# Transferring the rope pump to Africa: A long and winding road?

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*Why is a proven, simple technology which offers major economic advantages apparently finding some difficulty in gaining a foothold in Africa? Could it be too cheap for donors and too expensive for users? If the answers were simple, we would either have mushrooming production or complete abandonment. It may just be that as a 'new kid on the block', requiring new ways of thinking and new policies, the transfer process will take longer than expected. This paper explores some of the undoubted advantages which have convinced so many that its adoption has major benefits which should not be ignored. However it also examines some of the weaknesses and uncertainties which may be hindering acceptance of the pump by donors, governments and end-users. Addressing these weaknesses is essential if the pump is to fulfil any real potential to contribute to MDG (Millennium Development Goal) targets for water, health and poverty alleviation.*

**Keywords:** rope pump, Nicaragua, Africa, private suppliers, user acceptance, operation and maintenance.

The principles of the rope pump (Figure 1) have a 2000-year history of use in China and the Middle East, largely for small-scale irrigation. In more recent times, the establishment of the rope pump as an acceptable rural water supply technology in Central America is well documented, as are the principles of its operation (e.g. Bombas de Mecate, 1998). It has become a preferred option which contributes to over 35 per cent of rural water supply coverage in Nicaragua, and is widely used in Honduras (WSP, 2004) and El Salvador among others. Its benefits have extended beyond domestic water supply, often bringing dramatic increases in income levels and food security through small-scale irrigation and reduced time in water collection. The experiences gained in Latin America have led to many initiatives over the past 10 years to transfer the technology to sub-Saharan Africa (SSA, the main

> The rope pump provides over 35 per cent of rural water supply in Nicaragua

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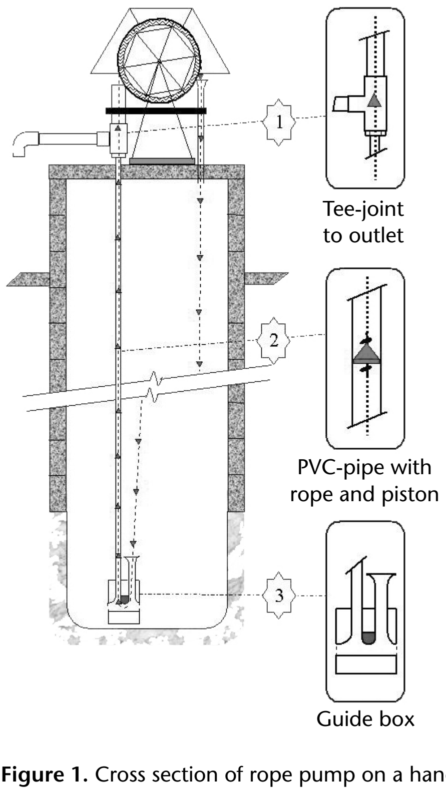
subject of this paper) and to South-East Asia. The main reasons are its simplicity and low cost but also the growing disquiet at the low levels of functionality of conventional pumps despite all the efforts to establish reliable supply chains and repair systems.

The potential for low-cost pumps in both South-East Asia and Africa is enormous, at both community and household level. For instance government estimates indicate that around 3 million family wells in Cambodia would be suitable and in Mali there are over 200,000 such wells.

Only in Latin America has rope pump production yet reached independence from donor inputs

However, only in Latin America has rope pump production yet reached the stage of sustainability and independence from donor and NGO inputs and control. Equally there appears to be a general reluctance in SSA for governments and donors to regard the rope pump as an acceptable level of service in rural areas, despite their inadequate capacity to provide sufficient 'better' alternatives. Barriers to the transfer of such a simple and cheap technology may have been under-estimated, so the lessons learnt should be of relevance to future moves for its introduction and expansion.




**Box 1. Elements of the rope pump**

The principle elements of the rope pump are a pulley wheel, a rope with washers (pistons) attached at regular intervals, a pipe (of slightly larger diameter than the washers) that enters the well and at the base of the pipe a guide box round which the rope runs and returns to the surface. As the wheel turns and lifts the rope and washers, the washers trap water and bring it to the surface. The pump will lift water from up to 50 metres.

Maintenance needs are simple and can generally be carried out by users or local artisans using locally available materials. (Modified from WSP, 2001)

**Figure 1.** Cross section of rope pump on a hand-dug well.

Despite several useful commentaries on the process (WSP, 2001), and good documentation of Latin American (Alberts, 2004). and Cambodian experience (Ideas at Work, 2008), there is still an apparent lack of data to allow objective analysis of what is going right and what is going wrong and why in SSA. This is an area which the Rural Water Supply Network and WaterAid are planning to address, but to which many readers of this article may be able to contribute. Thus what is written here introduces some ideas but seeks further evidence and systematic evaluations of the effectiveness and impact of rope pump introduction and pointers of how best to improve and accelerate its adoption.

## The transfer process: Recent history

Dissemination of the rope pump technology mostly draws on the experience of Nicaragua, from which community-based programmes in Ghana, Madagascar and Mozambique form the main offshoots. Zimbabwe has developed the pump mainly autonomously and smaller NGO-based production and promotion has started up in at least 10 other SSA countries (see e.g. www.ropepump.com, and Table 1), including South Africa (Still et al., 2004). Ethiopia is the only country so far to have a relatively large-scale development of rope pumps principally for household level.

### *Nicaragua*

In Nicaragua the first rope pumps were produced in the early 1980s and for 10 years were almost exclusively acquired privately, often through micro-credit systems. By 1995, once a market had been established and experience gained, models were developed also for community use. These were adopted by NGOs and with this experience government added the rope pump to the list of acceptable technologies. Official acceptance and widespread adoption was fostered by several enabling factors:

In Nicaragua, the private market was developed first, establishing user acceptability

- The private market was developed first, establishing user acceptability, supply chains and experience in maintenance.
- Loans were made available and users encouraged to link water abstraction to income generation as well as domestic use, so the loan could be paid back.
- With production well established, models were then developed for community use.
- Government was open to new ideas, and seeing the grass-roots demand and performance of the pump, included it firstly in

'acceptable options', and finally ended up with it as the 'preferred option' for rural water supply.

- Swiss Development Corporation (SDC) supported rope pump development over several years, including establishment in 1998 of the technology Transfer Division of a local production company, Bombas de Mecate (BOMBESA), to promote transfer to other countries.

***Ghana***

Government was not convinced that the technology was of an acceptable level

Ghana was one of the first countries targeted by BOMBESA. The initial process is well described by WSP (2001). The assumption was that the idea would take off quickly and demand would develop to support expanding production, but this did not occur and government was not convinced that the technology was of an acceptable level. WaterAid (2004) identified several key reasons:

- lack of promotion to stimulate social interest: the pump was regarded as unattractive compared with standard options;
- user and professional perception of easy contamination of water;
- selection of remote pilot communities made monitoring and maintenance difficult;
- dependence on private sector promotion (in which pump producers had no experience or training);
- little political interest to develop the technology into something more acceptable.

In 2003 a second attempt was led by WaterAid and its partner Rural Aid, in northern Ghana. The main elements were the provision of a market for rope pumps through purchase by NGOs for community supplies, training of local pump menders and quality control of production. It has led to a significant growth in output to over 1,600 rope pumps. Two or three other producers, who combine pump making and low-cost drilling, have also become established through NGO support in other areas of the country, catering more for small groups.

Partly because the community pump is now comprehensively (and expensively) protected from contamination and no other model is offered in the north, sales to individuals have here been limited mainly to peri-urban dwellers as insurance against piped supply failure. Pump production is therefore still generally NGO-dependent and the pump is not yet accepted by government despite strong lobbying by WaterAid and others. Acceptability to communities may also reflect the way it has been promoted, which perhaps plays less

There is a danger of giving the pump a 'poverty' label that discourages uptake

on its ingenuity and performance, but more on its lower capital and recurrent costs. They may choose to pay US$200–250 for an Afridev/NIRA or get a rope pump free. This carries the danger of giving the pump a 'poverty' label that discourages uptake, as payments are not well linked to capital costs.

### *Madagascar*

In Madagascar interest in the pump has been led by the local NGO Taratra, which was looking for sustainable handpumps suitable for installing in its projects in the south of the country in the late 1990s. Through collaboration with SDC and SKAT, samples of three types of pump including the rope pump were imported and installed in 1999 to test their acceptability, sustainability and replicability in a community setting. Following an evaluation of this project, Taratra decided to commence production of the rope pump, and SKAT provided continued support to this including modification to make the pump more rugged. A private organization was set up to continue production and to date approximately 1,000 pumps have been installed. In contrast to the other SSA countries examined, over 300 of these have been installed on government and UNICEF programmes.

### *Mozambique*

The process in Mozambique has many parallels to that in Ghana. In 2001 UNICEF funded a government visit to Nicaragua to observe rope pump production workshops and field sites. Government officials were unimpressed by the relatively frequent breakdown and the prominence of the family pump, since they were looking for community options. In 2002 WaterAid was looking for low-cost alternatives to its early policy of installing windlasses on wells. Government was pushing WaterAid to seal the wells and they agreed to a pilot rope pump programme. A team from BOMBESA helped set up production of a robust community model that might prove acceptable to government. At the same time 60 pumps were imported from Taratra in Madagascar. CARE, WaterAid and UNICEF have now installed more than 270 pumps in the country, and DAPP/ADPP at least the same number again. While attitudes have begun to change, as with Ghana, government enthusiasm for the pump remains muted, for similar reasons. The fundamental problem is that they doubt its performance in terms of reliability and water quality for communities compared with the Afridev which is favoured and adopted for planning and standard installation.

Government doubts the rope pump's reliability and the quality of water compared with the Afridev

### *Zimbabwe*

Simultaneously to the introduction in Ghana and Madagascar, separate developments were occurring in Zimbabwe. This started with the introduction of an effective but rough-and-ready rope pump for irrigation purposes, at family level (Lambert and Faulkner, 1991). In the late 1990s the principles were taken up by PumpAid and a closed model (the Elephant Pump) developed for community and institutional use. PumpAid has produced around 4,000 pumps in Zimbabwe (I. Thorpe, personal communication) and now also produces 75 a month in Malawi. Mvurumanzi Trust promotes rope pumps usually made by users themselves for multiple uses in Zimbabwe and DAPP has also set up production (usually for irrigation).

Numbers installed are still small compared with the need for improved water lifting and protection

Table 1 shows most of the range of initiatives under way; despite almost 10 years of development, numbers of rope pumps installed are still small compared with the need for improved water lifting and protection. Many small fires have been lit but they have not coalesced

**Table 1.** Known rope pump initiatives in SSA

| *Country* | *Comments* | *Scale/number of pumps to date* |
|---|---|---|
| Burkina Faso | Started in 1976 (Demotech) now being reintroduced by WaterAid | <100 |
| DR Congo | Small-scale development Tanganyika lakeside Solidarité, 2006–2008 | <100 |
| Ethiopia * | Selam TVC + JICA/EWTEC promoting rope pumps at household level, + training district production | >2,000 |
| Ghana | Four main producers, established for 2–8 years, pumps for community level. Mainly in northern/upper eastern regions | >1,600 |
| Kenya * | Introduction and production/promotion for multiple use. Eldoret Diocese water and sanitation ACK-WATSAN | >500 |
| Madagascar | Introduction and production/promotion Taratra and T Plus | >1,000 |
| Malawi | DAPP mainly for irrigation but also domestic*, exported also to Mozambique. Pump Aid community pumps 900–1,000/year | >400 |
| Mali | Oxfam piloting rope pumps in Gao, with government approval | <50 |
| Mozambique | 5 producers in 4 different provinces. ADPP mainly irrigation pumps*, WaterAid/ CARE community pumps | +/- 500 |
| Niger * | Rope pump and low-cost drilling, 1 producer in Maradi with EWV/UNICEF | <100 |
| Senegal* | 2 producers mainly for private market in Casamance, trained by EWV | >400 |
| South Africa* | Ubombo Family Wells Project from 2003, KwaZulu Natal | >200 |
| Tanzania* | Rope pumps, source up-grading and for domestic/productive use SHIPO | Not known |
| Uganda | Small-scale piloting by DWD/Busoga Trust, and initial production (Mambo) | <20 |
| Zambia * | DAPP, around 50% household 50% community, usually also with irrigation | >600 |
| Zimbabwe | Rope pumps for multiple use, models with varying levels of protection, mostly community level/schools (Pump Aid/ Mvurumanzi*) | >4,500 |

* High proportion for family level use

to form a blaze. Perhaps this is because we are still early in the process: even in Nicaragua a 'critical mass' was not reached for 10–15 years.

But what do these varying scales of transfer demonstrate as strengths and weaknesses of the technology in a new environment? Success or failure may be determined by: (1) the socio-economic environment; (2) technical issues; (3) target groups; (4) the methods of financing; (5) marketing strategies; (6) water uses; and (7) the policies and involvement of governments which affect success even more. These factors are explored further below.

## Factors in the success of technology transfer

### *Different socio-economic environment*

In economic and demographic terms, the environment within which the rope pump has flourished in Nicaragua has some similarities but also some key differences from the main African context (see Table 2). In terms of development, all of Latin America falls in the medium to high range of human development, while almost all the low index countries are African. The rural context in Nicaragua suggests that farming produces a higher income which may be spread among the poorer rural communities creating more disposable income than in the typical SSA context. Entrepreneurial skills may also be better developed. Significantly lower donor per capita inputs to most African countries also suggest that people may have to fund more of their own solutions in SSA and Cambodia.

In Nicaragua there may be more disposable income than in the typical SSA context

These aspects may have important implications for potential, marketing and finance of a technology such as the rope pump, which in Nicaragua has depended partly on the willingness of families to invest in improving their own water supplies.

**Table 2.** Key features of the rural context

| *Country* | *HDI (2006)* | *Rural population (1 000s) 2010** | *Rural %age of total* | *Rural population density* | *%age labour force in agriculture* | *Per capita GDP($) 2006* | *Agricultural GDP ($) 2006 coverage* | *%age rural water* | *Aid/head US$ 2006* |
|---|---|---|---|---|---|---|---|---|---|
| Nicaragua | 0.698 | 2 489 | 42.7 | 19.5 | 14 | 779 | 783 | 63 (2006) | 132 |
| Burkina Faso | 0.342 | 12 811 | 79.6 | 46.8 | 92 | 238 | 88 | 66 (2006) | 60.6 |
| Ethiopia | 0.371 | 73 844 | 82 | 65.4 | 78 | 109 | 56 | 31 (2006) | 25.2 |
| Ghana | 0.532 | 12 079 | 48.5 | 52.5 | 54 | 281 | 179 | 64 (2004) | 51 |
| Mozambique | 0.39 | 13 935 | 61.6 | 17.8 | 74 | 269 | 85 | 26 (2006) | 76 |
| Zambia | 0.407 | 8 118 | 64.3 | 10.8 | 63 | 353 | 92 | 41 (2006) | 121 |
| Cambodia | 0.583 | 11 753 | 77.20 | 64.9 | 74 | 309 | 148 | 61 (2006) | 37.3 |

* Projection based on UN Population Division, 2008
*Sources*: FAO Statistics Division, 2008; UNICEF/WHO, 2008; WRI, 2006; UNDP, 2006

### *Technical issues*

The rope pump is easy to copy badly

*Performance and quality control*. The rope pump is promoted for its simplicity; however, while this makes the pump easier to construct and repair, it also makes it easier to copy badly. Early evaluations of the transfer found that in Ghana (Bombas de Mecate, 2002) and Mozambique (E. Harvey, personal communication) among others, poor materials and poor processes of construction meant that many pumps broke down or worked badly: for example, because of the irregular size of pipes and washers. Poor performance also arises from 'pirate' producers in Ethiopia, who do not follow quality control standards and undercut the costs of better producers. Their presence illustrates a growing market, but also the ease with which a technology can get a bad name.

To avoid poor products and a bad reputation requires quality control, even for simple mechanisms. Since governments in most countries are not yet convinced that the rope pump merits inclusion among standard technologies, quality control tends to be exerted by NGOs/donors. In Mozambique, however, the government is now considering how best to certify production quality and is expected soon to provide a certification based on adherence to a manufacturing guide, produced by SKAT (E. Harvey, personal communication).

*Variations in design*. Three basic rope pump models exist: one for families, a more robust version for communities and a third deep well version. In addition wind-, bicycle-, solar- and mechanically driven versions are found and ones which pump to elevated tanks or from ground tanks. Some of the many variations have improved performance or ease of maintenance, but others seem to have been made

Injection moulding machine for making pistons
*Credit:* Ludo Engineering

Pistons made in Ghana

The evolution of current designs should be systematically documented to avoid repetition of fruitless modifications

with little or no evidence of the justification or the improvement achieved. The main danger is that the experience of 25 years of testing and development is ignored by new producers, whose alterations may have already been tried and found wanting. Perhaps the evolution of current designs should be systematically documented to avoid repetition of fruitless modifications.

The basic design has been provided with varying degrees of protection which have added significantly to the cost. Accompanying data on water quality changes is lacking, however, and encasing the top works hides the state of the rope and may encourage greater corrosion. The basic rope pump usually conforms to JMP definitions of 'protected well' (WHO & UNICEF, 2005) for international coverage purposes. However higher levels of protection are being added to assuage government and donor fears, generally without any evidence of effectiveness, or shift in professional/policy-maker attitudes. Modifications to basic design may be worthwhile, but if the cost–benefit is to be determined, performance data is needed.

*Sustainability*. It is widely quoted that 90–95 per cent of rope pumps function, while of conventional piston pumps only some 70 per cent, at most, work in the medium term. The reliability of rope pumps is based mainly on evidence from Latin America, and there has not been enough time to see whether sustainability is equally impressive within the African context. Objective monitoring of performance is needed, and of the influence and need for continued support to users. While maintenance is easier, it is not known whether the problems of community management that piston pumps face may also affect the performance of rope pumps. Anecdotal evidence tends to suggest that privately owned systems are more sustainable, but the validity of this idea needs to be explored. If true, it adds significantly to the argument

Anecdotal evidence tends to suggest that privately owned systems are more sustainable

Senegal basic domestic rope pump

This heavy duty rope pump has greater protection for developing a household market for pumps alongside the community one and would also indicate that for conventional pumps it is the social issues of community management, rather than technology and supply chains which create the most problems.

### *Target groups: large or small?*

A fundamental problem for the pump is whether it is to be promoted as a community supply for 100–300 people or whether it is principally for groups of less than 100, or whether it is equally suitable for both. Different promoters target different groups of users. The pump exists in different forms to suit each market.

In Nicaragua, the pump has been shown to work well at both communal and household levels, but data is lacking for other countries in different cultural environments. In Zimbabwe and Madagascar the rope pump is also said to perform well at community levels, but lack of supporting data and analysis of contributory factors make it difficult to identify and transfer lessons learnt to new areas. Where larger rope pump projects have been initiated, despite donor and government reservations on durability and water quality, they have generally only targeted communities, because they have been implemented in the context of the community management model used everywhere for improving domestic access to water.

In Zimbabwe and Madagascar the rope pump is said to perform well at community levels

In the larger-scale efforts to introduce the rope pump in northern Ghana and most of the developments in Mozambique and Madagascar, sales are mainly to NGOs. Production remains dependent on them and there is often little development of the private market that can give producers a more sustainable income. A parallel development of the private market widens demand but also increases the skills pool of people able to maintain and install the pumps, and to make or source any spare parts needed. This has only generally been done by the smaller-scale producers, where NGOs include family rope pumps as part of wider community development. Shipo in Tanzania, Ideas at Work in Cambodia and JICA in Ethiopia have shown that targeting families can successfully encourage investment in supply improvement and lead to a more 'bottom up' approach. However, governments tend to be reluctant to be involved in the growth in private supplies, which do not fit well into either their planning or regulatory frameworks.

Governments tend to be reluctant to be involved in the growth of private supplies

Thus the rope pump as a solution for either large or small target groups, appears to sit uneasily with most government and donor strategies.

A clearer and more objective picture is needed with respect to the sustainability and functioning of both communal and household-level rope pumps, in order to address these strategic concerns.

### *Financing development*

*Support to the private sector*. A similar unease arises in financing of rope pump development. Donors and governments tend to like large projects which require less tracking and management, and have very specific outcomes. Low-cost solutions despite their likely greater sustainability, tend to be less popular and more difficult to track. Despite SDC and WSP's early championing of technology transfer, no large donor funding has followed.

This situation has meant that technology transfer as a donor-driven ('top-down') activity tends to have received only short-term support to the private sector on which it depends. Loans to improve workshops, costs of developing the market, support to microfinance are all aspects which producers need to develop, but for which early commercial turnover may not be sufficient. In Senegal, Enterprise Works (J. Naugle personal communication) found that the two-year period of outside support to the private sector has been insufficient to build up a 'critical mass' of pumps, and while production continues, it is limited by producers' lack of expertise and funds to market the product effectively. In Ghana the story is similar (Bombas de Mecate, 2002); while NGOs provide a market, they are not supporting the private sector to broaden the demand and reduce dependence on variable donor interest. Developing the broader market base takes time, and investment in pump production can be ineffective if support is withdrawn too quickly. In Nicaragua, WSP (2008) points out the central importance of the private sector promoter; but also the sustained and close collaboration received over a period of a decade from SDC, which encouraged the promoter to support the development of other entrepreneur producers, both in Nicaragua and elsewhere.

Investment in pump production can be ineffective if support is withdrawn too quickly

*Support to the user*. The typical cost of a community rope pump is \$200–350 and for a household level model, \$75–150. This compares with typical costs of \$1,000 for a NIRA and \$800 for an Afridev. The pump does not have low per capita cost for small groups, but it does have low unit cost. Thus it is cost effective for small groups because they may be able to invest in it for themselves, without major subsidy, and its performance compares favourably with the higher cost pumps (Harvey and Drouin, 2006).

The affordability to users of the capital costs of rope pumps is exploited in few African countries, but was an integral element of the success in Central America. It is also apparent in several NGO initiatives (e.g. Shipo in Tanzania, Enterprise Works in Niger and Senegal, JICA/Selam in Ethiopia) as well as in new initiatives in South-East Asia (Cambodia, Laos etc.). These successful developments of the household rope pump depend totally on selling at cost, but also often on loans or revolving funds, managed by a local microfinance institution, by pump producers or local NGOs. This allows a wider range

Microfinance allows a wider range of people to afford pumps of people to afford pumps and reduces or eliminates the need for subsidies.

### *Marketing*

Marketing is important at different levels. On the one hand the technology must be advocated (marketed) to donors and to governments, including district planners, sector professionals and health officials. These can stop progress before it starts. On the other it must be liked by producers and users, and seen as having specific advantages which merit investment in it and effort to keep it working, whether at community or household level. If one or other group take a dislike to the technology it is unlikely to prosper.

Marketing also requires a strength of voice, but this is weakened by poor communication, particularly between the larger and smaller-scale interventions, which could help in promotion and dissemination of the lessons learnt. The various organizations involved in transfer of the rope pump have used different approaches, depending on their policies, skills, knowledge and objectives and a united message based on combined experience is lacking.

A united message based on combined experience is lacking

*Marketing for sector professionals*. The attitude of sector professionals can be a major challenge to progress for a simple technology. The promoter is convinced of the pump's value; it is a mistake to assume that this perception is shared by the government or donor engineer. To a qualified engineer, the rope pump is not 'sexy', because it offers little opportunity to apply technical knowledge. Fundamentally the problem for sector professionals is the perception of the pump as a backward step, when they wish to move to higher levels. This may colour their assumptions on water quality, durability and sustainability if no hard evidence is available. It is a view that can easily be at odds with users' views, and so marketing needs to be targeted in different ways to the different stakeholders. Approaches towards involving government and donors are discussed further below.

The problem for sector professionals is the perception of the pump as a backward step

*Marketing for users*. Product promotion is an area which requires serious market research especially when householders or communities are being asked to invest in the full capital cost of pumps themselves. We may think a technology is brilliant and just what people want, but we need to understand how they are thinking in different cultural environments, and get a better idea of what they can afford. In Cambodia careful market research preceded selling, and as a result sales have taken off rapidly, with 1,200 pumps sold in the first 18 months, partly as a result of 'Tupperware' sales methods (A. Smit, personal communication), and all have been kept operational (Ideas at Work, 2008). Elsewhere it is generally assumed that seeing a pump is sufficient to trigger demand, but it seems that the effect only really takes hold when there are sufficient numbers of pumps for neighbours to begin to want to copy their peers (Harvey and Drouin, 2006).

At household level it is usually the more progressive and affluent who invest first

Different strategies are needed for community and household levels. At household level it is usually the more progressive and affluent (sometimes peri-urban before rural) who invest first, or those who use it primarily for irrigation and so see rapid economic benefit. It thus gains a status from the start, to which others can aspire. Where this is established, the rope pump appears to also become a more acceptable alternative for communities. Paradoxically the rope pump is usually marketed to communities by NGOs as being a cheap alternative to more conventional handpumps such as the Afridev or NIRA. However, communities rarely contribute significantly to the capital cost of their pumps, so they often prefer the more expensive option on the assumption that it is better or offers higher status.

The introduction of status and marketing principles also encourages users to view the rope pump not as an end point but as a step towards higher options. The income generated can be used to invest in a solar or mechanical pump at a later date, as has happened also with the treadle pump. Thus a marketing dynamic evolves requiring a range of products and an upward progression encouraged by status and differing uses.

### *Water use*

*Multiple use*. A major drawback of communal water supplies is the difficulty of using the water for productive purposes. In some instances (e.g. southern Madagascar) communal vegetable gardens have been set up irrigated by community-owned rope pumps. More usually, however, land tenure, and the division of both labour and revenue make communal ownership more problematic than private for-productive purposes.

Where rope pumps are for sale to households, multiple use of water is generally encouraged

Where rope pumps are for sale to households, multiple use of water is generally encouraged. This is true in Nicaragua, and several other countries are now promoting rope pump sales linked to an ability to recover the cost of purchase over a relatively short period (one or two years maximum). Zambia, Zimbabwe, Ethiopia, Senegal and Niger are examples of where links are made to income generation, expanding the demand and providing loans which allow a wider range of people to buy a pump.

It is also an approach which has had good success in Cambodia.

*Drinking water*. As the emphasis in this paper is mainly on the provision of drinking/domestic water, concerns over water quality have been mentioned. Monitoring of water quality may in part reflect the multiple use or even only-irrigation use of pumps which may not be kept as clean as drinking water sources. Even so, both in Cambodia

(Sampson, 2008) and in Nicaragua (Gorter, 1998), a 10-fold reduction of faecal coliform was observed between rope pump wells and open wells, and a slightly lesser reduction in Ghana and Honduras. Significant improvement has also been found in Kenya (Hughes, 2004) and by WaterAid monitoring in Mozambique (Sutton, 2008). Doubts arise because the rare monitoring results that are available show the rope pump to give significant reduction in health risks but not necessarily zero risk. Comparative results for conventional piston pumps tend to give a similar picture (e.g. Tadesse et al., 2006) but are not given the same prominence because these pumps have been promoted as the best solution for so long. In reality, neither is perfect and both require household water treatment to ensure delivery of zero coliform water to the consumer.

In reality, neither the rope pump nor conventional pumps give zero risk of faecal coliform contamination

### *Government/donor involvement*

Perhaps the most critical element to successful transfer was identified by BOMBESA (Bombas de Mecate 2002). Nicaragua developed the rope pump through a bottom-up approach, while its introduction to most other countries on the larger scale has been top-down. The difficulty is to involve government as early as possible, but to balance this with grass-roots growth in demand. In Nicaragua, Madagascar and Zimbabwe, government acceptance and adoption of the technology has come about through seeing the demand, but the official acceptance of the rope pump as a level of rural water supply service which contributes to coverage has proved a stumbling block in many SSA countries.

It appears that three factors particularly encourage government interest and incorporation of the technology into rural water strategy. These are:

- the definition and demonstration of potential/demand;
- the understanding of the need for new options to reach MDGs;
- the acceptance of the technology as contributing effectively to coverage.

The main barriers to official acceptance have been protection of the quality of water (perceived as poor in the original models), the assurance of production quality and doubts on durability for large groups. Mozambique illustrates well the difference between acceptance and adoption. While it is setting up standards of production for community use, it does not include rope pumps as an option in its own planning or in its monitoring and counting towards coverage.

The main barriers to official acceptance have related to water quality, production quality and doubts on durability

The stance of government in Ghana is similar, with a lack of conviction that the pump offers sufficient potential for strategic consideration. Many donors seem to feel that it cannot deliver safe water and so cannot be included in planning for coverage or promoted as a supply improvement. None of these organizations has carried out systematic monitoring of water quality in the African context, to prove or negate the point, or to compare performance with other technologies regarded as 'safe', and nor have the champions of the technology. Thus a barrier exists and opinions are hardening – apparently on the basis of conflicting assumptions, not facts. Obtaining good objective data is becoming increasingly urgent.

In the many other countries (see Table 1) where the pump has been introduced, in smaller-scale developments, official adoption still mostly remains a distant dream.

## Conclusion

From the experiences to date, certain factors emerge which can accelerate or slow down the speed of technology transfer for the rope pump:

### *Strengths*

The pump is amenable to local manufacture and user-led maintenance

The pump is amenable to local manufacture and user-led maintenance, and has proved very suitable for small user groups. Installation of a rope pump brings significant improvement in water quality over bucket and rope abstraction. It also provides genuine opportunities for people to help themselves to a better quality of life, and low unit costs which are affordable to some on the private market. Affordability can be extended by micro-credit and the increased potential for productive use.

### *Weaknesses*

Dispersed development to date has resulted in little exchange of information

The lack of evidence to confirm its sustainability in community use (in the African context) is combined with doubts over its ability to deliver adequate water quality to count as coverage (for the MDG target). In addition it is commonly perceived at community level as 'low' technology and therefore lacking in status. These factors lead to reduced acceptance by governments, donors and sector professionals, compounded by uncertainty on how it can fit into regulatory and financial frameworks and sector planning, especially when adopted at household level. Dispersed development to date has resulted in little exchange of information or power of advocacy to influence government views, and no certainty that similar results can be achieved in transferring between different social/economic environments.

### *Recommendations*

The rope pump has many advantages. However the process of transfer and the factors affecting it can be seen to be complex. As the weaknesses emerge and are addressed, the strengths will become more dominant. This takes time and tackling weaknesses needs to be speeded up if the rope pump is to achieve its potential in contributing to MDG targets over the next six years. Weaknesses could be much reduced with better availability and sharing of data and collaboration in advocacy. However this needs to be combined with a clearer vision of how to achieve sustainability, which would include:

- collection and sharing of data and experience from different countries and cultures;
- nurturing both private and communal markets (marketing, micro-credit);
- longer term support to small producers (loans, strengthening business management, marketing capacity and quality control);
- developing clear guidelines on how the private market and possibly small subsidies to it could be included in sector planning.

### *Call for information*

The authors would be interested to hear from anyone with experience of the rope pump in Africa or elsewhere, whose ideas and information could help to fill out the picture provided here and move us towards a clearer view of the pump's likely contribution.

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