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Difficulties with handpumps

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Introduction

Sierra Leone, a former British Colony, on the West Coast of Africa got her Independence in April of 1961. The census of 1985 placed the population figure at 4.2m of which 80% live in small hamlets and villages which constitute the rural poor. The major occupation in the rural areas is farming at subsistence level, watering their farms from rainfall during the wet season, and small swamps in the dry season. The wet season lasts from May till October during which an average of 3000mm of rain falls each year. The rest of the year sees very little or no rainfall. The temperature throughout the year stays between 19C and 27C.

By December most small streams and springs start drying up as the water table recedes and collecting water for domestic and other uses presents a serious problem particularly in some parts of the rural sector where there has been no intervention for making water of acceptable quality available within easy reach. By the month of March the water table has dropped considerably, sunshine is at peak and a temporary marginal drought condition is experienced year after year. Farming activity dwindles to its lowest ebb, except for small swamp farms, as there is up to now no irrigation project to support large scale farming throughout the year.

As a consequence of this annual occurrence, attempts were made to improve on the domestic water supply situation in some villages. Some village dwellers dug their own wells. These were usually shallow wells hardly exceeding 10m depth of irregular cross section because they had access to only a few hand tools for digging and little knowledge of any scientific approach o tackle the problem. No attention was paid to health consideration for the simple reason that they were completely unaware of the fact that water, traditionally regarded as the cleansing agent and the source of life, could be a major factor contributing to the spread of diseases leading to depth. When such wells were dug, they were dug in search of water. If they were fortunate to go deep enough, not prevented by lack of zeal, co-operation or boulder outcrops then that was it. They will draw water from the hole using any implement whatsoever from whatever source or making. These were traditional wells of unquestionable importance to their users even though the water brought up was dirty from the sides of the well caving-in and the scoop picking up all the rubbish that would have accumulated at the bottom because these wells were only uncovered holes in the ground into which frogs, snakes, insects, fish and debris found easy access but no easy exit.

This situation was observed by missionaries and American Peace Corps outreach who made the first attempts in improving the water situation in the rural areas. The technology was still simple.

The villagers were encouraged to dig holes as far as the dry season water table, and a first consignment of the American Demstar handpump was brought in. These were pumps designed for use by farming families in the United States and because of the poor installation procedure coupled with the frequent rough handling from village communities the inevitable breakdowns started not too long after they were installed. No spare parts were available, there were no trained handpump technicians in the village and people took it that the well had failed when once the pump failed to produce water. They then reverted to using polluted surface water source until the 'stranger' who installed the pump came back to fix it. When he would not come quickly or did not have replacement parts, the pumps rusted and suffered damage beyond repairs.

The use of these pumps tailed off gradually as the pumps continued to break down without being fixed. Construction of wells also seemed to loose importance and steam and government concentrated on large communities and towns which had not been provided with any form of reliable potable water supplies.

By 1975 some 30 water supply stations had been built in different localities in the country serving communities of population ranging from 5000 to 120,000.

Rural Water Supply Projects

Emphasis on these larger communities was then shifted to smaller rural settlements where water supply coverage was estimated at about 2% and infant mortality rate at about 30% by 1980. The first rural programme was for concrete-lined hand-dug wells each fitted with a pulley to carry a piece of rope with a bucket attached to the end entering the well. This served as the only device for extracting water from the well. If the bucket was lost or there was rope breakage then people who wanted to use the well had to improvise. Rope from tree fibres or car outer tyres and pails from inner tyres were made or bought by some individuals. Others bought imported rope and bucket and some used a combination of these items. These implements belonged to the individuals who used them and after use were placed on the ground. Consequently wells were contaminated during the process of extracting the water and it seemed no one took care of the water points. There was no restriction on the number of buckets entering the well. No thought was given to preventing the rope from dragging on the ground.

It was at this point that the idea of using handpumps was again conceived but the Water Supply Division was very cautious over introducing this technology because it had been observed that the handpumps are susceptible to breakdowns and there were no handpump technicians in the country. Breakdowns arise from the movement of component parts and the conversion from movement along the Loci from an arc of a circle to simple reciprocatory movement. Thus in most pumps, wear occurs at the points of leverage and between the piston and the cylinder walls. The pump rod also will have some play when the handle is operated which will get worst with constant use. Valves also must work for extended periods without fatigue. Suction pumps have a restriction on the depth from

which water can be drawn.

This presupposes that the materials used are of sufficient strength and quality, do not deteriorate with time, do not themselves contaminate the water being pumped and installation has been done correctly. Other considerations were unavailability of spare parts, transportation for handpump technicians from headquarters to remote areas to fix handpumps and which pump to choose anyway. It seemed sensible, for reasons of standardization; installation, repair technology training, exchange of replacement parts etc. that too many different types of pumps were not to be entertained.

The question of maintenance was also considered and reference had to be made to World Bank, UNICEF publications and other available material on handpumps to serve as guidelines for the selection of the pump to use.

Choice of Pump

The following were considered with the view of establishing a reasonably self sustaining handpump programme.

1. Is pump robust? How often will the pump need attention because of faults (a) above ground level? (b) below ground level?

2. Which component parts cause the most frequent breakdown?

3. Are there many parts required?

4. Who would be responsible for repairing the pump? Are there trained people in the country with specialized tools? Could the pump maintenance be done by villagers themselves?

5. The cost of the pump and spares.

6. If central Government were to assume the role of pump maintenance, will it be realistic to expect Government to provide transportation for a pump mechanic to visit a broken pump located in a distant village within short notice?

7. Are replacement parts available in the country? How will these parts get to the village where they are required?

8. Could these replacement parts be manufactured in the country? If not, until parts could be fabricated locally, how are they to be brought into the country and who will be responsible for the distribution of these parts?

9. Are component parts attacked by the atmosphere or water?

With these in mind, the Water Supply Division decided on the India Mark II Pump because most of the conditions were reasonably satisfied. One major problem, however was that many tools were required for the installation and removal of the riser pipes because where large depths were involved, this could not be done by hand. Thus a problem for complete village level operation and maintenance was envisaged.

Installation commenced in 1982 and to date just under 300 IM II pumps and about 150 Kardia pumps have been installed. More pumps are currently being installed, essentially of these two makes.

Kardia won the tender for wells in the Bo/Pujehun project with KFW sponsorship. The drop pipe is plastic and

works very well with

aggressive water.

A few other types e.g; Aquadev, Bellows and the Rower handpumps have been installed for trial and observation.

The Policy for Pump Maintenance

Pumps maintained entirely by villagers with the know-how and a stock of spares should prove successful particularly where the village is sufficiently motivated or where water could not be obtained from any alternative source. To implement the policy developed for maintenance the Water Supply Division saw the need to run training programmes for people residing in villages with handpumps, as a first step. This training introduces the maintenance policy to the village handpump caretakers, as they are called, whose role will be doing preventive maintenance of handpumps and pursuing repairs beyond their own capabilities. They are the ones who would report to the Chiefdom mechanics whose training includes overhauling the pump. Chiefdom mechanics will have the complete set of tools for this purpose and each will cover a cluster of between five and eight villages. It will be the responsibility of the village to provide transport and the fees of the Chiefdom Mechanic. Each village is required to contribute towards a revolving fund for the purchase of a few of the parts that are likely to wear fast and external bolts and nuts that could be lost. These deposits should be made by the villagers into the account opened for the pump maintenance in the Provincial or District Banks. Their receipts for the payments are two bank slips, one of which is kept by the village while the other is presented at the Provincial Water Supply Office. New pumps are installed against the presentation of this slipfor the initial payments. A similar procedure will be followed for replacement parts. An initial stock of spares is bought by each Project from which broken parts are to be exchanged on presentation of the broken parts plus one bank slip. The other slip is retained in the village as a receipt.

When this policy has operated for some time, reviewing of the receipts will give an indication of the quantity of parts that have needed replacement. This will serve as a basis for ordering new parts through an international agency.