Letters to

Bush Pump goes east

We read with great interest Peter Morgan's article 'Zimbabwe's user-friendly Bush Pump'. What puzzles us is that this pump, with its excellent track record, was never adopted as the standard in the rest of Africa!

Lifewater International, a Christian, non-profit, water-resource management organization, has installed several Bush Pumps in Africa and Siberia. We have taken the liberty to modify it slightly, while still maintaining the original idea of simplicity in fabrication and maintenance and repair.

Briefly, the three modifications are:

- instead of using one solid block of wood, we have taken three thinner, blocks of wood, 1.5 inches thick and 5.5 inches wide, and laminated them together;
- rather than mounting the pump-stand assembly to the well casing (our wells usually have 4-inch PVC casing), we use two steel angle iron posts (60mm x 60mm), which are vertically planted in the ground with concrete next to the casing at a distance equal to the hinge pin distance in the wooden block (the wooden block fits between the posts) and
- a sleeve of steel pipe slides up and down over what might be called an extension of the rising main, and the pump rod is attached to the top end of this sleeve, while the 'forward' hinge pin is linked to the bottom end of the sleeve, thus allowing the pump rod to move always straight up and down, while the hinge pin describes an arc as the pump handle is operated.

In Kenya and Uganda we built one from scratch, buying the materials locally, and then taking them to a welding shop and a machine shop to get the welding done and the holes drilled. It does require a drill press that can drill 1-inch holes in steel.

At this point, we do not have much detail on the pump's performance although, in Guinea Bissau, the PVC casing tended to crack at the top due to the jerking of the rising main which was attached to a PVC cap. Since then, we have eliminated that problem by installing bases, similar to the India MKII base, over the casing.

We are presently looking into making cheaper and simpler piston and cylinder assemblies that could be assembled by someone as a 'cottage industry'.

Sincerely yours
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Peter Morgan responds:

'Your technical points demonstrate that the Bush Pump concept is very adaptable, and it is encouraging to hear that innovative modifications are being made elsewhere. Why is the Bush Pump not widely known or used in Africa? Pumps which have similarities have emerged in Uganda, Kenya, and Tanzania (and possibly elsewhere). They have all been ignored and replaced by imported pumps which are strongly promoted by agencies such as the World Bank and the UN. Even in Zimbabwe, these agencies have tried to replace the Bush Pump, but the government has resisted this for many years, being determined to retain something of its own which is locally designed and manufactured. The Bush Pump has not let us down.'

Editor's note: Odo Siahaya has just returned to Uganda. He plans to write a detailed account about how the modified Bush Pump is faring in the field in Tanzania, Uganda, and Siberia — and what the users think about it! — in a future issue of Waterlines. *You can find out more about Lifewater International's work by looking at their homepage which you can visit at: http://earthview.sdsu.edu/lifewater/lifewater.html.*

the Editor

Comfortable carrying — the participatory angle

Vol. 14, No. 3 arrived today; it is an excellent edition, full of interesting articles. We will find many of them useful in preparing and training relief workers.

Ben Page's article on the ergonomics of water-carrying asked for a response. I have long argued that this is an area that requires further research, and I am glad to see Ben has done some. I have carried out some preliminary research in the past, some of it related to my work on micro-scale irrigation, where large quantities of water are carried by hand to water vegetable plots.

I believe there is scope for further work, both on the technology of personal carrying of water (hand, hip, head or back), and for the development of hand-pushed water-barrows. An interesting angle would be to develop a participatory approach to the improvements of such technology — I know of one successful example used in pit-latrine design in refugee camps. If someone wants to initiate such research, I would very much support the work and would be happy to give any advice or help that I can.

Yours sincerely
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Any lime will do?

I was very interested to read Joao Gnadlinger's article, 'Lime the great sealer: constructing low-cost, sub-surface rainwater tanks in Brazil', in Vol. 14, No. 2.

The Building Materials and Shelter Programme at Intermediate Technology has, for a long time, been interested in promoting the increased utilization of lime and other alternative cements to Ordinary Portland Cement for building. Lime production is viable on a relatively small scale, promotes the development of small enterprises and can be focused on a small localized market and, therefore, be responsive to the needs of such a market.

There are potential pitfalls, however, in using lime in water-retaining structures which, I believe, have not been sufficiently addressed in the article. Although lime was traditionally used in underwater construction before the development of Portland cement, this was either a special kind of lime, known as a hydraulic lime, or a mixture of normal lime mixed with a material known as a pozzolana — basically a finely powdered, heat-treated (volcanic) form of silica. These two types of cement will usually continue to set when covered with water and be relatively resistant to damage by water in the long-term.

Normal high-calcium lime, on the other hand, does not harden by reaction with water, but by reaction with carbon dioxide gas in the air. When this lime is covered by water, it will stop hardening and, because calcium carbonate, the material which gives hardened lime its strength, is slightly soluble in water, it will ultimately dissolve out.

Mr Gnadlinger does not specify which type of lime was used. If it is normal lime, rather than hydraulic lime or lime-pozzolana, I am concerned about the long-term durability of the tanks.

Also, lime is quite a porous material, considerably more porous than Portland cement. The water may start to leach out through the mortar joints and, as the soil background which supports the wall of the tank may become quite weak, the risk of cracks and distortions in the tank walls may increase. In the longer term, the walls of the tank could become so distorted that sections are no longer in contact with the background, and are liable to collapse.

The use of a pure-cement coating for waterproofing the tank might not be all that effective. First, cement is not completely impervious, and will inevitably let some water through. Secondly, neat cement is likely to crack as it dries, and these cracks will allow some water to seep through. In fact, if a lime/cement/sand mortar is used to plaster the inside of the tank, an additional neat cement layer may not significantly improve matters.

Mr Gnadlinger states that the experiments using oils for waterproofing were not considered successful; were they applied at high-enough temperatures? A satisfactory waterproofing mixture can be made which can be used for a number of applications by hydrating quicklime with water and an oil, or materials such as tallow or casein (the main protein in milk), to give a soapy limewash. The high temperature of lime hydration effectively disperses the oil or fat admixture within the limewash.

From the article it appears that a number of tanks have already been built in north-eastern Brazil so, possibly, some may already be a few years old. It would certainly be very interesting to learn from Mr Gnadlinger how well any of the older tanks are performing. It would be especially important to get some feedback if the lime used for the mortar is not a hydraulic lime or not mixed with a pozzolanic additive, because accumulated wisdom would indicate that this type of lime would not be effective in underwater structures. Certainly, if the experiences from north-eastern Brazil are to be disseminated to other countries and regions, it is important to ensure that the tanks are adequate for holding water, and that the information on the materials used and how to build them has been accurately documented.

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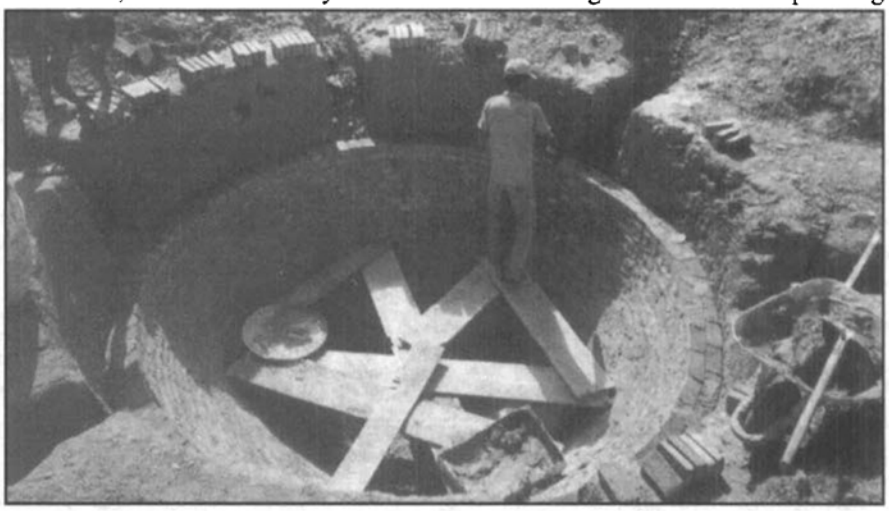

A brick and lime-mortar cistern in north-east Brazil — building for durability?

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