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Rural Water Supply in Developing Countries

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Rural Water Supply in Developing Countries

Proceedings of a workshop on training held in Zomba, Malawi, 5–12 August 1980

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Operational Maintenance in Malawi

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If the government's efforts to upgrade the standard of living in rural communities by supplying them with potable sources of water are to be realized, then operational maintenance of these systems is of vital importance. The success of these efforts depends upon the operational maintenance organization. Unfortunately, this branch of rural water supply is the weakest link between the organizers/planners and the users. This is due to several factors: (1) unrealistic assumptions made by the organizers when setting up the operational maintenance network; (2) difficulty in identifying which sector of society will shoulder the operating and maintenance costs; and (3) manpower-training difficulties due to funding, organizational, and planning problems.

This paper will attempt to outline the present state of operational maintenance in Malawi and focus attention on possible solutions. The three major rural water supply systems in Malawi to be discussed are: the gravity-fed scheme; the shallow wells program; and the borehole program.

Gravity-Fed Scheme

Responsibility for the maintenance of a piped-water project is divided between the main project committee and their subcommittees and the village committees, all of which are established prior to the installation of the project. The project committees are responsible for reporting failures in the pipeline and intake, whereas the village committees report on the taps. A few people within the project area are trained by the field assistant in methods used to mend and join PVC piping, to repair breaks in the line, and how to clean each of the screening, sediment, and storage tanks.

There are two problems with this maintenance system: (1) the people trained to maintain the system are not employees and as a result they may leave the area without notifying the main committee or training a replacement; and (2) the people who monitor breakdowns in the system have to travel long distances to report any problems and to collect materials at the project subcentre to repair the system.

Shallow Wells Program

One of the major problems with this program is that the PVC pump is still being modified by the research branch of the program. As a result, no fully field-tested pump is available. The first pump was a Mark I pump, which has undergone modifications through the Mark II, III, and IV series. It is being modified further into a Mark V model. The result of such diversity in this experimental pump is that it requires a large and varied stock of spare parts.

In this program, maintenance is carried out by an action committee in the village

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that owns the well. Because the pump is simple in design, it can be easily maintained using spanners and requires little expertise. The committee is also aided by a project assistant.

The main faults of the PVC pump are the wearing out of the PVC plunger, washers, and the cylinder. The PVC pump has an advantage over the borehole pump, however, because it needs no lubrication. Also, because it serves a small community it is not as overused as the borehole pump.

One of the problems of maintaining the pump is that it is assumed that the self-help spirit in the rural communities, generated during the project, can be perpetuated indefinitely. The other problem is that no funds or funding agencies are identified for operational maintenance and as a result the program tends to deteriorate as spare parts dwindle and are not restocked.

Borehole Program

Of the 300 boreholes drilled annually, 250 are fitted with hand pumps to supply water to rural communities. There are several types of hand pumps being used as the government tries to find one which is durable and inexpensive. Unfortunately, this has been difficult to achieve because the most durable pump is also the most expensive. The pumps used are: Climax, Goodwin, Bush pumps, Limani mono pumps, and National pumps. The first two pumps are supplied from Britain and the last two pumps from South Africa. Only the Bush pump is locally made. The diversity of pump types has further aggravated the problem because it requires that parts for all pump types be stocked. Of all of these pumps, only the Climax pump is durable enough to withstand prolonged usage; but again, it is the most expensive pump. Conversely, the cheapest pump, the Bush pump, is also the weakest pump, requiring maintenance more often. The other pumps are relatively durable but require more attention than the Climax pump.

The most common causes of borehole-pump breakdown are: (1) The number of people using the borehole as their only source of water is much too large; sometimes as many as 500 persons. The result of this heavy usage is premature breakdown. (2) Poor workmanship by maintenance crews due to inadequate training. This is primarily the fault of planners. (3) Use of low-cost pumps. This results in increased maintenance and frequent breakdowns, which makes the use of cheaper pumps a poor choice economically. (4) Waters aggressive to mild steel, resulting in frequent replacement of parts. (5) User mishandling because of a lack of knowledge on how to operate the pump. (6) The failure of the community to develop a feeling of ownership of the pump and to realize the importance of clean water results in neglect of the pump, followed by breakdown. (7) The borehole maintenance units are too few to maintain all of the boreholes. This results in long periods without servicing. Because they are few, the units can only respond to breakdown calls. This also results in inefficiency. (8) Incorrect gravel packing, resulting in silting and leakage in the cylinder due to the abrasive nature of the sand.

Maintenance Organization

There are 20 units strategically located throughout the country to service and maintain 4000 pumps. Each maintenance unit operates a 5 ton truck that has a winch and mast mounted at the back for lifting the pump head. A borehole pump is serviced after it is reported broken down. A member of the community reports the breakdown to the district council which, in turn, reports to the maintenance unit of the Department of Lands, Valuation and Water in that particular district.

The maintenance section is headed by a senior wells maintenance officer who is both the administrative and technical head of that section. His deputy is a technical officer. These two people supervise three regional foremen who are the field officers controlling the 20 units. Each unit is divided into four subunits. The wells maintenance

assistant heading each unit organizes trips to each subunit. He leaves his base and establishes a temporary working base in the subunit with the highest number of broken-down pumps. This reduces the amount of travelling that would otherwise be required. As he works in one subunit, pump breakdowns accumulate in the other subunits. He then moves to the next subunit with the highest number of broken-down pumps. The regional foreman makes sure that the units meet all operational requirements and supervises the overall program.

Recommendations

During the organizational stage, operational maintenance of the project must be considered and, if possible, included in the early phases of the project with the intention of improving its organization with time.

Training should be considered in terms of the following questions: (1) What part of the system can successfully be maintained by the rural communities, taking into account their literacy? (2) Could the rural communities themselves organize and fund that maintenance, and/or if it must be handled by the government, what is the best approach to achieving this end to include community involvement? (3) Who is best suited to training the rural communities? Could the field staff who installed the system together with the rural community provide the training?

It is, therefore, envisaged that any training program for operational maintenance must involve mainly the field assistant and the users. Thus, the program must be geared toward these two groups.