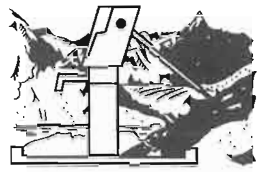
18th WEDC Conference KATHMANDU, Nepal 1992

WATER, ENVIRONMENT AND MANAGEMENT



Rejuvenation of drinking water tubewells

Prof S Ramachandran and Dr B B Chaudhuri

The magnitude of the task of providing potable water to the growing rural population and the enormous cost involved, exclude the possibility of any centralised urban type delivery system. In particular,developing countries have adopted the strategy of drilling borewells wherever feasible, fitting them withhandpumps. Other options like tubewells with power pumps,sanitary wells with handpumps and use of mountain springs are also employed but are quite insignificance compared with the phenomenal rate at which handpumps are being installed.

In India, Ground Water [4] sources account for 81.3% of all rural water supply. Handpumps account for 60.5% of village drinking water. In certain States the percentage is much higher (Table 1).

TABLE-1

INDIA (1966) AVERAGE DENSITY PER VILLAGE OF HANDPUMPS AS RURAL WATER SOURCES.

State	Number of handpumps	Total number* Drinking water sources/ village	% of handpumps
Bihar	11	12	92
Gujarat	6	8	75
Karnataka	8	9	89
Madhya Pradesh	3	4	75
Orissa	2	2	100
Rajasthan	2	2	100
Tamil Nadu	9	11	82
Uttar Pradesh	4	6	67
West Bengal	10	11	92
All India average			60.5

* Does not include tanks and ponds

However, handpumps installed without adequate survey and skills are easily susceptible to damage by misuse and overuse. While the ultimate objective of the potable drinking water programmes is the improvement in the health status of the people, the durability and local level maintainability of handpumps have yet to receive the attention they deserve. More often than not, the easy option of discarding old and defunct tubewells is being exercised, although this syndrome is neither justified economically nor sound technologically.

In a 1984 survey of 1566 handpumps in 589 village of Maharashtra, India, Raj Kumar Daw[2] found 64% in use and 36% not-in-use. This survey also revealed that there was little understanding of the purpose of the platform, the conditio of platforms and drains reflecting the generally defunct status of the handpumps (Table 2).

TABLE 2

CONDITION OF PLATFORMS AND DRAINS OF HANDPUMPS IN MAHARASHTRA.

Condition	Platforms %	Drains %
Good and Fair	21	14
Poor and Bad	70	42
Absent	9	44

The study revealed that while the ground water from a tubewell is supposed to be safe, contamination results from poor anchoring, infirm base and consequent seepage of wastewater into the tubewell.

The experience of Tamil Nadu, India in handpump maintenance has been more satisfactory. The Tamil Nadu Water and Drainage Board (TWAD) instals the pumps, the maintenance is handled by the Directecate of Rural Development with involvement of local bodies. With effective monitoring, out of 90,641 pumps installed (1976-1988) only 215 were permanently damaged, 173 faced temporary failure due to lowering nof water level, 83 needed flushing and 599 needed minor repairs.

In its report of 9 December 1991[3] the

World Bank/UNDP Regional Water and Sanitation Group, Accra, Ghana has made an interesting observation non the field performance of 295 Afridev Pumps installed in the Karonga Integrated Rural Groundwater Supply Project, Malawi, that while some pumps (installed between 1988 and 1990) are in dire need of repair, the communities wait until the pumps break down completely. Yet, close monitoring and good preventive maintenance by the community have kept 95 - 100% of pumps operational at all times.

An evaluation done on behalf of Government of India[4] in 1986 gave the breakup of handpump failures (Table 3).

TABLE-3

INDIA (1986):PERCENTAGE OF HANDPUMPS NOT WORKING AND SOURCES GOING DRY.

State	Hand pumps not functioning %of total	Sources gone dry % of total
Andhra Pradesh	10-14	14-15
Assam	25	
Bihar	83	
Gujarat	7	86
Haryana	25	
Karnataka	23	14-15
Kerala	60	
Madhya Pradesh	10-14	61
Maharashtra	10-14	58
Orissa	10-14	20-25
Rajasthan	38-43	20-25
Tamil Nadu	38-43	20-25
Uttar Pradesh	38-43	20-25
West Bengal	38-43	42

The reasons for the non-functioning of sources as evaluated for Government of India in 1986 are in Table-4. Sources going dry and hand-pumps not working together contribute to 63% of sources becoming defunct.

It is therefore reasonable to conclude that approaches to maintenance directly affect the life of the handpumps. Also positive approaches like rejuvenation are called for to stretch the life of a handpump beyond the "defunct" stage so that wasteful replacement investment is postponed if not avoided.

TABLE-4

INDIA (1986) REASONS FOR NON-FUNCTIONING OF SOURCES

Reasons	% of total
Sources gone dry	27
Handpumps not working	36
Power pump failure	2
Taps not working	5
Standpost broken	2
Pipe disruption	5
Poor quality of water	5
Erratic water supply	2
Other reasons	12

On the otherhand, UNICEF[1] REPORTED ON THE Indian handpump programme in 1986 after a survey of 18 Districts in six States as follows:

Positive Indicators

- 80% pumps in working order
- 88% pumps had firm pedestals
- 84% pumps had platforms constructed
- 92% pumps were with platforms and drains
- 92% pumps were accepted as the source for drinking and cooking purposes

Negative indicators

- **16% pumps without platform**
- 20-26% pumps without drains
- 69% pumps accumulated water around them
- Community participation was lacking
- 72% of reported failure were unattended for more than one month
- 28% could not be repaired due to the absence of spare parts or special tools
- Preventive maintenance did not exist anywhere.

UNICEF concluded that the programme had achieved sustainability on the basis of the above findings.

The apparent variances among the various statistics of "defunct" handpumps in due to the difference random areas chosen for survey, but the fact remains that in spite of all efforts, a very large part of investment in handpumps (20-36%) has turned useless and new socially acceptable strategies are needed to make these work once again. This is notwithstanding the odd favourable experiences of Tamil Nadu and Malawi.

In this paper, an attempt is made to describe two successful methods to rejuvenate defunct tubewells. Lutheran World Services (I) rejuvenated a number of defunct and abandoned tubewells in Ranibandh block in Bankura District of West Bengal, India. After rejuvenation, these tubewells have been functioning for the last four years. In another effort, Sunil Kumar Pradhan, the Village Pradhan of Naichampur I Gram Panchayat of Moyna Block in Midnapore District, West Bengal has successfully rejuvenated old, idle handpump sources. LWS (I), located at 84 Dr. Suresh Sarkar Road, Calcutta 700 014 rejuvenated 130 handpumps with financial support from Council for Advancement of People's Action and Rural Technology (CAPART), New Delhi, while Pradhan had financial support from the Government of West Bengal State. The area is drought prone, has undulating rolling topography with hillocks, low ridges and valleys, patches of cultivable land along the valleys between hills and hillocks.

10 out of 11 water sources in West Bengal's villages are handpumps. The supply of drinking water in Ranibandh also is basically by new tubewells, although the distributioin of tubewells is somewhat skewed. Sufficient water was not available throughout the year with acute scarcity in 67 scattered villages. Insufficient yield and non-functioning of new sources were major causes for shortages. Drinking water facilities were also limite in the remote pockets. The terrain and inaccessibility also created problems in fetching drinking water from distant areas. 40% of the population had real problems during April - June. (Table-5)

Measurements of water level made in January indicated low near-surface levels with a sharp decline from March onwards, reaching a maximum in May-June before the arrival of the monsoon. The maximum number of sources including tubewells and dugwells but excluding open ponds and tanks in any one single village, is 23·100 villages have 5 such sources, 51 villages, 6 to 10 sources, 9 villages 11 to 15 sources and there are more than 15 sources in 7 villages. Out of 395 tubewells in the block. 127 (32.2%) were not working and the causes of non-functioning were ascertained when they were rejuvenated.

TABLE-5

CHARACTERISTICS OF THE RANIBANDH PROJECT AREA

District/State	: Bankura/West Bengal. India
Location	: Ranibandh Block
Latitudes	: Between 22°,42'30"& 23° 1'6" N
Longitudes	: Between 86°36' & 86°53'E
Population/Area	: 81800 / 428.4 Sq.km.
Temp (winter)	: 7 to 18 C (min.5.4C)
Temp (summer)	: 33 to 41C (March to June)
Rain (average)	: 1544-1359 mm(June to Sept)
Soil cover	: varies from 1.00 to 3.50 meters.
Highly weathered crystallines	: vary in thickness from 1.50 to 13.70m. The degree of weathering varies with depth. extending upto 22 m
Less weathered and fractured crytalline equivalents	: Generally encountered at depth of 5 to 6 m from the sruface. At times these zones extend upto 50 m.
Basements	: Hard, massive, crystalline rocks which are not appreciably fractured and hence unweathered, showing negligible alterations, not allowing groundwater movements.
Villages surveyed	180
Tubewells surveyed	395
RCC well(excluding 131 dugwells)	446
Tubewells rejuvnated	130
Revitalisation of open wells	61
Renovation of open wells	200
Construction of platforms/soakpits/drains	150
Conversion of open to sanitary wells	30

The tubewells had become defunct due to one or more of the following reasons:

less water availability	16
want of minor/major repairs	13
unsutable water quality	42
detachment of pipes/assemblies	13
slit and mud in water	
bad odour of water	38
seepage of contaminated and dirty water	
absence of/damaged platform, drainage and soakpit	80

There was no uniformity in the construction of platforms 80% of which were damaged and it was apparent that the very purpose of the platform was not understood, leading to poor anchoring and seepage of wastewater into the borewell allowing contaminatioin. Drains were lacking in more than 80% of tubewells. There were either absent or done in such way that they could not drain. Of the 446 RCC wells nearly 154 needed repair or renovation.

There were nearly 300 tanks/onds excavated in the entire block, but siltation had reduced their holding power and with reexcavation and they can recharge the ground water enhance the supply of water during the drought period. Some of these can be provided with slow-sand filtration units to make the water potable.

The survey showed Iron contamination in tubewells of 49 villagers, possibly orginating from the parent rocks. Rejuvenation of such tubewells was done with air at high velocity allowing aeration which converted soluble iron into precipate, and come alongwith water.

The period of non-functioning of handpumps is summarised below:-

Numer of tube wells	Months out of operation
1	6
15	12
35	24
9	36
7	48
3	60
3	72

The following objectives motivated the present study and action programme.

- to make the existing sources usable with minimum additional investment
- to rejuvenate, revitalise and renovate the existing sources and to demonstrate the strategy and reduce the need for fresh handpumps.
- to develop an appropriate maintenance system involving the rural people, the Panchayats and the State Government and to create awareness and skills.
- to educate and create awareness on safe drinking water.

The rejuvenation at Ranibandh was done by passing high pressure air (7 to 8kgf/ cm^2 and 60 C through the bore hole continuously for some time (more two hours) with visible changes in the quality of water.

TABLE-6

COMPARATIVE FINANCIAL BENEFITS OF REJUVENATION

Particulars	Rejuvenation of old tube well(Rs.)	Drilling of new tubewell (Rupees)
Drilling rig	3.750	12,500
Casing pipe	-	4,500
Handpump/spares	3,600	4,500
Total	7,350	21,500

1 US$ = Rs. 30 1 £ Sterling = 55

In similar effort, Sunil Kumar Pradhan, successfully resank and relocated the handpumps, RCC platforms and pipes at Panchpukuria. A 10 year old handpump with a "defunct" label for 9 years is now in reuse. 50% of the old pipes (212 m) each were rejected. Alongwith 50% of new riser pipes, new strainers and new 75 mm casing pipes, three such rejuvenated handpumps are now performing well, two years later. The savings averaged Rs. 9,000/- at todays prices ($ 1.00 per capita).

The authors gratefully acknowledge the assistance and support of Lutheran World Services (India) and CAPART New Delhi. They are also grateful to Water Aid, London for consistently supporting such innovative schemes.

REFERENCES

1. Danida, Unicef, Department of Rural Development, Government of India, National Workshop on Village level Maintenance of Hand pumps 6 -8 April 1988.
2. DAW, RAJKUMAR of AFARM Pune, and UNICEF, status survey of Hand pumps in Maharashtra, India 1984.
3. The World Bank/UNDP Regional Water and Sanitation Group field performance reports on Afridev Pumps, 9 December 1991.
4. Department of Rural Development, New Delhi, concurrent Evaluation of Rural Water Supply, October to December 1986.