HANDPUMP DEVELOPMENTS* (1998)

Erich Baumann
Director
SKAT
St. Gallen, Switzerland

ABSTRACT

By the year 2000 an estimated 2 billion people will lack access to safe water supply and adequate sanitation. Striving for universal coverage calls for mobilising additional resources, and maximising the impact of investment by using appropriate technologies.

Handpumps are environmentally friendly, easy to maintain, and often the most cost-effective option available. Their designs have improved consistently over the past years. The VLOM concept brings enhanced effectiveness and accountability. Village communities select the technology and are responsible for operation and maintenance. The Handpump Technology Network (HTN) supports VLOM through: Institution and Capacity Building, R&D, Technology Transfer, and Dissemination of Information.

The achieved results are: Low cost technologies are recognised as viable alternatives. Communities successfully manage handpumps that are specifically designed for VLOM. The pumps are affordable, reliable and easy to maintain. Private sector participation in project implementation and local manufacture has been established. Standardisation has resulted in better quality products and substantial economic gains.

1.0 BACKGROUND

Lack of access to safe water supply and inadequate sanitation are the leading causes of illness, death and malnutrition in developing countries. Despite significant progress made during the International Water Supply and Sanitation Decade the primary goal of providing universal access to safe water was not achieved. It is estimated that by the year 2000 nearly 2 billion people remain unserved.

Currently, governments and donors are spending about US$ 1,500 million per year in the rural water and sanitation sector. Three to five times the present investment would be required to achieve universal coverage. It is essential to mobilise additional financial and non-financial resources through user contribution in cash and kind, and to maximise the impact of investment by using appropriate technologies and increasing private sector participation.

The supply driven implementation of projects has resulted in lack of community ownership, which makes the upkeep of water-points a major problem. Governments are not in the position to provide adequate O&M services in remote areas, resulting that capital investments are heavily under-utilised.

2.0 TECHNOLOGY

2.1 OPTIONS

Top-down planning needs to be replaced by bottom-up planning. The village communities are directly responsible for the management of their water supply system; they have the final choice of technology. The community's choice of technology is normally guided by their own sense of need and by the ability to pay their share of the implementation cost. Furthermore, they have to take into consideration the affordability of costs for operation, maintenance and repairs, and as well the reliability of the system. The communities depend on reliable advice and assistance given to them to arrive at a sensible choice. Easily understood information materials on the different options (point sources or piped systems) must be available.

The options open to a community are usually limited due to the prevailing field conditions. Where ground water is used, two main sources are available:

- hand dug wells
- machine drilled boreholes

Whenever the geological conditions allow it, professionally constructed hand dug wells or hand drilled boreholes are the lowest cost option for the small rural communities. However, where digging is not possible at acceptable cost, the more expensive borehole drilling will be necessary.

The hand dug wells and boreholes can be fitted with a variety of water lifting devices.

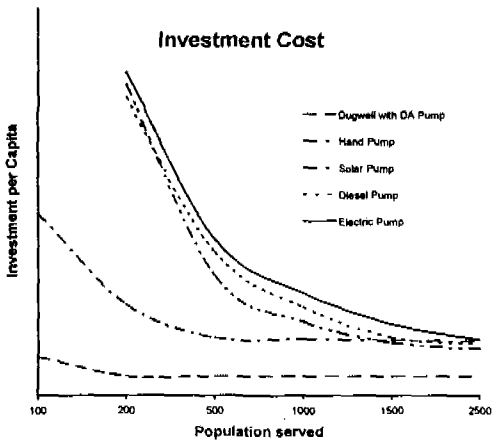
- Handpumps:
  - ◊ Suction Pumps for very shallow installations of less than 7 m
  - ◊ Direct action pump for shallow installations of up to 15 m
  - ◊ Deep well pumps for installations between 15 and 80 m
- Mechanised wells with small submersible pumps driven by electricity from :
  - ◊ the national grid,
  - ◊ a small diesel generator or
  - ◊ a photovoltaic system.

The linkage between the water source (borehole/well) and the pumping device is often a determining factor for the success of an installation.

2.1 TYPICAL COST FOR SMALL WATER SUPPLY SYSTEMS

The main cost indicators are, investment cost per capita, and annual running cost per capita. As a general rule:

- For small communities of less than 200 users: hand dug wells equipped with simple direct action handpumps present the lowest cost option.
- For communities of 200 to about 1,000 inhabitants: boreholes with reliable and robust handpumps are the most cost effective choice.
- In range of 1000-2000 inhabitants: handpumps or pipeborne systems are possible, solar pumps might be attractive, especially if the pumping lifts are low.
- For larger communities between 2000 and 5000 inhabitants: small pipeborne systems with submersible pumps will be lower in cost than handpumps.



3.0 HANDPUMP TECHNOLOGY NETWORK

In many countries, handpumps represent often the most cost-effective option for rural water supply and they are the principal technology used. They are environmentally friendly, relatively simple to operate, and manageable by the community itself. As a village level technology, they perform remarkably well, serving communities of 400 to 500 people for long periods with minimal maintenance. Handpump designs have improved consistently over the past years.

However, some issues remain unresolved. The need for continued external support for capacity building, dissemination of information, refinement of handpump designs, was emphasised 1992 at a Workshop, in Kakamega, Kenya. The workshop mandated the formation of a Handpump Technology Network (HTN) to provide an institutional framework for better co-ordination of handpump related development activities and to optimally utilise resources for technical assistance.

HTN is a focal point for conceptual planning and adopts a balanced approach to strive for sustainability, not only in terms of hardware, but also in terms of supporting "software". Implementation strategies have to be institutionally sound, technically realistic, and meet identified needs of users. The experiences and lessons learnt are documented and published. SKAT, Switzerland runs the HTN secretariat.

HTN provides demand-based support in the fields of:

3.1 INSTITUTION AND CAPACITY BUILDING

Demand driven approach, private sector based service delivery mechanism, cost sharing by all stakeholders require a corresponding change in the institutional role of the Governments, from a provider of services to a facilitator. The new role demands from the Governments the formulation of a national sector policy, co-ordination, support, facilitation, funding, and capacity building. Donors/ESA's provide financial and technical support. NGO's and private sector carry out the implementation work, service delivery, training, etc.

3.1.1 The VLOM Concept

Community participation is the key factor to attain sustainability. Decentralisation gives the community the chance to actively take part in the management of operation and maintenance. The Village Level Operation and Management of Maintenance (VLOM) concept, brings enhanced effectiveness and accountability. VLOM means:

- The villages accept responsibility for the water-point
- The users maintain and repair the pump by themselves, for bigger repairs they can get the help of an area mechanic
- The users finances repair and spare parts cost

Governments should create an enabling environment, provide technical support, build capacity in co-operation with NGO's, monitor project implementation, and assist in major repairs or rehabilitation.

3.2 RESEARCH AND DEVELOPMENT

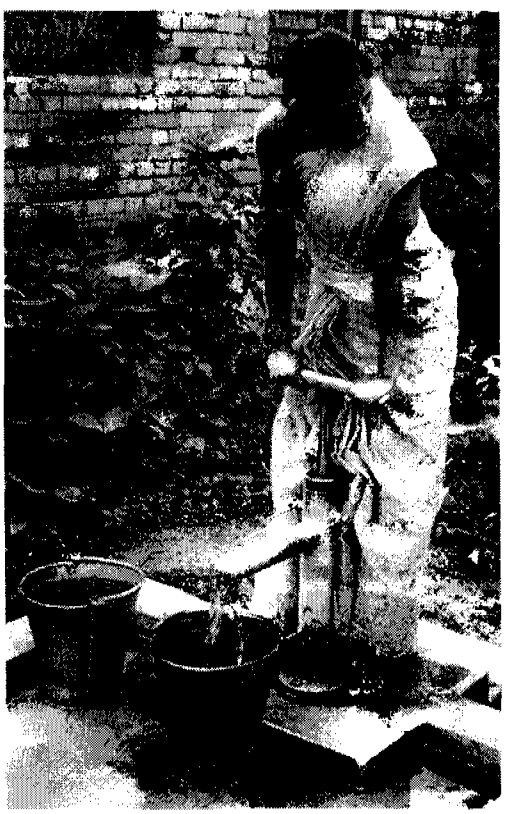
HTN co-ordinates and facilitates resolution of outstanding design issues and identifies priority areas for R&D on handpumps. Resources for technical assistance are optimally utilised through systematic collaboration with private sector initiatives, collection and sharing of information, and co-ordination of efforts. Creation of an R&D database and the dissemination of results facilitate a dialogue and an interactive R&D process. HTN supports both north-south and south-south co-operation on R&D.

Research and development on public domain handpumps has contributed significantly to the development of the rural water supply sector over the past 20 years.

3.2.1 Development of VLOM Pumps

Pumps were specifically designed to meet the VLOM requirements, to make them user-friendly, more reliable and better adapted to O&M by communities. As a result, field-proven, reliable and easy to maintain handpump designs are now available in the public domain.

- The Afridev was the first pump specifically designed to meet VLOM criteria's. Only one single spanner is needed for all routine repairs. Minimal support from trained area mechanics is required.
- In the meantime, other types such as the India MarkIII (VLOM) pump came on the market.



3.2.2 Direct Action Pump

In many countries up to 50% and more of all the water-points can be fitted with direct action pumps. Direct action pumps have few moving parts and are excellently suited for village level maintenance. The buoyant pumprods help to distribute the pumping effort between up- and down-stroke; this allows the use of direct action pumps up to lifts of 15 metres. The moderate cost gives a good potential that the communities could purchase them on fully private basis.

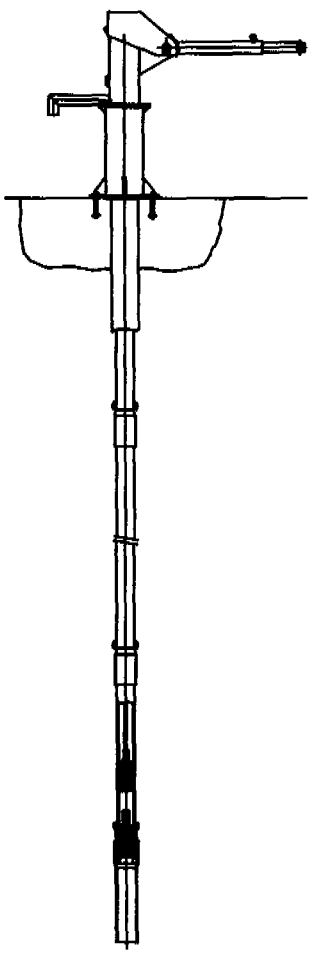
The Tara Pump in Bangladesh and Yaku-Maya Pump in Latin America are successfully used in villages with small user groups. In Africa, where large user groups draw water from one pump a more rugged pump is required. This led to the development of the Malda pump in Malawi. This robust direct action pump was designed to meet the arduous user conditions in Africa. The testing in the field and in the laboratory of the Malda pump was concluded in February 1998. Local manufacture has started in Malawi, India and Kenya.

3.2.3 Deep Well Installations

Other R&D gaps include models for extra-deepwell application, cost-effective options for corrosion resistant riser pipes and connecting rods. Glass fibre rods offer a great potential especially in aggressive water. The flexibility, the lightweight and the strength of this material effect that pumps with deep installations are easy to operate and repair. Their potential for ease of maintenance is visible when they are removed from the well in one piece.

Rising main pipes are subject to high mechanical stress and corrosion. The commonly used PVC pipes are corrosion resistant but come to the limits of their physical strength. Glassfibre reinforced composite materials for rising mains pipes offer higher nominal strength and are definitely cheaper than stainless steel pipes.

3.3 STANDARDISATION



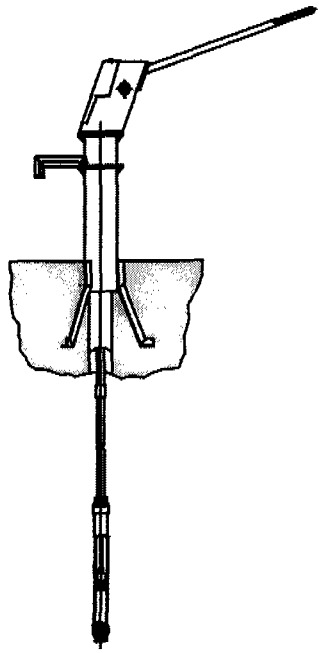
Afridev

A familiar, known technology that is supported by the relevant after sales services is often the better choice than the theoretically optimal technology. Appropriate technology selection and standardisation on the use of equipment offers significant benefits such as limiting the variety of spare parts and training that is required, preventing fragmentation of market demand thereby increasing economic viability of local production and reduction in capital and spare parts costs.

The experience in the last two decades indicates that several countries have benefited immensely by standardisation on one/two handpumps. The standardisation on a handpump - the India Mark II in India, the Tara handpump in Bangladesh and the Afridev in Pakistan - was the single most important factor leading to these widely acclaimed success stories. Another common factor was the rigorous and systematic field testing of the pumps before embarking on a nation wide standardisation.

The visible benefit of standardisation is the reduction in handpump prices. An India Mark II handpump was priced at US$ 120 in early 1980s and in 1996, it is available for US$ 98. The Afridev price came down from over US$ 600 in 1988 to US$ 250 in 1996. In addition, substantial savings were made in training and maintenance costs.

HTN formulated guidelines on technology selection and standardisation. A definite process needs to be followed for technology selection, including: defining field requirements, establishing performance criteria, pilot scale and large scale testing of pumps to evaluate field performance. "National Standardisation Committees",



India MarkII

constituted by the government with representations to all stakeholders, should adopt a minimum number of field proven (technology packages) handpumps, to meet the varying hydrogeological conditions, for national standardisation. Such a standardisation process may take 4 to 5 years. There are no short cuts; inappropriately selected technologies can jeopardise sustainability.

Introduction of a new technology where national standardisation already exists should strictly follow the technology selection process to ensure unbiased decision making. Such a changeover can hold enormous implications.

HTN maintains and publishes the international specifications of public domain pumps, such as the Afridev, the India MarkII/MarkIII, the MALDA, the Yaku-MAYA-TARA Direct Action pump and others. HTN places special emphasis on internationally accepted procedures for quality control. Supporting documents such as quality control manuals, production guides, installation and maintenance manuals ensure the quality of the pumps.

3.4 LOCAL PRODUCTION, AND PRIVATE SECTOR SUPPLY MECHANISM

An effective service delivery mechanism with adequate after-sales support is more important than a local production base. Wherever feasible, local or regional production should be encouraged as it has its own advantages. HTN facilitates industrial development and supports the production by local industries to lessen the dependency on imports. However, local production needs to be economically viable. HTN plays an integrating role in promoting regional efforts. Where the demand or market is too small, it is better to develop an effective dealership network.

Local production of handpumps has been established successfully in many countries, mainly in Asia but to some extent also in Africa. To ensure the quality of service delivery HTN promotes quality control safeguards such as pre-qualification of suppliers, third party inspection and dealer guarantee.

Procurement should be decentralised with the private sector playing the lead role, providing complete service delivery packages including production, supply of pumps, installation, training, spare parts supply, repairs, and after sales services. Centralised procurement should only be seen as the starting point towards eventual decentralisation.

3.5 INSTITUTIONAL FRAMEWORK

HTN work is primarily focused on partner activities within the HTN framework. Main partners within this framework are Swiss Development Cooperation (the main funding agency), UNICEF, UNDP/World Bank Water and Sanitation Programme, governmental agencies, multilateral organisations, bi-lateral donors, NGO's, R&D groups, inspection agencies, and private sector handpump manufacturers.