



**15th WEDC Conference**  
**Water, Engineering**  
**and Development in Africa**  
**Kano, Nigeria: 1989**

**Efficiency and cost containment of water and sanitation in Sudan**

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**INTRODUCTION:**

UNICEF'S involvement in water and in sanitation in the Sudan goes back to 1975 when a bore hole and hand pump programme was planned for southern Sudan. Implementation began in 1976 however the programme has gone through many phases since then. These included:

The three pronged approach which was adopted in 1979 to bring provision of potable water, sanitation and health education together to have a maximum impact for improving health.

Hafirs (man made ponds), power, dug wells, water treatment plants and small earth dams were added to the programme in the early 1980's in response to government preference for these traditional technologies compared to the uncertainty with the newly introduced hand pump technology.

Community participation for hand pump maintenance was incorporated in 1983. By then the programme was experiencing increased difficulties with maintenance of the hand pumps.

**PROBLEMS ENCOUNTERED:**

By the mid 1980's the programme was technically diversified and geographically dispersed. Logistic delays, problems with technical specifications for equipment and procurement of materials as well as technical supervision including programme management difficulties emerged.

The full impact of working in too large a geographical area, employing too many different technologies and having a variety of equipment was realized fully in 1986. A new five year country programme was designed in late 1986 which reduced geographic dispersion and concentrated on bore holes with hand pumps, latrines and health education.

However, the major enduring problem has been inadequate government commitment to hand pump technology. While there are a number of crucial factors influencing the success of the low cost approach to water

and sanitation, the first and possibly the most important is government commitment to low cost solutions.

Over the past decade the National Rural Water Corporation (NRWC) has had to devote most of their limited resources to an endless rehabilitation programme of comparatively high technology rural water supplies. As early as 1930 but accelerating in the 1960s over 3,500 water yards were constructed consisting of deep bore holes fitted with power pumps, elevated tanks and reticulation. A policy review is urgently needed in the Sudan to more adequately and realistically address the problem of rural water and sanitation so that new water facilities can be developed to keep pace with population growth and to eventually provide potable water to every community.

**COST EFFECTIVENESS:**

The cost effectiveness of hand pumps, VIP latrines and health education programmes are of primary concern and a requisite to further programmes expansion. The three elements must be delivered at about US\$ 25 per capita. In order to contain costs a number of preconditions must be met.

**Equipment:**

Appropriate drilling rigs and support trucks allow for efficient implementation. Over specified rigs are not appropriate for drilling shallow small diameter bore holes for hand pumps and result in unnecessarily high cost of the initial capital investment. Lighter rigs with the precise technical capacity to the geological conditions simplifies the technical aspects of the programme.

**Bonuses:**

Government staff responsible for programme execution must be properly rewarded. Considering gradual erosion of government salaries over the past decade due to inflation we estimate that the real purchasing power of NRWC staff has declined to around 10% of what it was when the programme started. (ILO ref Employment and Economic Reform, September 1986).

Production bonuses are paid based on good

quality work and shared on a predetermined prorata basis between managers and field crews alike. After the introduction of production bonuses output has doubled or even tripled in some areas thus reducing unit costs dramatically.

#### Plans:

Pragmatic programme plans must be drawn up and agreed upon by all concerned so as to facilitate efficient implementation. One of the principles we follow religiously for efficiency is that each geographic area must be fully covered before drilling is moved to a new area. This minimizes unproductive movement of vehicles and equipment and makes close supervision possible. Logistics are more easily managed as well.

#### Standardization:

Vehicles and equipment used should only have one make and model of truck, light vehicle and drilling rig. Such standardization drastically reduces down time on equipment and minimizes the investment in spare part stocks.

#### Design:

The designs of latrines, bore holes and hand pump installations should be standardized. This assures more effective supervision and minimizes the decision making process related to construction specifications. With good standard designs virtually all decisions can be made in the field by construction crews. Such standardization also facilitates supply planning, ordering and stock management of construction materials.

#### Critical Mass:

The importance of "critical mass": is imperative to success. First a "critical mass" of pumps must be installed with the right density e.g. one pump per 200 villagers and a minimum of at least 2 hand pumps even in small communities of less than 200 people. An adequate number of village mechanics must be trained, spare parts made readily available, tool sets supplied, and with NRW staff from senior management to field crews being fully aware and supportive of hand pumps. Only with this "critical mass" will hand pump water supply truly work and be kept working.

If the programme planning and design is not technically "elegant" it is very difficult to achieve cost effective implementation. All the above components contribute to reducing costs while simultaneously increasing production.

#### CRITERIA FOR COVERAGE:

Reasonable hand pump service levels must include back up capacity so as to provide water even when pumps break down (which is inevitable). This criterion must be built into the programme plan to give the community based maintenance systems a fair chance of success. All functional water supplies world-wide have back up capacity to avoid disruption of services when pumps undergo repair or overhaul. We believe that the same criteria must apply to a village hand pump systems in rural Sudan. The 1988 plan of action specifies: that one hand pump per 200 people maximum and never less than 2 pumps per village regardless of how few people reside in the village will be installed. Hand pump water supplies designed in this manner can be expected to function provided a village based maintenance system is established ... because it allows for a percentage of all pumps to be out of action at any one given time without reducing access to potable water.

#### COMMUNITY PARTICIPATION

It is widely acknowledged that villagers should be involved in water projects from the outset. For us in Sudan the process starts when the community is asked whether they would like a hand pump. Next we give the condition that they themselves must form a health committee. The government staff sit with the community to explain what the programme entails, what they can expect, what is expected of the village and what it will cost the village in form of time and money. This process allows the villagers to make an informed decision on whether they want to participate or not.

If the community decides to participate then:

- the health committee must be formed. This involves recruitment of 5 men and 5 women coming from the ranks of traditional leaders, health workers and teachers. This committee is given a one week training course, where all aspects of the project are thoroughly explained with concentration on health education.

Two of the committee members, a man and a woman, will be selected for a two week hand pump repair and maintenance training course.

- The villagers will contribute money for procurement of hand pump maintenance tools, as well as for an initial set of pump spare parts.

- The villagers will also make a commitment to sanitation through procurement of slabs and vent pipes for construction of household latrine.

After these requirements are met, the drilling rigs arrive and the village water supply is installed, which takes only one or two days for drilling and a week for pump installation.

#### VILLAGE LEVEL MAINTENANCE:

We have found that it is relatively easy to train villagers in hand pump maintenance and repair even when they have only a limited familiarity with tools and simple machines. Training begins with maintenance procedures for hand pumps including more complicated aspects such as threading of pipes and rods, next more detailed training and finally practical training is completed through common repair practicals.

It is through good training of the village committees and alerting them to these potential problems where the key to a well functioning maintenance system is found. The prerequisites for a village maintenance system are:

1. good quality initial installations,
2. national standardization of hand pump equipment
3. where possible local manufacturing of hand pump
4. constant regular reliable spare parts supply.

The actual choice of hand pump is less important than the decision to standardize although it is essential that the pump can be readily maintained on village level.

Another reason that UNICEF promotes village level maintenance and repair is that the Government of Sudan can ill afford to cover the cost of maintaining village water supplies.

Consequently, all maintenance costs are born directly by the beneficiaries as communities. This is why it is imperative that local communities fully understand and accept the system before the borehole is drilled. The programme must be in a position to provide accurate information to the villagers on annual maintenance cost, probable breakdown frequencies and other problems. If there are any doubts as to the village's capacity or willingness to cover these costs, then it is better to delay installation until they are well enough organized and motivated to look after their hand pumps.

#### THE THREE PRONGED APPROACH:

It is widely believed that the combination of water, sanitation and health education is required to achieve an impact on health. However, there are skeptics who believe that even with this three pronged approach the health impact is not measurable.

Indeed many studies show very low measurable impact compared with, say, interventions like immunization or oral rehydration therapy. The comparatively high cost is marshaled by these skeptics to "prove" that water programmes are not worthwhile but for the people of rural Sudan such "proof" is merely sentiment put water as their first priority such sentiments are both impossible to understand or accept and indeed it is hard to see how health benefits will permanently improve unless clean water is readily accessible. This "felt need" for water placed above virtually all other priorities provides a unique opportunity for introducing sanitation and health education which are rarely perceived as a priority need among villagers in the Sudan. Our strategy of water and sanitation combined with health education is translated in practical terms into no water supply without latrines and a trained health committee. We have found that communities are so highly motivated to improve their water supply that we can attach a number of "strings" to the programme and still achieve a high degree of compliance. While the long term effect of such "strings" is not known and we realize that we must change deep rooted traditions and habits to have desired health impact, none the less it is also recognized that latrines will not be built without "strings".

A comprehensive and richly illustrated manual has been developed to assist staff with explaining all aspects of the programme's three pronged approach to the various levels of people involved e.g. village leaders, pump mechanics, latrine builders, health educators, government officials and senior management. The roles and responsibilities of everyone is explicitly spelled out. The manual is generic and developed in such a way that it can be used by any organization or government department involved in rural water and sanitation.

#### THE REQUIREMENTS FOR SUCCESS:

Many interdependent components must be in place for achieving and sustaining an efficient and low cost water and sanitation programme. The most prominent are:

- Government commitment.
- Cost effective implementation e.g. an efficient implementation capacity.
- Realistic design criteria e.g. never more than 200 people per pump and never less than 2 pumps per village.
- Community participation and responsibilities e.g. attach "strings" to the provision of water while stating concisely what the village community is expected and required to do.
- National standardization of hand pumps to facilitate ready availability of parts and to simplify maintenance and repair.
- The combination of water sanitation and health education in a hard hitting target oriented and quantifiable programme with production bonuses built in.

These elements must mesh well to assure success. The programmes in the Sudan are not "there yet" but we do believe we are heading in the right direction.