

# Water for the forgotten people — Botswana's revolutionary well-jetting technology

by Jonathan Andrews

**Digging the well posed no problem for the small community; attempting to fit a handpump caused the professionals nothing but frustration. But, armed only with basic equipment, true grit, and a lot of ingenuity, the men of the Okavango Water Department made, literally, a technological breakthrough.**

BOTSWANA — LAND OF the fabled Kalahari desert, where water is a scarce and precious natural resource. Where groundwater is sometimes so saline that its only practical use is for salt production. Where water may only be found buried two or three hundred metres below vast beds of powder-fine Kalahari sand.

But not always. Tucked away in a remote corner of this dry republic is the North-West District and another extraordinary feature of Botswana — the 'Jewel of the Kalahari' — the Okavango Delta.

With each rainy season in Angola,

the Okavango River swells nearly seven times from its base flow of 100 m<sup>3</sup> per second.<sup>1</sup> Sweet water flows out and over and down into the sands supporting abundant wildlife in a wondrous inland delta ecosystem. With water and wildlife and vegetation come the people and with these people our story begins.

## Tribal lands

It is not easy to count the number of tribal groups in the north west. Here live the baHerero from Namibia, the baHambukushu from Angola, and the

baTswana, baSupia and baKhalagadi from other regions of the republic. Then there are the baYei — the river people — and the baSarwa, the San — the bushmen who call themselves simply 'the People'. There are certainly more.

Many of these people live in the 40 recognized villages and towns of the North West, villages with boreholes and diesel engines pumping water to elevated tanks for gravity-fed tap-stand supply. But this is not a story about them; this is a tale about a struggle for water where there is no money for a borehole. A struggle by one district council-based water department to find water and keep it flowing for the thousands of people settled in small, scattered communities where fully reticulated supplies are economically impossible. This is a tale of the discovery of a technology that suits the people, the environment, and the budget. In the North West this technology, however simple, means water for the forgotten people.

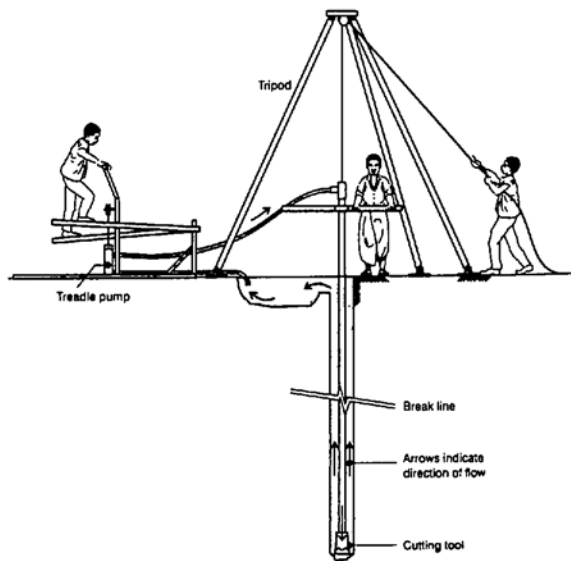


Paul Weinberg/Panos Pictures

*Botswana's Okavango Delta: close to the sand dunes, this inland delta ecosystem is home to a wealth of flora and fauna.*

## Principles of jetting

Water is pumped down the centre of the drill-rods, emerging as a jet. It then returns up the borehole or drill-pipe bringing cuttings and debris with it. The washing and cutting of the formation is helped by rotation, and by the up-and-down motion of the drillstring. A foot-powered treadle pump or a small internal-combustion pump are equally suitable.



### Advantages of jetting

- The equipment is simple to use
- Possible above and below the water-table.

### Disadvantages of jetting

- Water is required for pumping
- Suitable for unconsolidated rocks (eg sand, silt, clay) only
- Boulders can prevent further drilling

## Riddle of the sands

In many of the small Delta settlements, hand-dug wells are a common sight. Water can often be found 8 to 15m below ground. Traditional well construction is straightforward and, for the last ten years, simple improvements, involving the fitting of concrete casings, have been made. The fineness of the local sand, however, has blocked progress in both protecting wells completely, and fitting handpumps. Problems began when crews attempted to deepen well sumps so that handpump elements could be fitted. When they neared the static water-level, the water flow displaced the sand upwards, and a conventional shovel and bucket well-deepening job soon became a wasteful, not to mention dangerous, exercise. Sand flowed down behind the concrete casing from the surface where huge craters suddenly appeared. Concrete linings creaked and cracked, and welldiggers emerged from the ground pale, shaking, and in search of an alternative occupation.

Nearing their limit of frustration, hand-dug well team members and Okavango Water Department<sup>2</sup> managers set out to find a solution. They reasoned that, if the problem lay in the fact that the material they were burrowing through was weak, then it really should be making the job easier. This sand was so weak that even the gentle jet of a garden hose quickly gouged down into it. Perhaps a step back was needed to capitalize on the virtues of this problematic, omnipresent sand.

After many months of networking with water-equipment suppliers, drilling contractors, ex-water-department workers, and anyone willing to lend an idea, the garden-hose concept grew to project proportions. PVC pipes were slotted by hacksaws, geotextile sock screens were adapted to fit, and

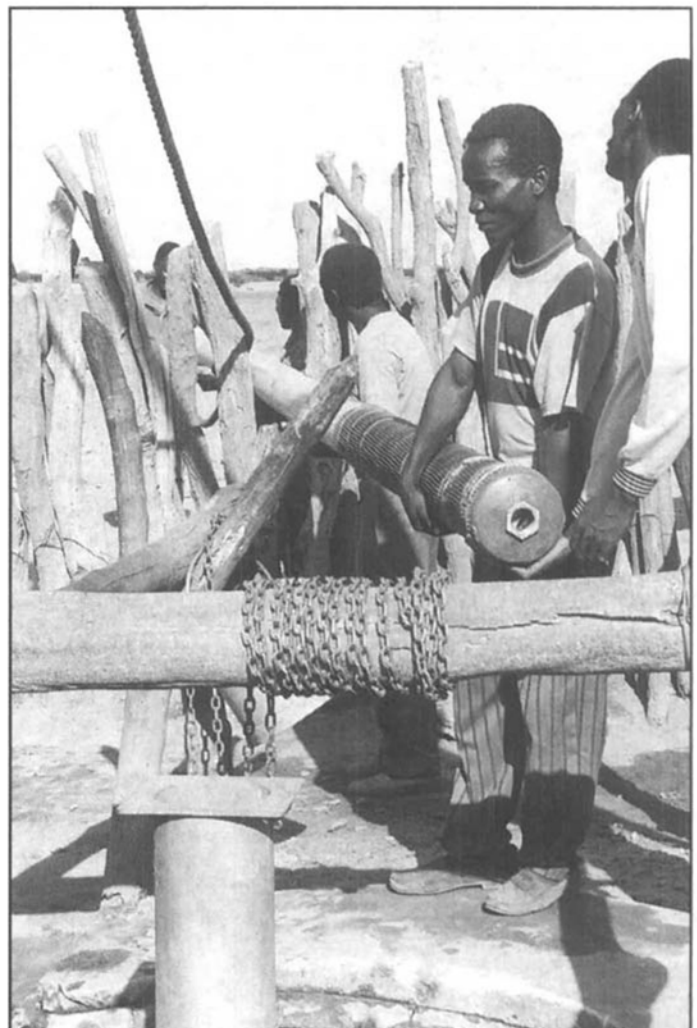
experiments led to the development of a simple jetting head that would direct high-pressure water to the cutting face. The first of a series of large diameter (160mm) well-points was manufactured at the Gumare water workshop; a 5000-litre plastic tank and a 80mm petrol-powered water pump were purchased, and the team prepared for their first well improvement by jetting.

## Innovation in action

In-field procedures were then formulated and tasks delegated to individuals. The team ran through a mock exercise to ensure that everyone knew their job before setting off for the community of Etsha 8, and the initial field-trial. They commenced setting up at 1pm and, after working through a few technical hitches, the first jetted well-point was installed and the equipment dismantled by 5.30pm. A sump for the handpump existed now, 5 metres below the water-table. The team left the site quite

triumphant, prepared to install the handpump the following day.

Spurred on by the success of this first project, the team continued to experiment with new ideas and install similar well-points in other settlements. Various problems came to light and procedures were adapted to cater for them — the need to maintain the verticality of the pipes was addressed by introducing a simple wooden frame whilst jetting.



*A completed well-point, showing jetting head and wrapped geotextile screen with protective netting sock.*