AN APPROPRIATED TECHNOLOGY

HANDPUMPS IN SRI LANKA

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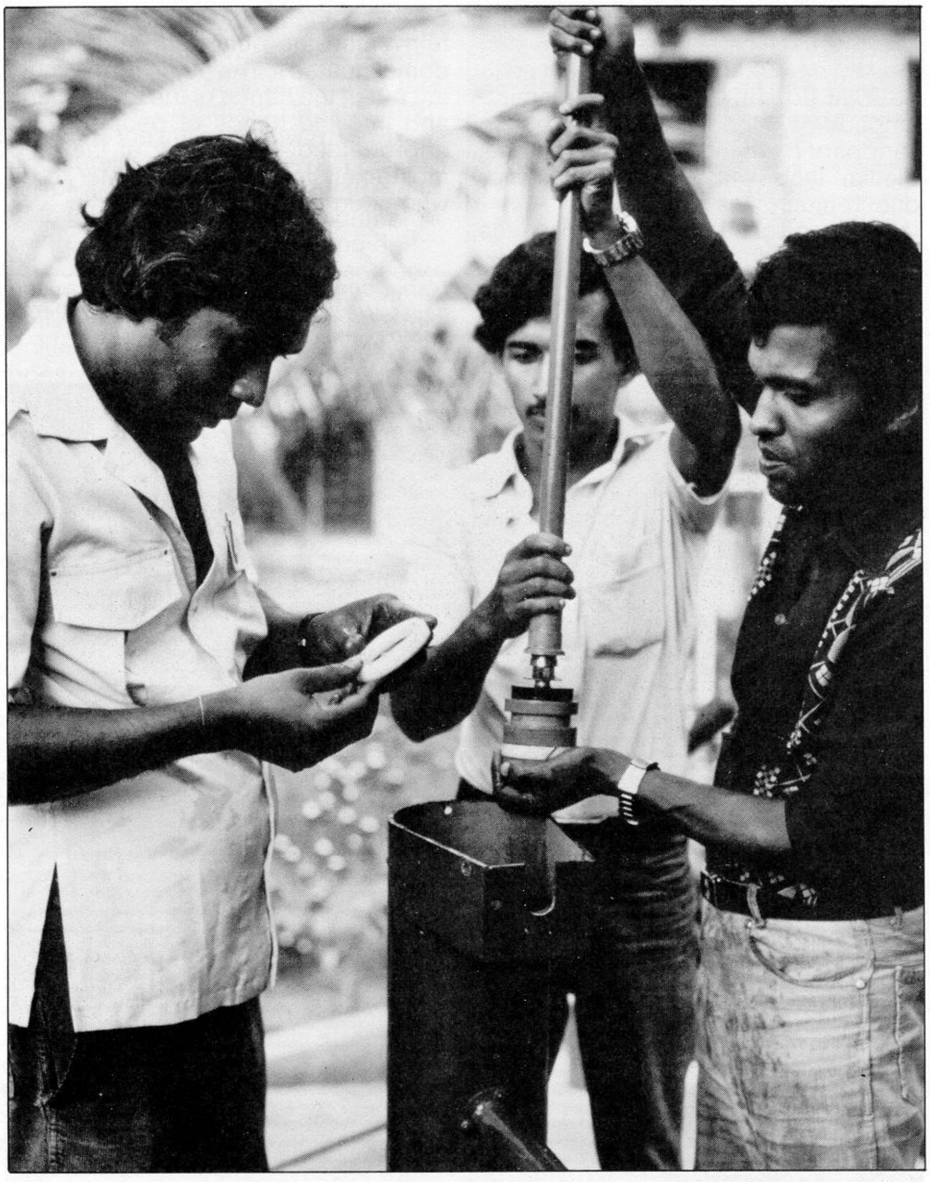
The new handpumps in the village of Yatiyana in Sri Lanka brought more than clean water to the families living nearby. For years villagers had been getting their drinking water from a shallow pit that they shared with dogs, snakes, and vermin. The result was diarrhea and dysentery.

The fresh, clean water the new pumps have provided has changed this depressing picture. One of the major sources of water-borne disease has been eliminated. But solving the health problems of Sri Lanka is no easy task. There are 23 000 villages in the country. A pump that is cheap and easy to maintain is essential to success.

Coinciding with the United Nations International Water Supply and Sanitation Decade, the Sri Lankan government, with the help of development organizations such as UNICEF, has launched a program to bring clean water to rural areas. The government has allotted 8 percent of its budget for this purpose.

In the rural areas only 13 percent of the population has access to community water supplies. The majority of Sri Lankans still get their water from rivers, lakes, canals, or open wells. Many do not understand the need to boil water.



Researchers in Sri Lanka took a good design and made it better-adapted

Plans call for 2500 wells to be constructed and supplied with handpumps, 130 towns to receive piped water, and the water supply system of 60 villages to be repaired and upgraded. The government has estimated that 4000 handpumps will be needed each year from 1985 onwards.

Handpumps became the focus of attention in Sri Lanka in 1978 when the government decided to investigate whether a pump could be manufactured that would not be too sophisticated for villagers to take care of themselves. Until then, pumps required a central maintenance service to keep them functioning.

The government also wanted to solve the problem of communication with the villagers. Installing the handpumps would have little impact on health if they could not convince the villagers to stop using alternate sources of water. The government turned to the Lanka Jathika Sarvodaya Shramadana Sangamaya (Sarvodaya movement) to take on the job.

The movement was founded in Sri Lanka by a 27-year-old high school teacher from Colombo, Agangame Tudor Ariyaratne, in 1958. He was inspired by the Sarvodaya ("all-awakening" or consciousness raising) thought of Mahatma Gandhi and by Buddhist philosophy to create a model for village development work based on self-realization through service to others. Sarvodaya encourages voluntary sharing of labour by community members to achieve development through practical projects.

Sarvodaya's goal was to introduce 21 handpumps to seven villages, including Yatiyana, in the wet zone along Sri Lanka's southwest coast. The pumps were to meet three conditions: that they be made of inexpensive parts mainly available in Sri Lanka; that they be simple to repair; and that some plastic parts be used to avoid corrosion. Until then, several attempts had been made to design, build and install such pumps, but without success.

The handpump piston and cylinder developed by IDRC and the University of Waterloo in Canada were chosen for field testing and adaptation in a project supported by IDRC.

Sarvodaya explained to the people

of Yatiyana and the other villages the importance of a covered well to their health and economy. Sarvodaya workers told them of the movement's philosophy of having everyone participate in both the labour and organization of a project. They encouraged a cooperative spirit by bringing the people together in work-sharing camps (shramadanas) and in gatherings where everyone was treated as part of a large family, making plans or putting on a cultural show. By working together, the villagers were awakened to a philosophy that would help them improve their economy in a way appropriate to their needs.

The Sarvodaya workshop had been building welded steel handpump stands and levers. These were redesigned to incorporate the IDRC/Waterloo piston and valve configuration. A local polyvinylchloride (PVC) manufacturer made pistons and valves. Polyethylene rings and other non-PVC components were machined at the Sarvodaya workshop, and some simple parts were made in the villages.

The villagers and field workers themselves selected the sites where each pump would be used by 3 to 10 families. No more than five pumps were installed in one village.

All wells were built according to a standard drawing, with walls constructed from rubble masonry and the cover and apron from reinforced concrete. In some sites there were existing wells constructed in this way, while in others Sarvodaya followers dug new ones.

By January 1980, the wells were built. In another five months, the handpumps were installed and monitoring work began. The work ended in April 1982.

Sarvodaya found it was able to come very close to reaching the goals for the design of the pump. Most parts were obtained in Sri Lanka. Only brass nuts and bolts, and polyethylene for piston rings, had to be imported. Plastic parts meant there was little corrosion.

Most pumps required some repairs, but these were not difficult to do, and in many cases could be undertaken by the villagers themselves. The pump technicians, who had been trained to assist with the installation of the pump, continued to make repairs when the pumps broke down or required parts from outside the village.

As a result of field testing, some changes were made in the IDRC/Waterloo design. Local fabrication of the piston and check valve caused considerable difficulty because solid PVC stock is not available in Sri Lanka. Several attempts were made to improvise with locally available materials. Initially, the Sarvodaya team tried making a "solid" rod or cylinder by gluing progressively smaller PVC pipes inside one another. Problems were encountered with this design because, when grooves were cut for the piston rings, the ends tended to break off. It was also very difficult to drill holes along the length of this "built-up" pipe. Next, researchers tried to fabricate the piston and check valve from wood and still use polyethylene rings as a seal. Although the construction of the valves was easier, they were not successful because the piston rings stuck in the grooves and did not seal properly against the wall of the riser pipe. Also, a poor seal resulted because of the rough inside surface of the PVC pipes available in Sri Lanka. This rough surface also quickly wore the polyethylene rings, resulting in burrs on the edge of the rings, which contributed to their sticking in the grooves.

Because of these problems, it was impossible to obtain an adequate seal along the piston and check valve using PVC rings. Instead, leather cups that could be made in the villages were designed to solve this problem. These cups were made using a simple press and a locally fabricated die. The leather was treated with tallow and held in the press for about 30 minutes to acquire the required shape.

Using a design that combined a hollow PVC pipe with a wooden core and employed leather cup seals, the researchers completely solved the problem. Not only was the leakage stopped but the wear of the riser pipe was also lessened. When polyethylene rings were used during field testing, the riser pipe wore by 0.35 mm after 90 days of use. This is believed to be due to silt particles becoming embedded in the rings and acting like sandpaper against the cylinder wall. Similar tests with leather cups produced much less wear.

This wood and leather design makes local fabrication and repair possible, and has proven its reliability under field conditions. The use of leather instead of polyethylene rings meant the rings wore out sooner, but it also meant that villagers, who could readily obtain leather and could work it, were able to replace the rings by themselves. Also, leather is less expensive than polyethylene.

In a second phase of the research, recently begun, the Sarvodaya group will manufacture their version of the pump through a network of cottage industries operated at the village level entirely by women. This research will test the feasibility of involving primary users — women — in all aspects of handpump development, from manufacture to installation and maintenance. By promoting handpump manufacture as an income-generating activity, it is hoped that self-sustaining village-level industries can be established. It is also anticipated that by locating the industries as close as possible to the sites where the pumps will be installed any problems in pump operation can be resolved easily. Spare parts and technical expertise will be readily accessible — not always the case when manufacture takes place at large-scale centralized facilities.

The PVC handpump was introduced to Sri Lanka as an exotic — but potentially adaptable — technology. The Sarvodaya team has in some senses reinvented the pump and thoroughly domesticated it. The pump is now moving out of the hands of the technicians and into the hands of people — an appropriated technology of the kind most likely to bring clear water to all who need it. □

Mark Rogers is a Canadian freelance journalist. He visited the Sri Lankan handpumps project to prepare this story.

The handpump at Yatiyana: more than clean water Photo: Mark Rogers