finance and the sensitization of all actors (direct and indirect) to the need for it.

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