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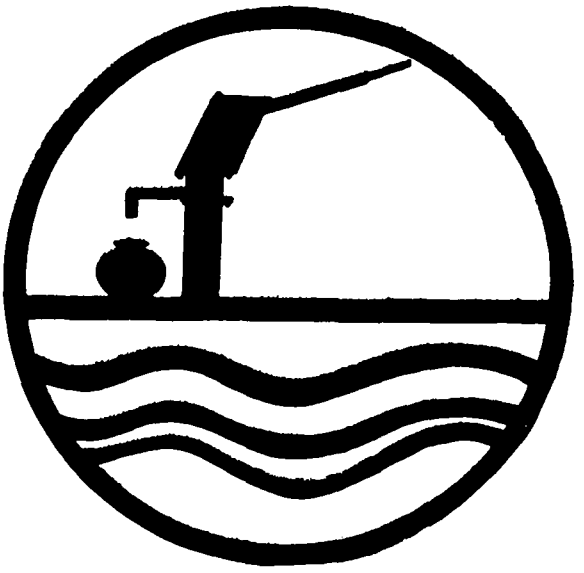
REPORT OF THE NATIONAL CONFERENCE ON

DEEPWELL HANDPUMPS

MADURAI, JULY 10-13, 1979



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Sponsored by the Ministry of Works and Housing, Central Public Health & Environmental Engineering Organisation (CPHEEO), and the United Nations Children's Fund (UNICEF)

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MADURAI JULY 10-13, 1979

INTRODUCTION

The National Conference on Deepwell Handpumps, sponsored by the Central Public Health and Environmental Engineering Organization (CPHEEO) and the United Nations Children's Fund (UNICEF) was held at Madurai from July 10-13, 1979. The theme of the Conference was "Deepwell Handpumps" - installation, maintenance and rejuvenation aspects.

The supply of safe drinking water to the villages of India is a major national task. The crucial aspect of this task is the ensuring of a long durable trouble-free service and easy to repair handpump - the most vulnerable part of the maintenance system. With the recent development of the new handpump - India Mark II - that can stand up to heavy wear and is easy to instal and maintain and its successful trial run, there is positive prospect of achieving the goal of providing the rural areas with a safe and perennial source of drinking water.

The success of this mass based public amenity needs active public awareness of the link between pure water and better health and the merits of handpump water. This has also to be stressed side by side with the actual installation of the deepwell handpumps. The village people are to be made aware that they have a pivotal role to play in maintaining the water supply system efficiently which is necessary to guard them against water-borne diseases that now take a heavy toll resulting particularly in infant mortality.

An experimental project in Tirunelveli district, Tamil Nadu, actively involving the local population has shown positive improvement in the service level with quicker repairs to the handpump system and lesser disruption in water supply. A number of factors have combined to make this possible, one of them being the installation of these India Mark II pumps. The key figure of this maintenance system is the village level caretaker selected by an interdepartmental team comprising of the State Department officials for Health, Engineering and Rural Development, after fully associating the local people in the selection process. The caretakers are trained to motivate others in the proper handling of the pump and its environment and to use the rural water supply programme as a focal point for health, sanitation and other related activities towards integrated rural development. The village handpump caretakers function at the grass root level of the handpump maintenance system which aims at establishing the most effective communication link between the village and the maintenance units at block and district levels.

The task today is to suitably assimilate this 'model' into the maintenance systems of other states in locations where the geophysical conditions facilitate deep tubewell pumps, providing the most economical solution to the problem of rural water supply.

The Conference was attended by representatives from the governments of 7 of the 10 states which are currently implementing the handpump programme*, as well as by delegates and observers from neighbouring countries.

As such, the National Conference held at Madurai has been a landmark in the history of the handpump programme. For the first time since its initiation, a concerted effort has been made towards a uniform approach and towards providing a broader and more effective framework for the successful implementation of the programme. The Conference has served to highlight the objectives of the handpump programme and focus on the means to achieve these objectives: primarily through quality control by standardisation of handpumps to the India Mark II type, and by the introduction of the viable three-tier maintenance system.

The National Conference has thus played a major role in consolidating the national approach towards the programme for provision of safe drinking water to rural areas. The recommendations arising out of these deliberations and exchange of local experience, problems and expertise would enable the States to suitably reorient their rural water supply programme, thereby facilitating rapid and effective coverage of the difficult areas and problem villages.

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* Andhra Pradesh, Bihar, Gujarat, Karnataka, Madhya Pradesh, Maharashtra, Orissa, Rajasthan, Tamil Nadu, West Bengal; observers from Uttar Pradesh, Afghanistan and Sri Lanka. States not represented: Bihar, Maharashtra, Rajasthan.

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INAUGURAL FUNCTION - TUESDAY, JULY 10, 1979

The National Conference on Deepwell Handpumps was inaugurated by Thiru M.G. Ramachandran, Honorable Chief Minister of Tamil Nadu.

In his welcome address, Mr K. Madhava Sarma, Managing Director of the Tamil Nadu Water Supply and Drainage Board, outlined the achievements of his State in this field where the implementation machinery has been well established and showing good dividend. He also elaborated on the theme of the Conference: an emphasis on effective maintenance, without which the programme cannot hope to be a continuing, ongoing answer to a major national problem.

In his inaugural address, the Chief Minister drove home the vital role of the delegates attending the Conference as experts in their field and the task force of the States in implementing the much needed Village Water Supply Programme. He also pointed out that with the increasing gap between availability of water resources and their demand, the need for tapping other sources besides ground water source like recycling process, converting sea water by desalinisation may have to be thought of for the near future.

Mr A. Sankaran, Adviser, CPHEEO, recapitulated the history of development of the rural water supply programme since Independence and its chequered progress over the years to the present stage of evaluation bogged by financial constraints, the present shortfalls and future needs.

Dr John D. Skoda, Senior Programme Officer, UNICEF, spoke on the UNICEF participation in the handpump programme, and the need to project the role of the programme within the national framework of planning for rural water supply.

The Key Note Address was delivered by Mr A.K. Aranganathan, Chairman of the TWAD Board, Tamil Nadu.

Mr S. Raghavandam, Minister for Labour, Government of Tamil Nadu, mentioned the emphasis laid by his Government on this vital minimum need programme in the last two years and the increased allocations made, resulting in a more pronounced progress in the provision of safe drinking water to the rural population.

SESSION I - TUESDAY, JULY 10, 1979

Chairman: Shri R. Krishnaswamy, Chief Engineer, TWAD Board

The first session began with the presentation of proformae A, B and C by Dr John D. Skoda, Senior Programme Officer, UNICEF, New Delhi (Appendix I). The proformae are intended to act as a uniform data basis for the collection and collation of data on incorporating details of types of schemes and expenditure involved in rural water supply systems and excreta disposal installations; guidelines for an annual drilling and pump installation report; and a projection for the rural water supply programme, providing information on the area and type of coverage envisaged for scarcity and problem villages.

It is essential to obtain the information requested in proforma C for future requirements of the programme facilitating planning for the supply of materials and equipment, and to avoid gross shortages or surpluses which might otherwise disrupt the implementation of the rural water supply programme.

Mr V. Venugopalan, Deputy Adviser, CPHEEO, explained the Conference agenda and announced the setting up of a "Working Group for formulating the recommendations" comprising of Mr A. Sankaran, Adviser, CPHEEO; Dr John D. Skoda, Senior Programme Officer, UNICEF; Mr P.N. Qazi, Engineer-in-Chief, PHED, Madhya Pradesh; Mr Ramachandra Rao, Chief Engineer, Panchayati Raj Department, Andhra Pradesh; Mr Madhava Sarma, Managing Director, TWAD Board, Tamil Nadu; Mr D. Das Gupta, Superintending Engineer, PHED, West Bengal; Mr T. Ramachandran, Deputy Chief Engineer, TWAD Board, Tamil Nadu; Mr Kenneth R. McLeod, Project Officer, UNICEF, New Delhi; Mr R.L.M. Janssens, Assistant Project Officer, UNICEF, New Delhi, and Mr V. Venugopalan, Deputy Adviser, CPHEEO

STATUS PAPER ON THE NATIONAL RURAL WATER SUPPLY PROGRAMME

Mr A. Sankaran presented the Government of India status paper on the national rural water supply programme (full text of the report in Appendix II). The paper detailed the status of the rural water supply programme in India today, and the efforts and progress made in this field over the past 35 years. The report also mentioned UNICEF assistance to the programme, and the development of the India Mark-II handpump which has provided the basis for the recommended 'three-tier' maintenance system. The objective of the programme is to provide a safe and continuous source of water supply to India's rural population within the International Decade on Drinking Water Supply and Sanitation (1981-1990).

PLANNING AND MANAGEMENT OF RURAL WATER SUPPLY FACILITIES IN TAMIL NADU

Mr K. Madhava Sarma, Managing Director of the Tamil Nadu Water Supply and Drainage Board, presented a paper on the 'Planning and Management of Rural Water Supply Facilities in Tamil Nadu' (full text in Appendix III). The paper outlined the developments which had led to the need for a systematic and technical approach to the rural water supply problem in Tamil Nadu, resulting in a classification of all problem villages and habitations under six categories in descending order of priority. The per capita cost of rural water supply schemes was discussed in relation to the necessity for effective maintenance and upkeep, emphasising quality control at both the installation and maintenance stages.

OBSERVATIONS

The following points emerged from the discussions on the proceedings of Session I :

- Mobilisation of local resources for financing the rural water supply programme must be stepped up by state governments. Enormous financial inputs are required for the programme to ensure coverage of all the needy population by 1990 which is the target of the International Decade on Drinking Water Supply and Sanitation. Reliance on central government aid is no permanent answer to the problem, nor is dependence on UNICEF assistance. The role of UNICEF, it was clarified, is that of an activating agent and not solely a funding source. State governments could therefore, levy a surcharge on stamp duty, cinema tickets, court fees and other sources, thus mobilising funds which should be specifically earmarked for the rural water supply programme.

- Financial inputs into the medical care programme should be diverted to providing a safe water supply. Water-borne diseases currently account for 50 to 60 per cent of major health problems, and an emphasis should therefore be placed on preventive medical care which would prove more beneficial in the long run.

- In view of the vital role the rural water supply programme plays in the larger framework of national development, the scheme for provision of water supply to rural areas should be considered a "core" subject under Plan schemes, on par with irrigation, power and agriculture.

- Regarding piped water supply schemes, it was suggested that provision of individual house service connections, wherever possible, should be maximised and charges should be collected accordingly. This would make it possible to subsidise the maintenance of the total water supply system by respective local Panchayat bodies.

- The above potential sources for funding operations would enable the state to ensure maintenance of handpumps: sustained working, prompt repairs and consequently better credibility would eventually generate the community participation and involvement necessary for the success of the programme.

- The CPHEEO, as an organisation which should serve as a high level planning body, must be strengthened in order to meet the challanges posed by a massive programme of this magnitude. As this organisation is concerned with public health oriented rural and urban water supply and sanitation as well as solid waste disposal and connected environmental aspects, the CPHEEO status should be raised to the level of the Central Water and Power Commission, and CPHEEO should be vested with higher powers and direct authority to enable its taking effective, positive and speedy action to meet the challenge of the forthcoming water decade. The CPHEEO will be required to coordinate the greater inputs to the programme, which is already quite large and will grow in complexity over the years to come.

- The production of essential items, such as C.I./M.S./G.I. pipes, steel plates, PVC pipes and pumps barely meets the existing demand and would be totally inadequate to meet the increasing

needs of the programme. It is, therefore, suggested that the position be examined for further augmentation of production sources, pending which these materials could perhaps be made available by restricting exports of finished goods and by regulated imports.

- It was also felt that strict quality control measures have to be adopted to ensure the standard of pumps by manufacturers, to achieve which inspection teams should be set up to upgrade the standards of local manufacturers.

- The hydrogeological aspect of the programme is an important one, and has so far not been stressed sufficiently. The staff required to conduct detailed hydrogeological surveys should be appointed to the PHE Department/Water Boards, in order to reduce the percentage of failures in the drilling of borewells.

- Data collection should be given greater emphasis to ensure a realistic assessment and effective coverage of the problem. It was recommended that proforma 'C' presented at the Conference by Dr John D. Skoda, be completed and made available by all states as soon as possible.

SESSION II - TUESDAY, JULY 10, 1979

Chairman : Dr John D. Skoda, Senior Programme Officer, UNICEF

Session II featured the presentation of Status Papers on the rural water supply programme in the States of Tamil Nadu, Madhya Pradesh and Andhra Pradesh.

The Status Papers highlighted the comprehensive action programme for compilation of information on all the aspects of the programme including current assessment of the programme, available aid and future projections, and the organisational set up for project implementation, monitoring and maintenance. The papers covered provision of data on the respective phases of the handpump programme, from drilling activity to installation and maintenance of handpumps, and the source and availability of funds, data collection and reporting (Guidelines for status papers on the rural water supply programme in Appendix IV).

The status papers raised questions on the availability and procurement of materials for the programme, especially the supply of quality pumps to meet the increasing demand created by new installations and the simultaneous programme for rejuvenation of old pumps. Non-availability of materials also poses a strong threat to the targetted achievement of the programme, especially when the bore is drilled and no materials are readily available to complete the installation within a reasonable period thereafter. This long time lag results in public apathy, criticism and adverse reaction.

In this context, it was clarified that with the present drilling equipment (state-owned rigs, UNICEF rigs, contractors' rigs) available in the hard rock states, the average number of bores drilled per year cannot exceed 30,000. As the present six quality-controlled approved handpump production centres in the country could provide upto 40,000 handpumps per year for the programme, there should be no need to go in for any relaxation in the acceptance standard of India Mark-II pumps.

The success of the programme depends on strict adherence to the quality of the India Mark-II pumps, without which the maintenance structure cannot operate effectively.

OBSERVATIONS

On the basis of discussions on the status papers presented in Session II, the following points were emphasised:

- The handpump maintenance system, although differing from state to state, currently features two levels of control: the block level and the district level. In order to establish effective communication between the village and these two levels, it was felt that the village caretaker programme, which is already in operation in some areas, should be extended to all areas implementing the deepwell handpump programme. It was also recognised that the village level participation should preferably be voluntary as has been successfully attempted in several districts.

- The maintenance system also relies heavily on the actual quality of installation. The successful operation of the India Mark-II handpumps depends upon the rigid base and sub-structure provided for the pump, and to this end it was recommended that the method of installation detailed by UNICEF in the 'India Mark-II Handpump Installation Manual' be followed in all installation operations. The composition of the District Mobile Maintenance Team, which is responsible for new installations, routine maintenance and major repairs as well as rejuvenation work, should include one trained mason to ensure correct handpump installation.

- A state-wise systematic survey identifying problem villages with special reference to the source available and extent of availability should be conducted by all state governments. This data would assist planning of financial inputs, manpower augmentation and supply requirements for the rural water supply programme.

- A handpump could not be expected to serve more than an average of 250 persons efficiently. As such it was decided that provision should be made for an additional tubewell and handpump, in areas where the population served exceeds 250 persons.

- Clarification was sought as to whether the old pumps should be replaced by India Mark-II handpumps as a matter of policy, regardless of their working condition. In this context, it was recommended that old pumps should be replaced when frequent breakdowns render them beyond the point of economical repair. As the rejuvenation work must not, however, be permitted to retard the installation of new tubewells, and in view of the possibility of local scarcity of India Mark-II handpumps, the rejuvenation programme should be based on a system of priorities. For example, areas where there is only one pump and where the population depending on the handpump is a comparatively larger one, could be given priority in the replacement scheme.

- As the India Mark-II is the only handpump with a proven record of durability and sustained performance, this type is recommended for the deepwell handpump programme, and all supplies should be accepted only from approved manufacturers to ensure quality control. It was suggested that a list of approved manufacturers be prepared and provided by the CPHEEO and also its periodic updating by continuous inspection and control.

- To ensure uniform quality standards and to build up their own qualified quality control inspection teams, governments could draw upon the expertise of Crown Agent acting as Quality Control experts for UNICEF for the training of their inspection teams.

- As the handpump programme ensures water supply to rural areas under the 'minimum needs programme', coverage of which is a major governmental commitment, it was strongly recommended that the programme be provided with taxation relief, like Central Excise Central Sales Tax, Provincial Sales Tax, etc.) quota release of controlled steel and other short supply materials required, electricity tariff relief for power used, etc.

SESSION III - WEDNESDAY, JULY 11, 1979

Chairman : Dr B.B. Sundaresan, Director, NEERI, Nagpur

Further Status Papers were presented during the third session, by the governments of Orissa, West Bengal, Gujarat and Karnataka. These were also prepared according to the suggested guidelines (Appendix IV.)

MAINTENANCE EXPERIENCE OF HANDPUMPS

Following the presentation of status papers by respective state governments, special papers were presented on the 'Maintenance Experience of Handpumps' in the districts of Pudukottai, Tiruchirapalli and Madurai (synopsis of two reports in Appendix V). The papers presented studies of areas under monitoring and observation, with special reference to the maintenance structure, costing, general nature of repairs, identifying noticed areas of fault/breakages in the India Mark-II pumps under observation and suggestions for modifications and improvements to the existing pump design.

HANDPUMPS AND QUALITY CONTROL

One of the aims of the National Conference was to emphasise the need for quality control as a pre-requisite for the successful operation of the handpump programme. Mr G.B. Hale, Regional Engineer, Crown Agent, Bangalore, addressed the Conference on Handpumps and Quality Control; and the inspection procedure for the India Mark-II handpump (full text in Appendix VI).

The findings and experience of Crown Agent indicate that the India Mark-II is currently the best quality handpump available, and it would be a mistake to relax quality control in the production of these pumps. Although a great deal of emphasis has been placed on the manufacture of these pumps in accordance with ISI standards, these standards only serve to indicate the specified requirements of materials. The assembly of ISI certified products must still be passed by quality control inspectors, and to this end, Crown Agent is prepared to assist the State PHE Engineers for training and formation of state inspection teams.

Quality control inspection must be preceded by quality assurance, and it is therefore necessary to upgrade the standards of local manufacturers before they can be considered as approved and listed suppliers for the programme.

The basic requirements of quality control inspection of handpumps must provide for the quality of finish and workmanship, ensure correct dimensions and physical requirements, accuracy of the finished product all of which depends on the use of machinery, jigs and fixtures, in the production of the pumps.

When discussing the structure and performance analysis of deepwell handpumps, Mr Hale pointed out that whereas quality control is important when evaluating the life and performance of a handpump, other factors must also be taken into account. These include the yield of the water source (which should be at least 2 gpm), the quality of water, utilisation, the method of operation, and the maintenance factor.

Regarding inspection procedure, Mr Hale clarified that 10% of the pumps are selected at random off the assembly line for inspection, except in case where defects are discovered in which case the percentage is correspondingly larger. Since rejected pumps cannot be destroyed, and can still be sold inspite of rejection by quality control teams, Crown Agent suggests that rejected pumps should be properly stamped with reject seals by the inspection agents on the components and pump as would warrant.

The report on handpumps and quality control also provided information on the technical aspects of quality control, outlining the routine investigation process.

OBSERVATIONS

Quality control is one of the major aspects of the handpump programme, and the paper presented by Crown Agent helped the Conference arrive at the following conclusions:

- A systematic study of handpump operation and maintenance, and all other aspects of the programme, should be undertaken on a national basis. The related aspects under consideration should include community involvement and participation, evolving a programme which would ensure local community and leadership involvement from formulation to operation; the socio-economic status of the beneficiaries, which influences their acceptance of the programme as against reliance on unsafe water sources; a systematic study of the performance of the India Mark-II, and calculation of operational maintenance costs and the means to subsidise them; and mass health education programmes to increase public awareness of the benefits of the programme and the need to keep the handpump and its environs neat and free from waste water or stagnant water. The study of the India Mark-II is especially important as a basis for formulating guidelines for the handpump programme. Technical improvement is a continuous programme, and whereas the India Mark-II is currently the most advanced equipment available, improvements are certainly needed and envisaged in the course of time with experience gained. These can be suggested to research and developmental organisations through systematic feedback from the field, highlighting mechanical defects which can be eliminated in future models.

- Feedback on the operation and maintenance of the India Mark-II would entail the development of an efficient system of communication, which would facilitate periodic assessment and improvement on the programme.

- As the India Mark-II is currently the best pump available, state governments should ensure that it is the only one supplied for new installations.

- Quality control is the one major factor which ensures smooth and continuous working of the handpumps and their response to an efficient maintenance system. The operational performance of the handpump forms the basis for community acceptance of the programme as a whole, and to this end state governments must develop and streamline quality control inspection units. Crown Agents' functioning on behalf of UNICEF, has developed rigid standards for quality control, and states could avail of their offer to train state officers for their Quality Control Inspection teams.

SESSION IV - WEDNESDAY, JULY 11, 1979

Chairman : Mr P.N. Qazi, Engineer-in-Chief, Madhya Pradesh

The fourth session featured the presentation of special papers on the Indore Sanitation Pilot Project; Water, Health and Community Participation, the Caretaker Programme and an insight into Rural Sanitation; and the status position of the UNICEF-assisted pilot project of Tubewells and Handpumps in Jhansi District, Uttar Pradesh.

RURAL SANITATION PILOT PROJECT: INDORE, MADHYA PRADESH

The special paper on the rural sanitation pilot project being initiated in Indore district was presented by Mr V.K. Jain, Superintending Engineer (PHED), Indore (synopsis of special paper in Appendix VII).

The programme may be viewed as a prototype with potential for introducing the concept of environmental sanitation as an integral part of rural water supply programmes. The Indore project provides a systematic, well-planned approach to the problem of rural sanitation, comprising of four components which cover improvement of individual standards of hygiene, general village sanitation, and improvement of rural health standards through promotional health education programmes.

Currently a pilot scheme, the project will carefully be reviewed, monitored and evaluated for its performance and replicability. If successful, it will provide a model for adaptation in other areas where the existence of safe water sources provide a foundation for sanitation programmes.

WATER, HEALTH AND COMMUNITY PARTICIPATION

Dr E. Victor, District Health Officer of Tirunelveli District, Tamil Nadu, discussed the inter-relation between health and water and the methods of developing community participation in health education programmes(synopsis of special paper in Appendix VIII).

The paper clarified reasons for non-acceptance of the programme in areas where health education has not influenced community attitudes, and suggested methods for overcoming such resistance.

THE THREE-TIER MAINTENANCE SYSTEM: ITS IMPLEMENTATION AND ACCOMPLISHMENTS IN TIRUNELVELI DISTRICT, TAMIL NADU

Mr M. Francis, UNICEF Project Coordinator for the Rural Water Supply Study Project in Tamil Nadu, presented an outline of the three-tier maintenance system implemented in Tirunelveli district and its effectiveness as a catalyst for community participation and the introduction of health education programmes (full text of special paper in Appendix IX).

Mr Francis emphasised the role of monitoring and reporting, and the need for regular communication at all levels of the programme. The selection and training of personnel, especially the village-level caretaker, is an essential aspect requiring a careful and well-planned approach.

UNICEF-ASSISTED PROJECT ON TUBEWELLS AND HANDPUMPS IN JHANSI DISTRICT, UTTAR PRADESH

Mr Virendra Kumar, Superintending Engineer, U.P. Jal Nigam, Jhansi, provided the Conference with details on the UNICEF-assisted project in Jhansi, as well as a brief background on water supply schemes in Uttar Pradesh. The Jhansi project has so far completed the drilling of 80 successful bores, and 20 more are planned for Banda district.

The handpump programme was started on a small scale in Uttar Pradesh, as an alternative supply source for areas where it was difficult to maintain river schemes due to breakdown of power. Disruption of water supply led to the breakdown of supply lines, and thus the alternative of handpump water supply appears to be quite satisfactory.

APPOINTMENT OF SUB-COMMITTEE ON COMPARATIVE MAINTENANCE COSTING

Towards the end of the fourth session, a sub-committee was appointed to prepare a study paper laying down the parameters and norms (both physical and financial) to be considered when assessing the cost maintenance of handpumps. The costing would take into account the expenditure incurred on the ongoing programme as well on the rejuvenation operations. The members appointed to the sub-committee were: Mr Kenneth R. McLeod, Project Officer, UNICEF; Mr M. Subramaniam, Executive Engineer, TWAD Board; Mr K. Muthuswamy, Executive Engineer, TWAD Board; Mr M.A. Sattar Baig, Executive Engineer, Panchayati Raj, Andhra Pradesh; Mr V.K. Jain, Superintending Engineer, PHED, Madhya Pradesh; Mr T. Kanagarajan, Assistant Project Officer, UNICEF, Hyderabad; Mr B.B. Panda, Executive Engineer, PHED, Orissa; and Mr D. Das Gupta, Superintending Engineer, PHE Directorate, West Bengal.

OBSERVATIONS

Following the presentation of special papers, the discussions led to the following conclusions:

- The pilot project on comprehensive rural sanitation proposed to be started in certain villages in Indore district, Madhya Pradesh, could act as a format for replication of such schemes on a nationwide basis during the International Decade on Drinking Water Supply and Sanitation. The Decade will also focus special attention on environmental sanitation and the problem of waste water disposal, and the findings of the Indore Pilot Project area are expected to form the basis for future programmes on rural sanitation.

- The selection of the pump caretaker is an important process, and his job responsibilities should be carefully delineated. His duties should be largely restricted to communication with the block and district levels in the event of breakdown of handpump water supply.

FIELD TRIP/THURSDAY, JULY 12, 1979

Field visits were arranged on the third day of the Conference, to enable delegates to study the Caretaker Training Programme as in operation at Tirunagar (Madurai District), the Caretaker Refresher Training Course at Virudhunagar (Ramanathapuram District), and the handpump installations near Tirunagar.

Members were given the opportunity to gain first-hand impressions on the caretaker programme by observing the various phases in operation; they were also able to meet the trainees and exchange ideas with them on specific aspects of the programme including scope of training, motivation and incentives.

The most obvious feature of the caretaker programme in operation was the tangible impression of community participation. The trainee caretakers evinced a tremendous sense of pride and responsibility in their work and seemed well equipped to guide the villagers towards safe utilisation of the water sources.

The credibility of the handpump programme depends upon the extent of community acceptance, and to this end the caretaker plays a vital role as the "motivating factor" which calls for a sense of confidence, interest in the task and conviction of the cause.

GROUP DISCUSSION ON THE MAINTENANCE SYSTEM AS OBSERVED DURING THE FIELD TRIP

A group discussion was held on the maintenance system as observed in Tirunelveli District and an assessment was made of its replicability in all states currently implementing the handpump programme.

During the course of this discussion, the point was made that an effective maintenance system is essential for all areas depending on outmoded equipment for a safe water supply, which should cover the village level, the block level and the district level.

The rejuvenation aspect of the programme also requires as much emphasis as the provision of new installations. In areas where the installations comprise of new as well as old pumps, replacements should be made simultaneously.

Planning plays an important role in this process, as programme requirement projections ensure a continuous supply of equipment and material for the programme.

Operational maintenance costs can only be recovered from the rural community once credibility of the system has been established. The handpump programme therefore relies heavily on the quality of the pumps installed which, on the basis of their performance, should overcome the initial community scepticism.

The role of the State-level Project Coordinator was also discussed, and it was felt that such an appointment is essential. Selection of such personnel requires careful attention in view of the extensive operations the project coordinator is required to initiate and coordinate, including training programmes for District Mobile Maintenance Teams, mechanics, drillers, etc.

OBSERVATIONS

The group discussion on the Tirunelveli maintenance system helped to clarify the structural framework involved in maintenance. As an effective maintenance structure also relies to a large extent on the credibility of the programme, the following suggestions were made with a view to improving the public image of the handpump programme:

- The handpump programme requires publicity in order to establish and further credibility within the community. The achievements of the programme should be publicised, and to this end it was suggested that all state engineering departments recruit Public Relations Officers to project the benefits of the handpump programme.

- There should be an insistence on technical integrity to ensure a hundred per cent success. Even one failure in an area can prove detrimental for the image of the programme, and a special attempt must be made to eliminate those failures which are a result of technical personnel being forced into making wrong decisions by political and administrative forces.

- It is, therefore, necessary to achieve close coordination between administrative and technical personnel for an effective, efficient functioning of the programme. Efforts should be made to coordinate the working of personnel at both levels, clearly outlining job responsibilities and areas of operation.

VALEDICTORY SESSION - FRIDAY, JULY 13, 1979

Chairman : Mr K. Madhava Sarma, Managing Director, TWAD Board

The concluding session of the National Conference on Deepwell Handpumps featured an introduction to the "Dossier on the Handpump Programme"; presentation of the results of a handpump survey conducted by UNICEF; explanation of an organogram detailing the organisational structure of the three-tier maintenance system; the findings of the working group on operational maintenance costs; and, finally, the resolutions and recommendations arrived at by the Conference over its three-day discussions and deliberations.

DOSSIER ON THE HANDPUMP PROGRAMME

Mr Raymond L.M. Janssens, Assistant Project Officer, UNICEF, New Delhi, provided the delegates with background information on the "Handpump Dossier" prepared by him, and explained its relevance to the programme currently under implementation (Introduction to the Dossier and Dossier contents in Appendix X).

SURVEY ON HANDPUMP OPERATION AND MAINTENANCE

Mr Raymond L.M. Janssens, Assistant Project Officer, UNICEF, New Delhi, presented the results of a survey on handpump operation and maintenance (survey results in Appendix XI), which was conducted in 17 districts of six deepwell handpump programme states.

The major points which emerged from the presentation of the survey results were:

1. There is a distinct co-relation between the quality of platform construction/materials used and the frequency of breakdowns.

2. The cost of maintenance of handpumps, incurred on spare parts, is Rs.35.20 per pump per year on an average.

ORGANOGRAM ON THE STRUCTURE OF THE THREE-TIER MAINTENANCE SYSTEM

After presenting the results of the survey, Mr Janssens explained an organogram (reproduced in Appendix XII), showing the action and operation of the District Mobile Maintenance Teams engaged in the Handpump Rejuvenation and Maintenance Programme, and the organisation of the caretaker programme: the requirements thereof, and the persons involved in the implementation process of the programme.

The organogram outlines communication and coordination problems which clearly indicate the need for a state Project Coordinator who would coordinate and streamline the implementation and functioning of the Handpump Rejuvenation and Maintenance Programme as well as the handpump Caretaker Training Programme.

FINDINGS OF THE SUB-COMMITTEE ON COMPARATIVE MAINTENANCE COSTING

The report of the sub-committee constituted to study the norms for maintenance costing of handpumps was presented to the Conference by Mr Kenneth R. McLeod, Project Officer, UNICEF, New Delhi, in the concluding session (full text of the report in Appendix XIII).

The sub-committee studied the cost of supporting a viable maintenance structure to service the India Mark-II installation for a period of three years, ensuring at the same time a constant supply of potable water to the villages.

Present cost factors indicate that the average India Mark-II handpump, properly installed and supported by the three-tier maintenance system, can be fully covered at a rate ranging from Rs.150 to Rs.200 per pump per year. However, the sub-committee accepted Rs.300 as a realistic figure; allowing for all contingencies projected over a three-year period, an extra margin was allowed, arriving at a final figure of Rs.320 per pump per year. It was indicated that the maintenance costing has been based on a properly constructed handpump with quality materials and fitted with India Mark-II pump and assisted by the three-tier maintenance system and cannot cover sub-standard systems and installations.

In conclusion, therefore, it is obvious that standardisation of the India Mark-II handpump must continue on a priority basis to avoid uneconomical maintenance costing. The rejuvenation programme, as defined in each state's 'Plan of Action', must be executed as soon as possible.

RECOMMENDATIONS AND RESOLUTIONS

The session concluded with the presentation of the recommendations and resolutions made by the National Conference on Deepwell Handpumps (full text of resolutions and recommendations on page 17).

The Conference recommendations provide priorities and guidelines for the handpump rejuvenation and maintenance programme, and will serve as a basis for future amendments of state policy on rural water supply. The resolutions call for a realistic assessment of the programme, identifying the problems encountered in implementation and the means to ensure effective and widespread coverage of problem villages and scarcity areas within the International Decade on Drinking Water Supply and Sanitation. The findings of the Conference will enable state governments to develop means for the mobilisation of resources and materials essential to the programme, while simultaneously streamlining existing operational and implementation structures.

The recommendations presented by the Conference highlighted the need for emphasis on three major factors governing the programme: quality control, standardisation and rejuvenation of handpump installations, and the placement of a viable maintenance structure. Strict control measures should apply to the quality of handpumps and related materials used for the installations, as well as to periodic checking of the chemical and bacteriological content of the water from the sources.

As the effectiveness of the maintenance system ensures the life and performance of the handpump, and also influences operational maintenance costs, the Conference resolved that each state should implement the quality control and maintenance systems as per Resolutions adopted.

CLOSING SESSION - FRIDAY, JULY 13, 1979

The closing session was prefaced by a general summing up of the proceedings, resolutions and recommendations of the National Conference by Mr A. Sankaran, who spoke on behalf of the Central Government, and Dr John D. Skoda, UNICEF.

The Conference concluded with a valedictory address by Thiru Muthu, Worshipful Mayor of the city of Madurai. The Mayor expressed the hope that the findings of the Conference would have far-reaching effects, benefitting the thousands of problem villages and scarcity areas under coverage by the handpump programme.

Mr V. Venugopalan proposed a vote of thanks to the organisers, participants, speakers and all those involved in the three-day discussions and deliberations, thus bringing the National Conference on Deepwell Handpumps to a close.

RECOMMENDATIONS AND RESOLUTIONS OF THE NATIONAL CONFERENCE ON DEEPWELL HANDPUMPS

RECOMMENDATIONS/RESOLUTIONS OF THE NATIONAL CONFERENCE ON DEEPWELL HANDPUMPS

1. It is resolved that providing potable water supply to all the inhabitants of India before the end of 1990 must be declared as one of the primary goals of the Central and State Governments in India, as already resolved by the United Nations and its member nations. This goal should not be downgraded at any time for financial reasons and should be taken as a "core" subject under Plan Schemes on par with irrigation, power and agriculture. The resources required for this programme (about Rs.7,000 crores) should be made available by the Governments through further tax measures, if necessary.

2. The data regarding the status of Rural Water Supply in various States needs to be updated by a methodical survey. This survey should be completed as quickly as possible to identify the problem fully, adopting the Proforma - C appended. The data for the balance one lakh problem villages should be furnished by October, 1979.

3. For achieving the goal in the International Decade on Drinking Water Supply and Sanitation, the CPHEEO - Ministry of Works & Housing, Government of India, which is the apex organisation for water supply in India, shall be strengthened to fulfil its role as a high level planning body. It should be organized independently on the lines of the Central Water and Power Commission with adequate resources and vested with adequate powers.

4. The Public Health Engineering Organisation in the States should be strengthened with proper technical personnel like hydrogeologists, and other necessary personnel in order to achieve the goals of the International Decade on Drinking Water Supply and Sanitation.

5. The success of the programme depends very much on the facilities available for analysis of water. Each state must, therefore, establish laboratory facilities adequate for chemical and bacteriological analysis of water samples of all the villages periodically, preferably at the district level. Research and development facilities must be created in each state.

6. The training facilities now available must be continued and expanded to meet the training needs at all levels.

7. The Chief Engineers of the Public Health Engineering Organisations and Rural Water Supply Schemes should be made Ex-Officio Additional Secretaries in the relevant department of the Secretariat, in order to obtain quick sanctions for the schemes and to expedite execution of this massive programme. Where Boards are functioning, the Chief Engineers must be made members of the Board.

8. To fulfil this programme, continuous and uninterrupted flow of materials like pipes, steel plates, pumps etc., is essential. Even with the present programme, sizeable shortfalls are noticed between supply and demand and such shortfalls are likely to increase in future. This matter should be thoroughly examined by the Government of India and sufficient flow of materials should be arranged by regulated imports of raw materials and/or finished products and by restrictions on exports, if necessary.

9. It is recommended that the State Governments should take over the maintenance of handpumps and piped water supply, and meet the entire cost of such maintenance. In case of piped water supply schemes, an attempt should be made to obtain revenue from the schemes by providing individual house service connections wherever possible.

10. It is further resolved that considering the fact that "deep tube well handpump" water supply schemes are serving the economically and socially weaker sections, Governments - both Central and State - should extend taxation relief like exemption from Central/State Sales-tax, Excise duty etc., to handpump manufacturers, and also release M.S. steel plates required in the manufacture under Quota.

11. It is further resolved that electricity tariff relief should also be extended for water supply schemes.

12. The Deep Well Handpump is a suitable solution for providing protected and perennial water to smaller villages in most regions; the India Mark-II handpump under adoption, made to I.S.I. specifications, offers the best available design now for the Deep Well Handpump. It is recognized that further improvements in the India Mark-II Pump are possible. A continuous study towards evolving such improvements may be made by all the connected agencies, i.e. State Governments, C.S.I.R., CPHEEO etc.

13. The installation of these handpumps on the lines indicated in the India Mark-II Installation Manual, is commended for adoption by all the States. A rigid base with a concrete sub-structure is essential for the longevity of the pump. The installation team working under the supervision of a Junior Engineer should include a trained mason in addition to one driver, one mechanic and two helpers.

14. Quality control in the procurement of handpumps is essential. There should be two stages in ensuring quality control:

    (i) Pre-qualification of suppliers to ensure that they have the necessary machinery, metallurgical expertise, jigs and quality control procedures so that they are capable of turning out quality pumps in the required time.

    (ii) Selection of a supplier, out of the pre-qualified listed suppliers, after the normal tender procedures and ensuring, by pre-delivery inspection, that the supplier, in fact, delivers quality handpumps.

15. **It is resolved that the CPHEEO may undertake the pre-qualification of suppliers with the recommendation of the Chief Engineers of the States and prepare a list of qualified suppliers after giving adequate opportunity** to Small Scale Industries to enrol themselves. This list can be continuously updated by enrolling qualified new entrants after scrutiny. Regarding stage two, it is resolved that all States must evolve quality control procedures and train their personnel in this respect. The States may, if need be, avail of the services of the UNICEF and their quality control agency in the training of their quality control and inspection wing personnel.

16. The CPHEEO may arrange to get rate contract for handpumps and their spare parts finalised.

17. There are frequent breakdowns in deep well handpumps at present, partly because they are over worked by the large number of people who depend on them for their water supply. It is recommended that not more than 250 persons should be catered to by one handpump, and each location where the population exceeds 250 persons should be necessarily provided with an extra source supply.

18. The earlier types of Deep Well handpumps, because of their less sophisticated design, tend to breakdown frequently. It is recommended that these older types of handpumps may be replaced by India Mark-II handpumps as quickly as possible, consistent with the availability of quality handpumps and their requirement in the new Deep Well Programme. In this replacement programme, priority should be given to pumps which break down frequently and pumps which supply larger villages.

19. It is resolved that there should be adequate technical personnel at the Block and District levels to undertake maintenance of handpumps. The communication time lag between the villager and the technical repair personnel, should be kept to a minimum, if the maintenance is to be effective. One of the ways of bridging this gap is through adoption of the "Caretaker Programme" as obtaining in Tamil Nadu. All States should provide such means of communication adopting the Tamil Nadu pattern or any other pattern as considered feasible in their States. The personnel used for such communication need training in all aspects of the handpump failure reporting if they are to be of real help. It is resolved that such training may be started in all States with the assistance of UNICEF. While the communication link between the village and the officials should be preferably voluntary, provision of an incentive may be considered wherever found necessary.

20. The persons to be utilised as the communication link between the village and the officials should be selected carefully. They should be users of the handpump water and should preferably live near the handpump. It is resolved that their duties be basically restricted to the role of supervision of the handpump working and breakdown reporting instead of using them for several other purposes, however laudable they may be.

21. There must be a proper monitoring system to enable a good feedback on all aspects of the handpump functioning and its maintenance, i.e., time lag between failure reporting and repairs, periodicity of routine inspection, daily use hours etc., for the purpose of the evaluation of the design and the manufacture of the handpump, defects in the system, etc.

22. It is resolved that to achieve uninterrupted monitoring and feedback on urban/rural water supply schemes and the physical performance of deep well handpumps at the level of the Chief Engineer, a suitable monitoring cell preferably headed by an Executive Engineer, at least, is created under each Chief Engineer immediately. This monitoring cell would also ensure coordination and feedback on training programme for technicians, mechanics, drillers,etc.

23. A beginning should now be made to also tackle the closely linked sanitation problem in villages, instead of postponing it further. Sullage disposal and disposal of human and other wastes is essential if the potable water supply programmes are to help in improving the health of villagers. A massive health education programme to improve the knowledge and change the health attitudes of the villagers in this respect, along with necessary programmes for construction of waste disposal facilities by the Government and the provision of materials necessary for construction of private sanitary facilities, is an urgent need at present.

Programmes such as the Indore project under evolution in this respect should be initiated in all States.

24. It is resolved that the post of a State level full time Project Coordinator at the level of a Superintending Engineer also be created immediately to ensure effective coordination of the activities of district level coordinators dealing with all aspects of the tubewell handpump caretaking, sanitation, mass education programme and training of mechanics, mobile teams and drilling teams. In respect of the handpump rejuvenation and maintenance programme, conditions laid down in the Plan of Action shall be adhered to.

25. It is resolved that the manuscript report of the Conference sub-committee on "operational maintenance costing" of existing deep well handpumps including India Mark-II, read out by the Chairman of the sub-committee, should be generally adopted and circulated to all States/delegates for guidance.

A P P E N D I C E S

PROFORMA A

PART I

RURAL WATER SUPPLY SYSTEMS

		Completed Installations in 19__ (last year)						Estimate for 19__, (current year)						Expectation for 19__ (next year)					
		I		II		III		I		II		III		I		II		III	
		S	P	S	P	S	P	S	P	S	P	S	P	S	P	S	P	S	P
Newly Constructed Schemes																			
Schemes Abandoned or Defunct																			
Total Expenditure in crores of Rupees	State Budget																		
	Central and External Assistance																		
	Total																		

I. Handpump Tubewells
II. Power Pump Installations with taps close to wells
III. Piped and reticulated systems

S = No. of Systems
P = Population Affected

APPENDIX I

PROFORMA A

APPENDIX I

PART II

EXCRETA DISPOSAL INSTALLATIONS

		Completed Installations in 19 __ (last year)		Estimate for 19 ___ (current year)		Expectation for 19 __ (next year)	
		S	P	S	P	S	P
New Installations							
Abandoned							
Total Expenditure in crores of Rupees	State Budget						
	Central and External Assistance						
	Total						

S = No. of Systems
P = Population Affected

APPENDIX I

PROFORMA B

ANNUAL DRILLING AND PUMP INSTALLATION REPORT FOR 19 ___.

	Rig Type	No. of rigs*	Total rig travel (Kilo-meters)	Total hours of opera-tion per rig (hrs.)	Total no. of bores drill-ed	Percen-tage of bores succe-ssful (%)	Ave. depth of success-ful bores (metres)	Ave. yield of success-ful bores (litres per hr.)	No. of hand pumps installed (India Mark II)**	No. of power pumps installed
Departmental rigs	Cable Tool									
	Mud Rotary									
	Air hammer 4"									
	Air hammer 6"									
	Other ____									
Contracted rigs	Cable Tool									
	Mud Rotary									
	Air hammer 4"									
	Air hammer 6"									
	Other ____									
Combined Totals										

*Defunct or idle rigs are not to be included above; however they were ___ (number) such ____ type lying with the department during this year.

**If handpumps other than India Mark-II, indicate ____ (number) and ____ (type).

PROFORMA C

FUTURE RURAL WATER SUPPLY PROGRAMME
(Prepared 19)

Type of Water Supply Planned		No. of villages to be supplied			Population to be benefitted			No. of villages where chemical quality of water is poor due to				No. of villages where bacteriological treatment such as filtration and/or chlorination is required
		I	II	III	I	II	III	Iron	Salt	Fluoride	Other	
Deep Tube wells	Hard Rock											
	Hard Rock with heavy overburden											
	Alluvium											
	Boulder Formation											
Shallow Ground Water	Tubewell in Alluvium											
	Infiltration Galleries											
	Other											
Protected Spring												
Surface Water												
Rain Catchment												
Other												
	Sub Totals											
	Total											

I. Handpump Tubewells
II. Power Pump Installations with taps close to wells
III. Piped and Reticulated Systems

APPENDIX II

STATUS PAPER ON THE NATIONAL RURAL WATER SUPPLY PROGRAMME

PAPER PRESENTED BY:

A. SANKARAN, ADVISER (PHEE)
MINISTRY OF WORKS & HOUSING
NEW DELHI

Introduction

The provision of safe and continuous water supply is the single most important and cost effective activity that can be undertaken to improve the health of the population. With the concern of Government for improving the life of the people in rural areas, concerted efforts are being made to provide a safe and potable water supply.

India is predominantly rural in character. According to the Census Report of 1971, the country has a rural population of 438.58 million, distributed over 5,75,855 villages. The rural population constituted approximately 80% of the total population of the country, at that time.

Government assessment of the problem

An awareness of the need to ensure adequate and wholesome water supply had prompted the Government of India to appoint a Committee known as the "BHORE" Committee in 1944. The Committee made a number of recommendations and suggested that the target should be to provide safe water supply for drinking purposes to the entire population within a period of 35 years.

This was followed by the Environmental Hygiene Committee in 1949, which recommended the provision of water supply and sanitation facilities to 90% of the population within a period of 40 years. It also suggested the formation of a Public Health Engineering Service.

The National Water Supply & Sanitation Committee (1960-61) assessed the magnitude of the existing water supply problems in the country and suggested significant procedural, organisational and financial reforms.

The Drinking Water Board set up in 1963, and which ceased to function after submitting its report, recommended the highest priority be given to the provision of water supply in difficult and scarcity areas, and recommended the completion of this activity within a maximum period of 5 years.

In 1962, the Union Ministry of Health undertook an assessment of the rural water supply problems to have the right perspective for launching a programme to meet the needs of the scarcity areas on a priority basis. The preliminary report on the entire country was available in 1964-65. However, the survey was completed only in 1972. The survey categorised the problem villages as under:

i) Villages where water is not available within a depth of 50 feet or within a distance of one mile (1.6 Km).

ii) Villages which are endemic to cholera.

iii) Villages with problem of guinea-worm infestation.

iv) Villages where water is unsafe due to the presence of excessive chloride, fluoride or iron.

This survey identified a total of 1.53 lakh villages as problem and scarcity villages.

From the above, it may be noted that comprehensive planning and large scale financial allocations were necessary for the vigorous implementation of water supply and sanitation programmes. Although the recommendations of the Committees could not be implemented in full, their views had a significant bearing in framing a policy with regard to water supply and sanitation programmes at a later stage.

The rural water supply situation and the progress made

The development of rural water supply schemes under the different programmes did not show particular progress because of financial limitations. It was estimated that only about 14,000 villages were provided with piped water supply until 1969, when the Fourth Plan period commenced.

The emphasis on the rural water supply programme underwent a radical change with the commencement of the Fourth Plan (1969-74). On the basis of the survey report in 1972, indicating that the problem villages would be about 1.53 lakh villages, rural water supply was taken to be one of the components of the 'Minimum Needs' (MNP) in the Fifth Plan. During the Fifth Plan (1974-79), attempts were made to provide safe water supply to the problem villages identified by this report.

Due to financial constraints, a policy decision was taken to adopt austere standards, by providing the cheapest mode of water supply to meet the minimum needs to the optimum population in the difficult villages and emphasis was laid on tapping local ground water sources. Piped water supply schemes were adopted only if a less expensive system, such as a handpump supply, was not feasible.

Upto 31.3.1977, about 40,000 villages in the problem and scarcity villages were covered leaving a balance of 1.13 lakh villages.

The Government of India launched an Accelerated Rural Water Supply Programme as a Centrally sponsored programme during 1977-78 with a view to cover all the problem villages (as identified in the 1972 survey) by 1981-82. This programme envisages the sanctioning of 100 per cent grant-in-aid to the States, for providing potable water supply to these problem villages.

The Government of India is also committed to implementing the resolution adopted at the United Nations Habitat Conference (1976) and the United Nations Water Resources Conference (March 1977) to the effect that as far as possible all human settlements in the country will be provided with safe drinking water supply by the year 1990.

The Accelerated Rural Water Supply Programme (ARP) was initiated as a catalyst, and to assist the State Governments to make a concerted effort to cover all the problem villages as early as possible, preferably before 1981-82.

With an assistance of Rs.40 crores under ARP supplementing funds of Rs.82 crores allocated under the MNP, a coverage of about 12,871 villages was achieved in 1977-78, thus leaving about 1 lakh problem villages to be tackled at the beginning of 1978-79.

During 1978-79, funds amounting to Rs.174 crores (Rs.60 crores under ARP and Rs.114 crores under MNP) were provided and about 30,400 villages were covered. This leaves a balance of about 69,600 problem villages and with an allocation of Rs.230 crores (Rs.80 crores under ARP and Rs.150 crores under MNP) during 1979-80, it is anticipated that about 33,000 villages will be covered during 1979-80.

It is anticipated that with increased allocations the remaining problem villages will be covered by 1981-82.

A sum of about Rs.650 crores approximately was spent on rural water supply programmes during the years 1951-79. As per the projections made by the State Governments, a sum of Rs.7,000 crores will be required during the years 1980-90 to provide complete coverage to all villages, problem and non-problem, with a safe and protected water supply.

Development of ground water sources and UNICEF assistance

Rural water supply schemes are presently primarily concentrated in scarcity areas, and a large number of such areas are in the rocky areas of the country. Consolidated formations are prevalent in the major part of the country, including almost the entire Indian peninsula which consists of hard rock formations. The exploitation of ground water for drinking purposes had not made much progress in such areas.

The successful use of 11 rigs procured through UNICEF under an emergency programme to provide water supply in the drought affected areas of U.P. and Bihar during 1967-68 and their continued effective use in the drought affected areas of Andhra Pradesh and Bihar led to schemes involving the use of drilling rigs and the utilisation of ground water for the rural water supply programme in a big way.

The assistance from UNICEF continued during the Fourth and Fifth Plan periods with emphasis on the supply of drilling rigs, spare parts, accessories, etc. to assist the State Governments in exploiting the ground water. UNICEF has so far supplied 133 rigs (128 hard rock rigs as well as 5 special type rigs). To keep all these rigs in operation, all spare parts and accessories are also being supplied by UNICEF.

The successful utilisation of these rigs has prompted some of the States to go in for rigs both imported as well as indigenous from their regular funds. They are also supplementing state purchased rigs with those already supplied by UNICEF. A few states have made good progress in providing safe sources of water in many of the problem villages. It is estimated that about 40,000 bores have been made by the rigs supplied through UNICEF. This benefits approximately 25,000 villages.

Development of dependable handpumps

Though much headway has been made in the field of drilling and providing safe sources of water supply, the ultimate aim of utilising this source and providing a continuous supply of safe drinking water to the community highlights the need for a sturdy and dependable handpump and also its proper maintenance. The handpumps that were available were mostly designed for individual use. The need was for a handpump suitable for community use. With the cooperation of W.H.O., UNICEF, CSIR and the State Governments, a deepwell handpump has been

designed and is presently being used in the programme. One portion of the pump, namely the pump head has been fairly well developed and though this design has been in use for the last 1-2 years, it is still too early to evaluate the dependability and sturdiness of the same in the long run. With the limited experience and information available to us so far the performance is reported to be encouraging.

The other important portion of the pump, the cylinder with foot valves etc., is being tested with different material combinations in field conditions and an acceptable design to suit the variegated field conditions will help in producing the final design of a dependable handpump.

An Indian Standards specification is also being brought out for the deepweel handpump.

Maintenance of Handpumps

Apart from dependability of the handpump, the problem of its proper maintenance is also of equal importance. Here again, with the assistance of UNICEF, and experience gained in the field a maintenance programme known as the "3-tier system" is being advocated. Under this system, the maintenance of all the handpumps will be under the unified control of the agency which is responsible for the drilling operation i.e. either the Public Health Engineering Department or the Ground Water Development Agency. The general establishment suggested for the maintenance set-up under this agency is a 3-tier system with:

a. A Village level caretaker responsible for keeping the installation free and reporting failures.

b. A Block level mechanic with some tools to enable him to attend to repairs in the top head mechanism.

c. A District based mobile 4-men maintenance team (consisting of a Junior Engineer, a Senior Mechanic, a repair-cum-driver and a fitter) under the direct control of an Executive Engineer equipped with a diesel vehicle and tools to enable the unit to carry out installations and repairs either above or below the ground.

For this Maintenance Programme, UNICEF is extending assistance in the form of diesel vehicles for the mobile maintenance team, handpumps, tools and repair kits for installation, repairs, etc. of the handpump. The State Governments are to prepare suitable programmes for this assistance indicating their commitments regarding the maintenance set-up under one unified agency.

Based on the satisfactory results so far obtained, this system for the maintenance of handpumps is being recommended to all the State Governments. The response to this set-up is satisfactory and many States have already established their own three-tier set-up.

The participation of villagers and their involvement in the improvement of their own water supply and sanitation will help substantially to plan and provide an acceptable system to the villages. The involvement of the villager as the caretaker in the 3-tier system in the maintenance of their handpump, needs detailed study which will help in suggesting suitable alternatives, if need be.

Water Quality

Tapping ground water sources at a depth of around 24 metres should in most cases assure a bacteriological and biological contamination free supply. However, periodic sampling and testing of water from this source should be carried out to ascertain bacteriological quality, particularly during heavy floods, inundations and outbreaks of epidemics. A pilot study has been initiated in one of the States under the Handpump Programme and the results from this study will help in initiating a proper course of action for utilisation of water testing methods in other areas.

Assessment of UNICEF-assisted Programme

An Evaluation Team was set up by the Government of India to study the UNICEF-assisted Rural Water Supply Programme in 1976. This was followed by a Rural Drinking Water Supply Mission sponsored by UNICEF in collaboration with CPHEEO and WHO in 1979. The report of the above two study teams analyses the progress of the programme for supplying drinking water in rural areas with special emphasis on the drinking programme. Apart from other observations the following points were also made:

a. Introduction of appropriate technology that can be maintained by low income communities such as the development of handpumps etc.

b. Encouragement of community participation and information regarding usage of facilities.

c. Training of manpower.

d. Surveillance of water supply provided, including water quality.

CONCLUSION

All member countries of the United Nations have resolved to provide safe, assured and a potable water supply to their population in the International Decade on Water Supply and Sanitation between 1981-1990 and to achieve this a concerted pre-execution planning and evaluation is being done with the collaboration of agencies like the UNIDO, WHO, UNDP, UNICEF. The greatest constraint in achieving this goal will be - so far as India is concerned - the extreme limitation on financial resources. As a result, there is a need to optimise the investment to achieve the maximum result, extending a safe water supply to the most needy, and also to ensure a methodology by which the assets created are maintained fully, and preferably with the active cooperation and participation of the beneficiaries. Attempts to achieve this goal would require examination of systems for the generation of resources, execution of the schemes with the maximum technical perfection, and involvement of the local population in the maintenance of the assets like handpumps, distribution system etc. The deliberations of this Conference attended by senior technical officers and administrators will be able to arrive at positive recommendations in regard to the above aspects, so that India is able to play its part in the International Decade on Water Supply and Sanitation fully and wholly.

APPENDIX III

PLANNING AND MANAGEMENT OF RURAL WATER SUPPLY FACILITIES IN TAMIL NADU

PAPER PRESENTED BY:

K. MADHAVA SARMA,
MANAGING DIRECTOR,
TAMIL NADU WATER SUPPLY
& DRAINAGE BOARD

The provision of water supply to the rural areas, which constitutes about 80% of the area, has acquired importance recently. Even earlier some investments were made in the sector but the technical knowhow, necessary for provision of water supply and available in India, was not fully applied to this sector. While designing water supply schemes for cities and towns, the water needs for human, commercial and industrial consumption are taken into account both for the present and for the future. Sources are selected which will yield the needed quantity of water reliably throughout the year. The water was tested for quality and necessary treatment given to make it conform to international standards. The water transmission systems are designed carefully and the distribution system designed to supply water to all parts of the town at specified pressure. This kind of technical approach has not been systematically applied to rural water supply schemes previously.

It was considered adequate to provide a well in a village to solve the problem. In several cases the water from these wells was not potable and suffered from defects like brackishness, excess flourides and excess iron. The wells also used to dry up during drought seasons and in summer. Having provided these wells the departments were satisfied and the villages were taken as part of their statistics of having provided water supply. Whenever a severe summer or a failure of rain occurred these villages suffered from water scarcity and drought relief measures were taken by the Government to supply drinking water to these villages at a huge cost. Several crores of rupees were spent in this manner every year. Such ill-planned expenditure in a short time again resulted in schemes giving only temporary benefits.

This neglect of rural areas and potential waste of resources has been reversed in Tamil Nadu by the Government by opting for a systematic and technical approach to the problem. A systematic survey of all the habitations in Tamil Nadu, with a view to categorising them in the order of priority on the basis of the quality of their source of water supply, has first been taken up. There has been some confusion created by taking a village as a unit for provision of water supply. The revenue villages have been evolved by the British administration from the point of view of land revenue and may have several hamlets. The Panchayats in Tamil Nadu, usually maintain the water supply systems and are relevant as a unit in the context of provision of water supply. Within a Panchayat there may be several habitations i.e., clusters of houses separated from each other. When the objective is providing water supply at the nearest point possible for all the citizens of these villages, the concept of habitation acquires importance and has been made the basic unit in Tamil Nadu. A habitation is defined as a cluster of houses having a minimum population of 100 and away from the neighbouring cluster by more than 250 metres. Clusters of houses not satisfying these two conditions are merged with the nearest habitation. The habitations are enumerated as parts of each Panchayat which are again

parts of Panchayat Unions(Blocks) which are located in Districts. Each of these units are given code numbers. The Gramsevaks of the blocks, numbering about 5,000 are given questionnaires regarding the sources of drinking water for the habitations and they have answered the questionnaires after visiting each habitation and conducting enquiries. These questionnaires are then fed into a computer and habitations classified according to the quality of its source. The sources have been judged according to the potability of their water, protection offered against pollution and perenniality.

Based on the characteristics of the sources, the habitations have been categorised into six categories in the order of priority. It is the primary objective of the Government to provide good sources to all the habitations which are at present depending on defective sources. As regards norms for the facilities to be provided in the distribution of water, it is recognised that a detailed distribution system in the villages, as in the towns, is a luxury which cannot be afforded at present. Only a public distribution system of water supply is contemplated for these habitations. Depending on the population of the habitation, and on geological considerations, protected open wells or deepbore wells with a handpump or a power pump with an overhead tank will be provided. The planning objective for the rural water supply sector has been defined as providing potable, protected, perennial water to the inhabitants of each habitation within the habitation itself in the shortest possible time. The daily quantity is fixed as 25 to 40 litres per inhabitant.

Even the very systematic survey done reveals some defects because of human errors in survey. To rectify this, consultations are held with the Panchayats, Panchayat Unions and the District Development Councils, to finalise the list of habitations to be taken up in each district before the programme is finalised. A list of habitations with categorisation is printed and sent to all the Members of the Legislative Assembly and Parliament, to all the Panchayat Unions and to the Collectors with the request that any defect in classification may be brought to notice and rectified. As soon as a work in a habitation is completed, a return is to be sent to the computer, so that the data regarding that habitation is updated.

It is seen on actual experience that provision of a reliable source and bringing of water within the habitation is a costly matter. Per capita cost of such schemes vary from Rs.40/- (where source is located within the village and only a handpump is provided) to about Rs.400/- (where water has to be brought from a distance). As a first phase of the programme, 5,420 habitations of categories 1 and 2 are being provided water supply at a cost of Rs.25 crores to cover a population of 21.5 lakhs. It is expected that the future programme also will be as costly and the total cost of meeting the objectives, i.e., providing potable and perennial water according to national standards within each habitation will cost more than Rs.100 crores. The Government are keen that such a programme must go through and welcome the provisions made in this respect by the Government of India.

Proper maintenance of such costly schemes is a must if the benefits of such huge investments are to be fully enjoyed by the rural masses. The Government of Tamil Nadu are very much interested in this respect and have taken concrete steps towards the objective of proper maintenance.

The local bodies for whom the water supply facilities are constructed are the agencies for the proper maintenance and they should meet the cost of operation and maintenance. While applying this principle, however, some difficulties are noticed. In some of the villages the technical skills necessary are absent. The spare parts needed, if

bought by the local bodies by themselves, will lack standardisation and unscrupulous suppliers may palm off substandard material at a high cost on the local bodies. Particularly in case of deep well handpumps where a standard product i.e., India Mark II has been evolved with specifications for each of the components, it is essential that the spare parts must be according to specifications. The handpumps which are subject to frequent use may break down often and it is necessary to employ technically qualified persons to repair these and proper supervision of their work by qualified engineers becomes necessary. In view of these factors, the Government have decided that the TWAD Board must be made responsible for provision of fitters to repair these pumps, supply of spare parts and technical supervision of the work. The shallow well handpumps (depth of the well below 50 feet) continue to be maintained by the Panchayats in view of their simple mechanism. Because the pumps are located in villages, the problem of communication becomes extremely important. Proper use of the handpump will enhance its life. To solve both these problems, Caretakers are selected for each handpump. These caretakers should be enthusiastic, literate and be users of the handpump water. They are given training with the help of UNICEF whereby they are taught the essentials regarding the handpump, proper operation of the pump and the benefits of using protected sources of water as against polluted sources like ponds. They are also given printed stamped postcards which can be used by them to inform the fitters and the district level mobile team regarding any repair needed for the handpump. The fitters, who are located in the Panchayat Unions are expected to do minor repairs and preventive maintenance. The district level mobile team is expected to do major repairs which involve lifting of the top-end mechanism out of the handpump.

There are certain problems which need to be solved in this respect. The mobile teams visit the villages for all repairs other than repairs to the top-end mechanism. The visit of the mobile team is necessary only because manpower is required to lift the pump out. The repair itself may be a simple one and can be attended to by the fitter. Each visit by a mobile team is expected to cost more than Rs.100/- on the average. It will be much cheaper if the block level fitter himself is enabled to do repairs by allowing him to engage labour to lift the pump. The role of the caretaker also needs to be discussed further. Can he be entrusted with minor repairs? Can the Panchayat be given some responsibility in this respect for stocking spare parts? There is no doubt that our ultimate objective should be to develop the capability for repair within the village itself. Considering that there are about 20,000 deep borewell handpumps benefiting about five million people in Tamil Nadu, this is an important objective to be pursued.

Comprehensive schemes, each covering several villages, are at present under the maintenance of TWAD Board. Schemes with power pumps covering a single village are maintained by the Panchayats excepting for three districts of Chengalpattu, North Arcot and South Arcot where the responsibility of maintenance has been taken over by the Board. The TWAD Board employs electricians and maintains stocks, spare parts and spare pumps to maintain the power pumps in these districts. The extension of this system to other districts in Tamil Nadu is under examination.

Cost of maintenance of handpumps is subsidised by the Government in the case of poor Panchayats. The cost of maintenance of power pumps is expected to be met by the Panchayats themselves. The cost of operation is to be met by the Panchayats in all cases. The Panchayats derive no income from sale of water in these cases as only a public distribution system is contemplated. Cost of maintenance of these schemes ranges from Re.1/- per capita per year to Rs.4/- per capita

Per year. This cost is expected to be met by the Panchayat from their taxes. The tax base of a Panchayat is such that they get only 4 to 5 rupees per capita at present. A big increase in this tax will be difficult as these taxes are house taxes based on their capital or annual rental value. There is need to study these problems further and make systematic provision for operation and maintenance of schemes. For bigger villages, perhaps part of the water can be sold by providing limited distribution mains. A separate water tax may be levied on houses of above a certain annual rental value.

APPENDIX IV

GUIDELINES FOR PREPARATION OF STATUS PAPERS ON THE RURAL WATER SUPPLY PROGRAMME

A. Introduction.

B. Programme in general.

C. State's Rural Water Supply Programme - present/future policy.

D. UNICEF assistance in the State Programme.

E. Organisational set up in the State for the preparation of projects as well as maintenance (Narrative and a chart). Any changes contemplated in respect of organisational set up may also be highlighted.

F. Summarised statement regarding physical achievements with specific reference to number of villages covered, population benefitted, number of sources developed, etc. (vide Annexures I & II).

G. Critical analysis of the following

1. Utilisation of different types of rigs

1.1 Availability of rigs (State owned, UNICEF supplied and from other sources).

1.2 Drilling performance - number of bores drilled indicating therein number of failures.

1.3 Availability of Geologists and geophysical instruments.

1.4 Replacement of rigs taking into consideration age and physical condition of rigs.

1.5 Overhauling of rigs indicating whether this could be done either at State Workshop or at Company's Workshop within the State or if not where outside the State.

1.6 Existing arrangements in the State in respect of workshop facilities indicating details of the staffing pattern.

1.7 Available facilities for State level Central Stores, store keeping records stating whether Cardex system is followed and whether trained personnel are available.

1.8 Drilling bits - availability and future requirements - their performance.

1.9 Availability of hammers and facilities for repairs and requirements for future use.

2. Spare parts

2.1 For imported rigs.

2.2 For indigenous rigs.

3. Present trained drilling crew available and future requirements

3.1 Availability of training facilities in the State and future requirements in this regard.

II. Utilisation of the bores drilled

(a) The time gap involved in bringing a tubewell to use with the fitment of a handpump after the completion of the bore - reasons in cases of long periods involved - type and selection of handpumps (apart from Mark II pumps supplied by UNICEF/procured by the State) - performance of the same - period of effective use before the first breakdown - the life of such pumps - supply of spare parts and period in bringing such pumps to re-use.

(b) The performance of Mark II handpumps supplied by UNICEF - effective utilisation of the same in terms of population operating the pumps - hours of working etc. - need for change, if any - ease of operation in terms of depth, etc.

(c) Maintenance set up, comparison between old system and new 3-tier system - establishment of the system at the three levels - the effective co-ordination, the possibility of establishing a criterion for the system in terms of pump coverage, area involved, etc. for the two levels: namely for the pump mechanic at block level and the mobile team at the district level - setting up of district workshop for handpump maintenance.

(d) Policy of the State Government regarding acceptance of 3-tier system for the State as a whole or limited only to UNICEF assisted programmes - details thereof.

(e) Coverage policy indicating number of beneficiaries per handpump as existing and as suggested for future adoption.

(f) Testing water quality (chemically and bacteriologically)

(i) Facilities available.

(ii) Water testing prior to commission of the programme.

(iii) Frequency of water tests during operation.

(iv) Proposals of augmenting the water testing facilities indicating therein the type of equipments required.

(g) Agency carrying out construction of platform and drainage facilities, time and cost involved.

(h) Organisational set up for construction, regular drilling programme as well as rejuvenation.

(i) Suggestions regarding changes in the design of platform, drainage facilities, etc.

(j) Source and availability of funds for handpump maintenance - approximate annual budget for maintenance of handpumps in the State.

(k) Average cost of maintenance per handpump per year.

(l) People's participation - general appreciation of the public in the utility - involvement in the proper operation and upkeep of the installations - need for health education, sanitation, etc.

H. Data collection and reporting

(i) State survey of problem villages indicating population, type of source, coverage, etc.

(ii) Data collection of specific programmes like well drilling, installation of handpumps, maintenance of handpumps, etc. at block level, district level and state level.

(iii) Periodical reports on different rural water supply programmes.

I. General comments etc. including the approaches to be followed to suit some unusual local conditions.

J. Conclusions on the present stages, future programmes (elaborate on the requirement of types and number of rigs for the future), policy, objectives, targets, linking up of ongoing water supply programmes with other activities such as sanitation, public health education, etc.

ANNEXURES

(a) Data on the rigs performance - maintenance chart, spare parts utilisation, rate of drilling cost/ft. of drilling different rigs. (Annexure I)

(b) Handpump installations, performance. (Annexure II)

(c) Typical study on 3-tier system for a few districts with data.

ANNEXURE I

Sl. No.	Type of rig	No. of borewells drilled			Depth drilled in Mts.	No. of pumps installed		No. of villages covered	No. of population benefitted	Remarks
		Success-ful	Unsuccess-ful	Total		H.P.	P.P			

ANNEXURE I

ANNEXURE II

TYPES OF HANDPUMPS AND THEIR PERFORMANCES

Sl. No.	District	Mark-II Pumps				Other types (information to be furnished separately for each type)				REMARKS
		No. installed	No. in working condition	Period of working	Periodicity of repair/ replacement	No. installed	No. in working condition	Period of working	Periodicity of repair/ replacement	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)

ANNEXURE II

APPENDIX V

SYNOPSES OF SPECIAL PAPERS ON THE MAINTENANCE OF HANDPUMPS IN PUDUKOTTAI AND TIRUCHIRAPALLI DISTRICTS, TAMIL NADU

1. Pudukottai District

PAPER PRESENTED BY:

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TWAD BOARD, RWS DIVISION NO.1
PUDUKOTTAI

Geology of Pudukottai District

Pudukottai district consists mainly of archaen, cretaceous, tertiary and quarternary formations.

Archaen formations are found in Kulathur and Thirumavam Taluks, covering an area of 2,107 sq. kms. The important minerals of this area are igneous and metamorphic: older biotite, hornblendic gneiss and granites, as well as magnetics and quartizites.

Cretaceous formations occur in Thirumavam and Alangudi Taluks, over an area of 581.51 sq. kms. The main minerals are sands, sandstones etc. of marine origin.

Miocene and pliocene formations are found in Aranthangi and Alangudi Taluks, covering an area of 1,847.19 sq. kms. The main minerals found in this area are sands and clay. Quarternary formations exist along the sea coast, with the main marine deposits (backward deposit) in an area of 118.26 sq. kms.

Ground Water Potential

Pudukottai district consists of 10 blocks. The hard rock area covers Viralimalai, Annavasal, Thirumayam, Ponnamaravathy, Kunnandarkoil, and parts of Arimalam and Thiruvarangulam Blocks.

The sedimentary area consists of Thiruvarangulam, Karambakudi, Arimalam, Aranthangi and Avudayarkoil. Viralimalai will be a catchment for other unions.

The potential of the rock area has been reduced due to continuous tapping over a large period of time. The rocks dip towards the sea and sources have thus been taken from the fractures, joints and faults. In sedimentary areas, however, the source can be taken from porous spaces which are perennial. This is not the case in hard rock areas.

Cretaceous and tertiary formations play a major role in sedimentary areas, whereas archaen formations comprise the hard rock area. No proper investigation in the coastal area has resulted in scant tapping of ground water sources, leading to the premise that the potential in these areas is very high.

Site Location

The selection of every site is checked and confirmed after analysis of a water sample for classification. The G.A. team is then sent for geophysical investigation with reference to rock exposures under the ground surface and openwells. The team studies the dip and strike of

the formation; in hard rock areas, this is done with the help of a clinometer compass. In sedimentary areas the study goes with soil conditions, basin, altitude and M.S.L.

The formations beneath the ground are studied by electrical resistivity probing with NGRI resistivity meter, KED meter, terrameter, scintrix meter, etc. Scientric is specified for hard rock areas. The resistivity is directly obtained from the matter value, and is multiplied by the constant to get the resistance of the sub-surface material.

Special Study at Mettampatty

Mettampatty is situated in Thirumayam block, with an Archaen strata where two probings have been conducted at two different sites over an interval of time. The value of station I has proved higher than station II, and there were no significant undulations and drops in the resistivity values. In the second station, the graph was extremely interesting with undulations, projections and droppings found between 30 to 60 metres depth. The bore in station II has been drilled to a depth of 122 feet with a yield of 30 GPM. The quality of water has been analysed and is reported to be chemically potable.

Merits of Handpump Schemes

Handpump schemes have the following advantages:

- they can be adopted in areas with poor ground water potential, as a minimum of 2 gpm or 10 lpm is sufficient;
- the scheme can be executed within a very short period of time;
- handpump schemes are economical even in areas with high populations and low ground water potential. The number of handpumps installed can be increased to suit local needs;
- effective maintenance is possible with less skilled personnel;
- and with proper maintenance, a handpump project ensures a permanent and safe drinking water supply.

Planning

One handpump is intended for areas with a population of under 300. Two handpumps are installed where the population ranges from 301-750, if the source is within the habitation.

Drilling of Borewells

4-1/2" dia. borewells were sunk in hard rock areas with the help of down-the hole percussion rigs. Casing pipes are inserted only for the top layer (10 to 20 feet) to retain the bore.

In sedimentary areas, borewells are sunk by rotary rigs with the desired diameter size. In these borewells, casing pipes are inserted to the depth recommended by the Geological Assistant, with slotted pipes in good yielding zones.

After developing the borewells with compressors, they are put into use and water samples are analysed for potability.

Installation of Handpumps

The 1,187 handpumps installed and maintained in Pudukottai district include 149 older style pumps, 804 of the Jalna type and 214 India Mark-IIs.

Advantages of the India Mark-II Handpump over older type pumps of the Senco and Nirmala Type

Older type pumps	India Mark-II
Unimpressive appearance	Good appearance, liked by village people.
The pump design involves many linkages which affect smooth functioning.	Elimination of linkages gives smooth functioning.
Certain spares such as the H. Fork and body of the pump are made of cast iron and hence cannot be easily reconditioned.	Except for the bearing, all other parts are easily reconditionable.
The flange to flange bottom arrangement does not serve with rigidity over a period of time.	The pump has got a rigid fixation because of the evenly-spaced three bent legs, thereby giving perfect alignment during operation.
The pipes are jointed directly to the body through a nipple and a reducer, and this arrangement does not give prolonged service. When the threads inside the body wear out, the body ceases to function.	The casing pipes are not jointed directly to the pump base, and therefore any disruption to the pump does not affect the casing pipe.
When the spout is damaged, repairs involve drilling and tapping.	The spout is firmly fixed to the water chamber.
The handle is not strong, and its placement too high for convenient operation.	Pipe handle is sturdy, well balanced and easy to operate.

Advantages of the India Mark-II Handpump over Jalna type pumps including Balaji Pumps

Jalna type pump	India Mark-II
The fixing of the bolts in the conversion head are not of a standard size, resulting in practically no interchangeability with other pumps	All spares, top end mechanism, storage tank, body of the pump are interchangeable from pump to pump.

Jalna type pump	India Mark-II
Inspection cover arrangements cannot serve for a long period of time.	Inspection cover arrangement serves without failure and safeguards the pumphead.
No storage tank, and initial priming is hence required.	Because of the presence of a storage tank, priming is not required.
The handle is light-weight and more effort is required to bring up water for continuous supply.	Heavier weight handle requiring less effort to operate.

Maintenance of Handpumps

The effective maintenance and repairs of handpumps is ensured by the implementation of the three-tier maintenance system, which links the village, block and district levels with an efficient communication structure.

Cost of Maintenance

Cost of spares	per month	Rs. 12,000.oo
Pay for NMR	"	400.oo
Pay for fitter	"	305.oo
Pay for driver	"	295.oo
Pay for union fitters	"	2,745.oo
Fixed TA for union fitters	"	450.oo
TA for union fitters (approx.)	"	360.oo
TA for driver (")	"	115.oo
TA for fitter (")	"	115.oo
Pay of Assistant Engineer	"	801.oo
TA of Assistant Engineer	"	200.oo
Total	"	Rs. 17,786.oo

No. of pumps under major repairs attended by maintenance team — 57 (average)

No. of pumps under minor repairs attended by union fitters — 144

Total — 201

Average cost per month per pump: Rs. $\frac{17,786.oo}{201}$ = Rs. 88.47 or 88.50

Cost of vehicle per pump (30 kgs) = Rs. 50.oo

Total cost of pump per month = Rs. 138.50

Utilisation

Of the 1,187 handpumps installed, 1,035 are used continuously; 82 are only used during the summer season, and a further 27 are sparingly used. 43 handpumps are not used at all.

Reasons for poor utilisation

1. There is no felt need for the installation of a handpump.
2. The handpump is inconveniently located.
3. People in the village prefer, by habit, to draw water from local sources such as ponds.
4. Health education has not been extensively available. Even after the installation of a handpump, people have no concept of the importance of a protected water supply.
5. Ground water quality is generally not acceptable to villagers.
6. Handpump schemes failed in certain areas due to silting of borewells.
7. Areas where alternative sources are readily available are sometimes wrongly classified as scarcity areas, leading to poor utilization of handpumps installed.

Frequency of Repairs

Repairs to pumps within a one-year duration

- Repairs due to wear and tear of the top end mechanism: 35%
- Repairs due to wear and tear of cylinder assembly: 20%
- Repairs due to falling of pipes and plunger rods: 5%
- Repairs due to pipe and plunger rod cut: 20%
- Miscellaneous: 20%

Repairs to platforms

Of the 1,187 pumps installed, 23 platforms required repairs. Over a period of three years, the percentage of platform repairs works out to 1.93.

Reasons for repair

- Uneven strokes or mishandling of the plunger rod
- Shearing of plunger rod
- Slipping of plunger rod and pipes
- Repairs of platforms in areas with slippery soil conditions - such as clay or silt - cause the positioning of the pump to change angle slightly thereby affecting the concentricity of the handpump.

Suggestions

Handpumps requiring least repairs are those which are installed over borewells with a 60 to 80 feet depth and a high ground water table

of 10 to 15 feet. These pumps work up to 1-1/2 years without breaking down, and site selection should therefore preferably consider points where a high ground water table is available.

The caste system prevails in almost all villages. Site selections should therefore take locations for different castes into account.

Geophysical points near tea shops and adjacent to private buildings should be avoided.

Slot size may be designed and adopted for specific problems, to minimise bore siltation.

The interest and involvement of local people should be encouraged through health education, utilising methods such as teaching aids, mass media, leaflets, pamphlets, etc.

Purchase procedures should be modified to enable purchase of the best quality handpump irrespective of the cost factor. The functional performance and durability of the handpump should be the major deciding factor.

Caretakers should report to block mechanics, and block mechanics to the mobile team in order to economise on expenditure incurred by unnecessary trips made by the district mobile team.

Block mechanics should come directly under the control of the mobile team, instead of functioning under the dual control of the Block Development Officer and the mobile team Engineer.

The operational centre of the block mechanic should be selected on the basis of concentration of handpumps in any particular area, and not at the block office. This would enable more efficient and rapid attention to repairs.

Block mechanics should be provided with spares, and instructed on how to attend to both minor and major repairs using locally available workers and machines.

The mobile team should exert an overall control and attend only to repairs of a specialised nature which require removal of the pump, etc.

A grouping of contiguous villages is essential in order to suggest comprehensive water supply schemes with an acceptable ground water quality.

For proper maintenance planning for handpumps, villages should be classified according to bore depth, the ground water table and chemical quality of the water.

At present the mobile team jurisdiction is based on the number of pumps. It should also, however, take into account coverage of terrain such as hilly, coastal, flat and isolated areas.

Field Experience of the Performance of the India Mark-II Handpump

The India Mark-II handpump currently has a chain with welded couplings. As a result, the chain links weaken and repairs are necessary. Other than this, the top end mechanism requires no repair if positioned correctly.

The annular space of the upper valve, which is in contact with the bucket fixer, shears out through continuous operation. The outer diameter of the upper valve at the annular ring thus increases and affects its functioning.

Apart from these problems, repairs where the rod or the pipe is cut are also called for.

In general, the performance of the India Mark-II has been outstanding. This has resulted in lower costs of maintenance and repair, to the satisfaction of the field staff which recommends the replacement of all other pumps with the India Mark-II.

Design Improvement

The length of the GI pipe can be minimised in accordance with the average static water level, enabling easy operation maintenance.

The provision of guide bushes between the junction of the GI pipes would give better alignment, thus avoiding repairs on rod and pipe cuts.

The wear and tear of the handle chain can be avoided by using a chain with universal couplings.

Providing a rubber washer to the upper valve, as the lower valve, would avoid wear and tear and increase the operational life of the upper valve.

The provision of hexagonal flats at both ends of the cylinder would enable opening and reassembling without damage.

A ball valve would eliminate a number of the lower parts in the cylinder.

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2. Tiruchirapalli District

PAPER PRESENTED BY:

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General

In view of the importance of providing a protected water supply to the rural population, the Government of Tamil Nadu has adopted an effective and streamlined maintenance structure to ensure against disruption or non-functioning of water supply systems. The three-tier maintenance system suggested by UNICEF has been implemented, and a study covering 573 handpumps installed in 9 blocks was analysed in this context. The study covered the expenditure involved, the nature of repairs undertaken and steps for preventive maintenance over a one-year period extending from April 1978 to March 1979.

Of the 573 pumps under observation in the 9 blocks surveyed in Tiruchy district, 21 were Monoblock and other older pumps, 484 were

Jalna Sholapur pumps and 68 were India Mark-II handpumps. The India Mark-II pumps were found to be more reliable, requiring a minimum number of repairs.

The three-tier maintenance system

The three-tier maintenance system is under implementation in this district, and the maintenance structure provides for:

- One district mobile team for every 1,000 pumps
- One block mechanic for every 100 pumps
- One village handpump caretaker for every pump

General nature of repairs

The average depth of borewells in Tiruchy district is 150 feet, and the static water level is normally around 30 feet with a drawdown of 10 to 15 feet in summer. The cylinder depth is therefore at 100 to 120 feet from the ground level. The basic repairs involved in handpump maintenance occur in the top head assembly, the rod, the chain and the cylinder assembly. These are attended to by the block mechanic and/or the district mobile team.

Review of repairs and maintenance during 1978-79

The total expenditure involved in the maintenance and repairs of the 573 handpumps surveyed amounted to Rs.150,000 over a one-year period, resulting in an average normal expenditure of Rs.261 per pump.

The nature and percentage of repairs were as follows:

Cylinder repairs	:	52%
Rod cut	:	16%
Chain cut	:	17%
Head repairs	:	15%

Suggestions for improvement

The India Mark-II handpumps: Although the performance of the India Mark-II has proven its sturdiness and reliability, there is scope for improvement in the following areas -

(a) the chain should be provided with a universal coupling for increased efficiency; and

(b) the spout should not be an integral part of the water tank. Currently, when the spout is damaged, the entire water tank has to be changed or removed for welding. To avoid this, it should be possible for the spout to be dismantled.

The maintenance programme: At present, one block mechanic is responsible for the maintenance of 100 handpumps, and one district mobile team covers 1,000 pumps. Since the mobile team, however, attends to an average of 40 repairs per month, it is suggested that the number of pumps covered by one team be reduced to 500. Since the maintenance of handpumps requires continuous and immediate attention, this would also reduce the transport expenses involved in the coverage of a larger area. This would reduce extensive travelling and related expenditure as well.

APPENDIX VI

INSPECTION AND THE INDIA MARK-II HANDPUMP

PAPER PRESENTED BY:

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During the discussions to-date I have listened with interest to the speakers on the problems and proposals for their States.

It appears to me that regarding the pump everyone agrees that

(a) the India Mark-II is the best handpump available to-date;

(b) the pump must be of first class quality.

Although, at one stage, it was suggested that in view of the great urgency for the supply of pumps we should be less stringent in our quality requirements. This is a mistake because one must "always start as one intends to continue" and any relaxation now would become a precedent for the future. In any case Ken McLeod (UNICEF) indicated realistic figures required, which are less than those intimated. For more than two years now, working for UNICEF we have established a quality of acceptable standard which is proving an assurance of a long and trouble-free life for the handpump.

It was implied yesterday that the establishment of an ISI Standard will automatically guarantee the quality and workmanship of the India Mark-II pump. It must, however, be remembered that any standard - whether it be ISI, JIS, DIN, BSS, etc. - only indicates the specified requirements of an article but this still has to be ensured by Quality Control.

If we are asked to carry out inspection and advisory service on behalf of State Government departments, we would welcome the local P.H. Engineers along with us to study all aspects of the production and quality control we carry out to achieve a pump of acceptable standard.

Because of the importance of the high quality required for these pumps, all our Inspectors are fully trained and conversant with the methods of Quality Control and the standards of acceptance of these pumps. Therefore, I can send any man at any time to a manufacturer and know that our standards are being maintained.

I turn now to the subject of this paper which concerns INSPECTION and the India Mark-II handpumps. It is interesting first to turn to the Dictionary to establish the meaning of the words:

INSPECTION - The process of inspecting

INSPECTOR - Someone officially appointed to make inspections and report to an authority. A police officer ranking below a Superintendent and above a Sergeant.

INSPECT - To examine formally e.g. for completeness or Quality. To pass in review ceremonially. To look closely at, scrutinise.

It will be seen that the words INSPECTOR and INSPECTION have many applications, but in the Engineering world we prefer the words -

QUALITY CONTROL

Referring to the process of inspecting which should be preceded by:

QUALITY ASSURANCE

which is the study of the product to determine the stages in production QUALITY CONTROL is to be applied and to what extent. By these two processes the quality and completeness of the finished product is theoretically achieved. The result depends on the competence of the inspectors exercising the QUALITY CONTROL.

Quality Control in Industry: This generally falls very broadly into three categories -

I. Firms with QUALITY ASSURANCE and QUALITY CONTROL Departments in operation.

II. Firms with a Chief Inspector who should determine the QA and supervise his QC inspectors.

III. Firms with no QUALITY CONTROL. These firms are generally more interested in production and quick turn-over than quality of product.

Why Inspection?

It is frequently argued that inspection by the purchaser is unnecessary since the supplier has a legal obligation to supply in accordance with the contract specification and to an acceptable standard of quality. However, receipt at site of defective materials or equipment can result in costly delays in the completion of projects or increased maintenance and operating costs, whilst legal sanctions taken against the contractor subsequent to delivery can never wholly compensate for such delays and costs.

Inspection is aimed at ensuring that the goods comply with the contract specification, that the manufacturing processes have been properly carried out and that the goods are properly packed for despatch. No system of inspection can guarantee 100% achievement of these aims, but inspection can and does reduce the risk of goods arriving in an unsatisfactory condition.

INSPECTION is not a duplication of the QUALITY CONTROL exercised by the manufacturer, but rather a means whereby the adequacy of such control can be determined and maintained. Obviously, the better the control exercised by the firm the less stringent need be the inspection instituted by the purchaser. In any event, inspection by the purchaser or his representative does not in any way relieve the supplier of his responsibilities under the contract.

Inspection of Handpumps

The basic requirements we look for in all types of fabricated handpumps are as follows:

1. Quality of finish and workmanship;
2. Use of correct materials, dimensionally as well as physically;
3. Accuracy of components and details checked against drawings;
4. Satisfactory weld profiles and clear of all slag;
5. The absolute minimum of weld distortion;
6. Alignment;
7. True and easy function of assemblies.

These requirements can only be satisfactorily achieved by use of -

1. Accurate machining of details and cutting/punching of plates and tubes;
2. Good solid fool-proof jigs and fixtures;
3. Good welders and welding techniques;
4. Works QUALITY CONTROL;
5. Satisfactory preparation of components for welding or galvanising;
6. Good method of paint preparation, application and drying.

If the foregoing basics are not followed, one can be confronted with -

1. Difficulties in installation at site;
2. Faulty installation, causing undue wear on moving parts;
3. More than average maintenance and replacement of parts;
4. Reduced efficiency of pump;
5. Early replacement of complete pump head;
6. Not obtaining full value for the cost of the pump plus the costs of continual maintenance.

Approach to Inspection - Handpumps

On placing an order with a contractor, visit to ascertain -

1. If a QUALITY CONTROL system is in operation. This should comprise
   (a) Goods inwards;
   (b) Stage by stage inspection of sub-assemblies including welding;
   (c) Sub-assembly clearance for preparation for painting;
   (d) After painting and drying;
   (e) Assembly inspection and testing.
2. That all necessary slip gauges, ring and plug gauges, micrometers, etc. are available.

3. If other pumps under manufacture, examine the jigs, if any, in use and ensure they are adequate. Otherwise, suggest improvements for manufacture of jigs to ensure the production of accurate units.

4. Study methods of manufacture of details and machining of components.

5. Ensure preparation for painting and actual painting procedures and drying is satisfactory.

6. Discuss specifications and drawings and indicate the acceptance standards and accuracy you require.

During Manufacture of Order

Visit firm on occasion to ensure your pumps are being accurately and properly prepared. If no works QUALITY CONTROL exists, request one to be set up or alternatively you must visit regularly.

ALWAYS TREAT THE FIRM WITHOUT QUALITY CONTROL WITH SUSPICION.

Up to this stage there has been a continual emphasis on quality and accuracy of workmanship. The fabricated handpump is a simple design requiring most accurate construction which is easily achieved for mass production purposes by the use of robust and effective foolproof jigs and fixtures. This combined with good "quality control" will help ensure the production of pumps which are -

1. Easy to install;
2. Efficient in use;
3. Long lasting;
4. Needing minimum of attention, maintenance and replacement parts.

Turning our attention to the India Mark-II which has been developed and improved over recent years and is of simple design with a minimum of moving parts and easy in operation. For the remainder of this talk, we will be considering this particular pump.

Basic Jigs and Fixtures Required

1. Flange bosses;
2. Head side plate bosses;
3. Box head - locating axle bosses and connecting rod bush accurately in relation to each other;
4. Handle window frame;
5. Accurate fixture for welding handle window frame to box head;
6. Spout assembly at 96°;
7. Water chamber base flange and stand pipe coupler;
8. Water chamber - preferably motorised;
9. Fixture for welding spout to water chamber;
10. Flange to pedestal pipe;
11. Pedestal and legs assembly;

12. Connecting rod coupler;
13. Handle assembly;
14. Chain to con. rod coupling.

These are considered basic needs but may vary from manufacturer to manufacturer depending on his facilities and expertise, but nobody can proceed accurately without these.

Coupled with this, you need good welders and QUALITY CONTROL.

Final Inspection

The contractor should offer complete pump sets in at least batches of 50 or in multis of 50. All heads, water chambers and pedestals should be laid out with easy access for inspection in fully painted condition. These units should be 100% inspected and random parts selected for building up into assemblies for checking of true lineability and stroke.

The workmanship and finish must be closely examined, with particular emphasis on welding, mating of flanges, minimum distortion, adequate clearances, paint and galvanising, thickness and quality, lineability, interchangeability, etc., etc.

This paper gives the basic requirements for the accurate manufacture and QUALITY CONTROL of quality India Mark-II Handpumps.

APPENDIX VII

SYNOPSIS OF SPECIAL PAPER ON THE RURAL SANITATION PILOT PROJECT INDORE, MADHYA PRADESH

PAPER PRESENTED BY:

V.K. JAIN,
SUPERINTENDING ENGINEER,
PHED, INDORE, M.P.

The 'Abohava' pilot project for rural sanitation was initiated in Madhya Pradesh in 1979. This project was an off-shoot of the piped water supply scheme; departmental officers in charge of construction and installation of a safe drinking water supply to 3 villages in Indore district generated community interest and involvement in the programme for supply of safe drinking water. This led, in turn, to an awareness of the need to maintain these sources and encourage community participation in improvement measures.

The villagers were made to realise that the man-hours - and income - lost due to water-borne diseases, the time unnecessarily involved in transportation of water and so on, far outweighed the comparatively minimal expense involved in devising and maintaining a safe water system. Efforts had previously been made by the villagers to construct surface drains and water-seal latrines, though these had proved largely unsuccessful. The reasons for failure lay basically in the fact that funds for the programme were scarce, and technical knowledge and guidance limited and inadequate. The villagers were almost totally unaware of hygienic refuse disposal methods. But for all this, the base for a systematic, well-planned programme was already established - inasmuch as the villagers realised the need for improvement and were prepared to participate and contribute, to the extent of their limited resources, towards a programme which would improve existing health and environmental standards.

In view of the existing spirit of community participation, a sanitation programme was devised for implementation in a few selected villages. The norms for selection consisted of villages with existing water schemes; villages with sufficient awareness within the community and a readiness to participate in improvement measures; a basic financial status which would enable the panchayat and villagers to contribute their share towards the installation, maintenance and operation of a sanitation scheme; and villages with easy access from Indore to enable follow-up and monitoring of the programme.

Based on the above criteria, 3 villages were selected in Indore district: Gawli Palasia, Rao and Tillor-khurd. The Government agency (PHED) was assisted in its selection by a team from UNICEF, and the infrastructure of the proposed project was determined by representatives from the village, block and district levels.

The project comprises of four programmes. The first, which covers the construction of individual sanitary latrines, aims at improving individual health standards. Improper disposal of waste results in transmission of intestinal diseases such as dysentery, typhoid, para-typhoid and infestation by parasites through the faecal discharges of infected persons. Although a sanitary sewer system is the most effective solution to the problem, this is not possible in rural areas at this stage; nor is it economically viable to install an individual septic tank with plumbing and separate disposal. The most feasible alternative is the installation of a sanitary latrine with disposal through a leaching pit, and the programme intends to provide a total

of 1,655 such latrines to households, schools and health centres in the pilot project villages. Of the 2,030 households in these areas, only 375 have existing latrine installations; the programme also intends to cover reconstruction work on a large number of these which have proved unsatisfactory.

This programme can only be implemented in households where space is available for construction of individual sanitary latrines. For total area coverage, therefore, it will also be necessary to install community latrines.

The planning and implementation of the individual sanitary latrine programme will be the responsibility of a village-level committee comprising of local leaders and block and district representatives. This group will also submit recommendations to an expert committee consisting of the block sub-engineer, the PHE sub-engineer and the coordinating officer.

The expert committee is responsible for site selection, purchase of materials and - most important - reviewing the progress of the programme.

The provision of community drainage is another component of the rural sanitation project in this area. The basic thrust of this programme is to control the breeding of mosquitoes in stagnant water, thus preventing malaria, filariasis and related diseases. The installation of community drains will help to regular sullage and waste water to nearby fields, and will also be partially useful for storm flow.

The drainage system will make use of locally available flagstone and bricks, thereby keeping the costs of construction to a minimum.

Whilst community drainage covers one aspect of village sanitation improvement, a general programme must also be implemented for effective health measures. The sanitation project will, therefore, cover hygienic waste disposal as a major aspect of the provision of public health services.

In households where sufficient space is available for trenching and composting, the villagers will be trained to dispose off refuse through composting. Since, however, the majority of houses in rural areas do not have space for local composting, the refuse disposal programme will provide hygienic containers - made of hostalen plastic or similar material - to the households against payment. These containers will be used for the temporary collection of garbage, and a disposal team will be responsible for the daily collection and disposal to the village compost pit. Besides providing refuse containers to individual households, community dust bins will also be placed at strategic points in the village and will be cleared by the daily disposal team.

The final component of the rural sanitation project in Indore is the implementation of promotional health education programmes which will emphasise the maintenance of these facilities. Health education is an educative process, and aims at providing the community with techniques to facilitate change, extend knowledge, and develop an awareness of the factors and attitudes which promote better health. Promotional health education endeavours to actively involve people in health and welfare schemes and related sanitation measures.

The aim of providing a safe water supply to villages, is to improve hygiene, and eventually to promote public health. It is, therefore,

essential for water and sanitation workers at all levels to be aware of basic health hazards inherent in their respective operations, and the correlation between personal hygiene and community health. The responsibility of the individual and the community towards public health must be clearly defined by sanitation workers to the community in which they operate.

The promotional health education programme is, therefore, a major programme component of the rural sanitation programme, as it engenders community participation and interest through extension of awareness and knowledge thus ensuring effective maintenance of the facilities provided. Workers engaged in this pilot project will be trained in programmes and methods at a training centre in Ahmedabad.

The first step towards promoting health education is the selection and training of local leadership as motivators for health activities. In this, the project coordinator plays a major role, as selection and training involves a personal approach, a great deal of resource and a thorough knowledge of the religious, social and cultural background of the area in which he functions.

Schools and colleges will also have to be mobiled for the extension of health education and awareness, to inculcate habits and attitudes for healthy living within young people in their formative years.

The Indore rural sanitation pilot project thus covers improvement of individual standards of hygiene, general village sanitation, and improvement of rural health standards through promotional health programmes. The project will be carefully reviewed, monitored and evaluated for its performance and replicability. If successful, it will provide a model for adaptation in other areas, as a positive step towards controlling the environmental factors which transmit disease.

APPENDIX VIII

SYNOPSIS OF SPECIAL PAPER ON WATER, HEALTH AND COMMUNITY PARTICIPATION

PAPER PRESENTED BY:

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TIRUNELVELI DISTRICT
TAMIL NADU

Introduction

Health has been theoretically defined as 'a complete state of physical, mental and social well-being'. When we question, however, the means towards obtaining health, the answer is a considerably more complex one. For life and sustenance alone, the human body depends on three essentials: gaseous, liquid and solid components, represented in human intake by air, water and food.

The first ingredient is a plentiful one, and even when polluted can be refined again by permitting a free circulation of air. The third - food - can be rendered sterile and germ-free in the process of cooking. Unfortunately, the source and availability of the second ingredient, water, is dependent for its acceptability on personal preferences largely governed by the taste of water. Limited sources where the taste factor is acceptable get over-worked and polluted through constant usage, and since water is far more prone to pollution than the two other life-giving sources, this gives way to a high incidence of water-borne diseases. Many health problems can be directly traced to the lack of a safe drinking water supply. When we refer to 'protected water', we associate it with 'health'; health should therefore be considered an integral component of water supply.

Knowledge and Attitude of the Community in Relation to Water

In order to ascertain community attitudes to water and health, and to determine whether the rural population understood the extent to which health was dependent on a safe water supply, a survey was conducted in the villages of Nanguneri Block in Tirunelveli district. The results of the survey pointed out an ignorance of basic health concepts: a depressingly high percentage of people had no idea that disease could be contracted through contaminated water. Most people considered acute gastro-enteritis to be, quite literally, a 'curse of God'.

Even educated villagers very rarely attribute disease to polluted water. This ignorance, however, is not due to a disinterest in learning; it exists simply because no efforts are made to educate people on health. Health education programmes must, therefore, run parallel with the supply of safe water sources.

In areas where health education has not been imparted to the rural population, the acceptance of handpump water supply tends to be extremely low. Based on a study of such areas, the general unacceptability can be traced to two factors:

1. If the handpump water tastes slightly brackish as compared to other available water sources, the handpump is abandoned in favour of wells, channels, rivers and so on, regardless of the fact that these are often polluted.

2. When the taste of both the handpump and the open well water is equally acceptable, people still tend to underwork the handpump supply. Most villagers find it more convenient to draw water from an open well, and even in cases where families use the handpump it is more often due to the proximity of the pump to their houses rather than a realisation that handpump water means healthy water.

The Challenge

Unless these attitudes can be overcome, the purpose of providing a handpump is defeated; the installation of a handpump is thus not the single factor towards providing community health. The first step comprises of making the village community realise the benefits of handpump water, and helping them to perceive the link between handpump water and health.

The observations of the Nanguneri Health Education Pilot Project, as well as the Caretaker training programme, indicate that every field worker - irrespective of the department he functions under - can educate the rural community in the course of his routine duties. This implies a basic sense of concern and commitment on the part of government personnel; the pre-requisite for the utilisation of personnel in this task is, therefore, the development of means and methods for mobilising their interest.

The generation of interest and involvement must thus be ensured at two levels: at both the community and the governmental level.

Solving the Problem

Positive and rapid action must be taken with the limited resources at hand in order to tackle this problem. To start with, interested and motivated personnel should be mobilised into organising Health Education Programmes. Volunteers from within the rural community should be trained as activators and motivators.

The following factors should be kept in mind when planning health education programmes:

- Government personnel are invariably viewed with suspicion by the rural community, and an approach is, therefore, not possible unless they work at building up a good rapport with the people.

- Village youth, when mobilised, can work effectively towards community development.

- Youth volunteers should be identified and utilised in the programme.

- Community attitudes and behavioural patterns cannot be expected to change overnight. The inputs will result in long-term benefits which will only be visible in later years.

The Utilisation of Volunteers

In both the Nanguneri Health Education Project and the Caretakers' training programme, volunteers have been found to be the pivotal factors

of the programme. The selection of volunteers and an assessment of their aptitude for social service is an essential factor for consideration, as it is directly related to the successful working of the programme.

Selected volunteers are given training in health education, which they subsequently impart to the village community on a more informal basis. They are aided and supported by the Health and Development staff. The enthusiasm of the volunteer/caretaker depends largely on the rapport built up by the field staff.

The pump caretaker, in particular, plays a vital role in encouraging community acceptability of the handpump. He also contributes indirectly to health education programmes by educating villagers on the safe use of water, and on the link between protected water sources and health.

The Content for Training in Health Education

Instruction on the safe utilisation of water forms a major aspect of all health education programmes. Villagers are educated on the sources of water, the purity of water available from these sources, water-borne diseases, the economics of water and health, the clorination of water and the control and prevention of water-related health hazards.

As most sources of water are polluted by man through unhygienic waste disposal, environmental sanitation must also be stressed by health education programmes. Such projects comprise basically of three components: the construction of a 'soak pit' for the disposal of waste water; the construction of manure pits for refuse disposal; and the construction of sanitary latrines for excreta disposal. To this end, volunteers are given instructions on construction and installation methods during training sessions.

Health education programmes also instruct village communities on ways and means to eradicate malaria. Immunisation and nutrition education are stressed, with a special emphasis on nutrition for mothers and children.

The basic objective of the training programme is to develop the 'total health' of a community, covering all the inter-related aspects which comprise an integrated approach to rural health.

The success of a health education programme depends primarily on the calibre of the health educator, and his effectiveness in training volunteers for the programme. This skill is developed through experience in training camps, and cannot be acquired through a reliance on theoretical knowledge alone. The training camps feature the use of various visual aids such as charts, in-field demonstrations and film shows, which enable trainees to acquire a fuller understanding of the health education programmes.

Other Agencies

Other than the volunteers specifically engaged in the programme, teachers can also be effective health motivators. To this end, an experiment was conducted in Cheranmahadevi Division of Tirunelveli district. Around 2,300 teachers were recruited as voluntary motivators in a one-day session, and they evinced a great deal of interest and enthusiasm. Most of the volunteers engaged in the programme have been

issued a booklet on health which presents information in a style that can be easily understood by any layperson who can read and write Tamil.

So far, the training programme has covered about 2,000 volunteers and handpump caretakers, and around 2,300 teachers. In Cheranmahadevi Division, volunteers and teachers have motivated large numbers of people to accept the sanitary latrine programme; as a result, 3,000 latrine sets are distributed per year. In fact, the demand in this division far exceeds the available supply.

An interesting contrast is the fact that, before the latrine construction programme was launched in this division, the programme was not able to motivate even six acceptors per block per month - inspite of a separate Research-cum-Action Project organisation functioning specifically for this purpose.

In order to restrict reliance on Governmental sources, a simple design was devised for sanitary latrines, which enabled parts to be purchased from the open market. Ready availability of supplies has helped in the effective implementation of this programme.

The Role of the Volunteer/Handpump Caretaker

The role of the volunteer/caretaker must be clearly defined. His basic contribution to the programme is as follows:

1. He is a link between the village community and the field worker in health education programmes.

2. He immediately lodges a report in the case of pump breakdowns or epidemics.

3. He assists in immunisation drives.

4. He motivates people to construct soak pits, manure pits and sanitary latrines as part of the environmental sanitation programmes.

5. He encourages people to grow kitchen gardens, a sanitary means of waste water utilisation.

The Role of the Volunteer/Caretaker in the Mobile Medical Team

In Tamil Nadu, the Health Worker Scheme suggested by the Central Government has been adapted to the Mobile Medical Team Programme. This programme is currently being implemented in 10 blocks of Tirunelveli district, and will gradually be extended to a wider area.

Under this programme, two Medical Officers go out to the villages and attend to patients during the day. A third Medical Officer attends an out-patients' clinic at the Primary Health Centre. Each team visits six to eight villages, and are thus able to cover all the villages in a block within a week. The doctors take primary health care to the villages, and to people who would otherwise have had no regular access to medical facilities.

In order to ensure community participation in the Mobile Medical Team Programme, a welfare committee is formed in each village. The pump caretaker is usually nominated as the contact person for the welfare committee, and he is required to maintain a village register in which the medical officer records his visits to the village.

The contact person is supplied with a first-aid kit to attend to minor injuries, and with bleaching powder to chlorinate water sources. He is also provided with chloroquine tablets to distribute to malaria patients. The contact person arranges facilities for immunisation drives and health education work, and coordinates with the Mobile Medical Team for better implementation of health programmes.

It has thus been possible for us to provide primary health care to the villagers by actively involving the pump caretaker/health volunteer in the activities of the Mobile Medical Team. This programme has been under implementation long before the 'Alma Ata' declaration, a fact which has been pointed out by Mr Francis, UNICEF Project Coordinator, in one of his periodic newsletters to the caretakers.

Ways and Means to Sustain the Interest of the Volunteer/Caretaker

The interest and involvement of the volunteers and caretakers engaged in this programme has been sustained by the following means:

1. Frequent contact by the field workers and officers, which boosts the morale of volunteers and promotes their status in the community.

2. In the Nanguneri Health Education Project, volunteers are given 'referral slips' to refer cases to doctors whenever patients request them for help. Patients provided with a referral slip are given preference by the doctors, and the volunteers are thus given special status in the community.

3. Volunteers have been issued certificates for having undergone the Health Education or the Pump Caretakers' training. This gives them a feeling of importance and encourages their sense of commitment to the programme.

4. Periodical newsletters circulated to volunteers, praising their involvement and achievements, also help to sustain the interest of volunteers.

5. Identifying the 'best volunteers' and issuing momentos to this end helps to boost the morale of volunteers.

6. Arranging interviews through All India Radio, and broadcasting such interviews in periodic programmes has also been found to be an effective means of sustaining volunteer interest.

Conclusion

The health education programme in Tirunelveli district has definitely proven to be a successful one. The key to success has lain in a genuine sense of motivation, which has encouraged community response and participation. The villagers are being helped to discover the means for improving and developing the ability to utilise those means independently towards eventual community development.

The success of the programme lies in the proper selection of volunteers. With the right volunteers, given the right training, health education can be effectively promoted in the rural community, encouraging a more positive response to other health-related programmes initiated in these areas.

APPENDIX IX

SYNOPSIS OF SPECIAL PAPER ON THE THREE-TIER MAINTENANCE SYSTEM: ITS IMPLEMENTATION AND ACCOMPLISHMENTS IN TIRUNELVELI DISTRICT

PAPER PRESENTED BY:

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TAMIL NADU

This paper attempts to share with you my experience in maintenance of deepwell handpumps in the Tirunelveli district of Tamil Nadu. The initial proposal aimed at providing communication support for the rural water supply programme in this State. This was intended as a preliminary step towards making community participation and community education an integral part of the UNICEF-aided rural water supply programme.

The objectives of this proposal were as follows:

- to test, under field conditions, a plan of action designed to promote community education and participation;
- through such participation, to reduce pump breakdown;
- if the strategy succeeds, to find out how it could be extended to a larger area;
- to make this a first step of a community education and participation programme aimed at linking drinking water to health and sanitation;
- and to evaluate the effectiveness of the approach.

The project was launched in Salem district. Half a dozen blocks were identified for this purpose, and the EOPs/EOEs who were to serve as 'communicators' in the project were also trained. However, within a short period of three months, it became increasingly obvious that we were centering on a local, enthusiastic, young volunteer of the village - eventually called the pump caretaker - in preference to the communicator strategy.

Visiting pumps, talking to villagers, discussing with staff and officials became a busy routine. Veerapondy was one block with an exceptional Block Development Officer; we discussed extensively with his staff, and their response was extremely encouraging. They were asked to select suitable young volunteers who could be trained as pump caretakers to look after the handpumps installed in their areas.

As pump machinery is frequently subject to breakdowns, a viable maintenance structure is essential for the effectiveness of the handpump programme. Unfortunately, the maintenance aspect was not emphasised during the Tamil Nadu drought of 1975-76, at which time the government concentrated solely on the provision of water supply to drought-affected areas. It was only later that the need was realised for a structured maintenance system.

Subsequently, we decided on organising a training camp of 1-1/2 to 2 days' duration, with the syllabus, the tools, reporting cards and

log sheets, etc. to be supplied to the trainees, but the details still remain to be worked out.

At the time, Mr Madhava Sarma took over as Managing Director of the TWAD Board. Mr Sarma had previously introduced a village-level maintenance system in South Arcot; the system had proved successful, and he suggested its implementation in Salem district.

There were, of course, subtle differences regarding details. They were finalised in accordance with local conditions and circumstances.

Once this was cleared by the Water Section of UNICEF, the list of pump caretakers for the Veerapondy block was finalised. The PA to the Collector, Assistant Engineer, Tiruchenkode, the District Health Officer, Salem and the Block Development Officer and his staff covered the syllabus and conducted the training camp.

This training camp dispelled all doubts and reinforced our faith in the caretaker strategy. It would suffice if I say that the reporting card/intimation card now in use, as well as the log sheet, were devised and finalised at the training camp with liberal suggestions and contributions from the pump caretakers.

During the training camp, a broken-down pump was pulled out and repaired by the pump caretakers. The trainees were also given a demonstration on the construction of a soak pit to avoid water stagnation. The District Health Officer was present throughout the duration of the camp.

The project was subsequently transferred to Tirunelveli district. With the help of the Collector, Tirunelveli district, the TWAD Board and UNICEF, the three-tier maintenance system was then finalised and approved by the Government in its GO. MS No. 1567 RD & LA dated August 3, 1976.

According to this, apart from the Pump Caretaker who will look after the Pump at the village level, there will be a Block level fitter for every 100 pumps and a Mobile Repair Team for every 1,000 pumps at the District level.

Intimation of pump break-down will simultaneously reach the Block Development Officer and the Engineer of the TWAD Board. The repairs which can be handled by the Block fitter are undertaken by him, and the remaining cases are referred to the Mobile Repair Team. The Mobile Repair Team will send a report regarding repairs carried out by them to the concerned officials.

A weekly progress report will be sent by the Executive Engineer (RWS) based on the report of the Assistant Executive Engineers to the Collector. The Divisional Development Officers also send a similar report based on the report of the Block Development Officers.

The coordination of the Development and Health Departments and the TWAD Board, in the matter of handpump maintenance, became more and more effective.

Water from the deep bore well handpump came to be projected as an instrument of health. The Calcutta study, which showed that 76% of the out-patients reported at the hospital were victims of ailments caused by unprotected water, provided an entry point for the Health staff.

The pump caretakers, who taught the villagers how to operate the pump, provide disposal for excess water, attend to preventive maintenance, report pump break-downs and project water from the pump as an instrument of health, emerged as health volunteers of their respective villages.

Health Education dealt with immunisation, malaria control, environmental hygiene, protected water supply and nutrition and dove-tailed perfectly into the handpump caretaker training programme.

Training in Health Education resulted in an added impetus for the caretakers to see to the working of the pump without break-down, to ensure the uninterrupted supply of drinking water. It also paid rich dividends in the introduction of sanitary latrines in individual homes, protection through immunisation, etc.

The stage by stage action involved in organising and conducting a training camp will be seen by delegates during their field visit to Tiruparankunram Block.

Monitoring and Reporting

1. The intimation card promptly conveys breakdown of pumps simultaneously to the Block Development Officer and the TWAD Board.

2. The log sheet gives a record of the ups and downs in the life of the pump. It is a double edged weapon, because it also exposes defaults of the official machinery.

3. A daily report is made of repairs carried out by Mobile Repair Team. The log of the Mobile Repair Team vehicle has to be closed every day. Details of pumps repaired are also recorded. I used to get them for one full year, although subsequently such reporting became more erratic. However, this system has a great many advantages and I would strongly recommend its continuance.

4. A weekly progress report can be used with suitable modifications, detailing the nature and number of repairs attended to by the District Mobile Team.

5. Fortnightly progress charts give a broad outline of the general health of the pumps.

Conclusion

The availability of enthusiastic young men in villages, willing to work for community betterment, is one of the significant discoveries of the project. Their selection must, however, be made with care and their training must effectively prepare them to assume this responsibility.

The pump caretaker works on a purely voluntary basis. His interest will have to be sustained. This is achieved through periodical newsletters.

Contrary to popular belief, another significant finding is that the Indian ryot, who has made this country surplus in food, is not averse to change in his habits of sanitation. We are thus on the threshold of a new era of potential changes being brought about through community education and participation.

APPENDIX X

THE DOSSIER ON HANDPUMPS

DOSSIER INTRODUCED BY:

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Introduction

The Handpump Dossier has been compiled with a view to providing a systematic classification of available information on the Handpump Rejuvenation and Maintenance Programme, with a special emphasis on the planning of the Caretaker Training Programme and the implementation of the three-tier maintenance system.

State Governments have already agreed in principle to implement the three-tier maintenance system vide the 'Plan of Action' signed by each State Government, the Central Government and UNICEF, which specifies the procedures, targets and inputs to the Handpump Rejuvenation and Maintenance Programme. However, a practical and well-planned approach has yet to be devised to enable the extension of the Caretaker Programme from a pilot project phase to a wider implementation based on this 'model' in all deepwell handpump programme states. Primarily, planning a viable maintenance structure for the handpump programme necessitates the communication of information and experience acquired from a study of areas where the three-tier maintenance programme is already under implementation, and sharing such information with people involved in the handpump programme at all levels.

The contents of the Dossier have been divided into two sections:

General Information Files, providing a background on the handpump programme and its existing planning and implementation structure; and

Procedure Guidelines for the actual implementation process, specifying implementation procedures as well as programme requirements for the three-tier maintenance system and related programmes on Public Health Education.

In brief, the Dossier presents general and specific information in a non-technical style, allowing for easy reference and readability.

The information is intended to assist administrative and technical personnel of various departments connected with the handpump programme, and persons involved in its implementation at the state, block and district levels. The detailed classification of information provides an extensive as well as intensive insight to the programme, and serves as a reference guide at all levels, from programme planning to implementation.

Contents of the Dossier

The Handpump Dossier, classified into Information Files and

Procedure Guidelines, comprises of a number of sections which focus on separate - but integrated - aspects of the handpump programme.

The General Information Files detail information on

A. Handpumps and Maintenance
   The Programme

B. Tubewells

C. The Development of the India Mark-II Handpump

D. Handpump Rejuvenation and Maintenance
   The Plan of Action

E. The District Mobile Team and District Workshop

F. Village Handpump Caretakers

G. Water Treatment
   The Fluoride Removal Plant
   The Iron Removal Plant

The Procedure Guidelines cover

1. The District Mobile Team and District Workshop

2. The Block Mechanic

3. The Village Handpump Caretaker

4. Water Supply and Public Health Education

APPENDIX XI

RESULTS OF THE HANDPUMP SURVEY

RESULTS PRESENTED BY

RAYMOND L.M. JANSSENS
ASSISTANT PROJECT OFFICER, WES
UNICEF, NEW DELHI

In April 1979, UNICEF sent forms to District Engineers of 17 handpump programme districts requesting information on India Mark-II handpumps, manufactured in quality-controlled production centres, which had been in operation for at least one year in the field.

The survey (results on the following page) was conducted in 6 states: Andhra Pradesh, Bihar, Madhya Pradesh, Orissa, Tamil Nadu and West Bengal. A total of 450 forms were sent out for collection of the required information. This exercise resulted in a return of 633 forms, an extremely encouraging response indicating the enthusiasm with which the survey was carried out. The period of operation of the handpumps surveyed ranged from 10 to 29 months.

The details covered by the proforma included information on the date of installation, whether installed by a District Mobile Team or contractors, and whether the installation was on an existing or new tubewell. The survey asked for the provision of non-technical data, concentrating on the condition of platform construction, the number of breakdowns, nature of breakdowns and repairs (whether to the above-ground mechanism in the pump head or in the below-ground assembly), and the costs involved in maintenance. Maintenance costs covered only the cost of spare parts, although a few districts also indicated expenses incurred on petrol, oil and lubricant.

Conclusions

One of the major factors the survey confirms is the distinct co-relation between the quality of platform construction/ materials used, and the frequency of breakdowns. Poor platform construction results in loosening of the pedestal in its concrete foundation and consequent oscillation of the below-ground assembly, which in turn leads to extra strain on the joints of pipes and connecting rods/damage to cylinder. Correct installation procedure, therefore, and the use of quality material is essential for the life and performance of the India Mark-II handpump.

The survey also indicates the significant decrease in costs of maintenance incurred on spare parts, arriving at an average of Rs.35.20 per pump per year. The figures provided ranged from an expense of Rs.4.31 per pump per year in Purulia District, West Bengal to Rs.55.20 in Nalgonda District, Andhra Pradesh.

94.9% of the surveyed pumps (i.e. 66.3% 'working properly' and 28.3% 'minor repairs required) are in working order after an average operational span of 16.5 months.

In the previously used double guide cast-iron handpumps, the above-ground mechanism accounted for approximately 75% of the breakdowns; this survey indicates that the pumphead breakdown factor for the India Mark II pump head is only 8.5% and the below ground mechanism (pipes, connecting rods, cylinder) accounts now for 91.5% of the breakdown percentage. Of this, the cylinder accounts for 80% of the repairs required (note that very few of the surveyed pumps have the recently developed India Mark II cast-iron cylinder and standard bright steel rods).

INDIA MARK II HANDPUMP SURVEY RESULTS

1. States and districts in which the survey was conducted:

1.1 Andhra Pradesh		1.2 Bihar	1.3 Madhya Pradesh	
Chittoor	Mahboobnagar	Singhbhum	Bhopal	Sehore
Medak	Nellore		Raipur	Seoni
Nalgonda			Raisen	

1.4 Orissa	1.5 Tamil Nadu	1.6 West Bengal
Keonjhar	Kanyakumari	Bankura
	Ramanathapuram	Purulia
	Tirunelveli	

2. Number of India Mark II handpumps surveyed : 633

3. Surveyed India Mark II handpump installed on existing tubewell : 45.94%
   Surveyed India Mark II handpump installed on new tubewells : 54.06%

4. Condition of platform

   4.1 Good and firm foundation : 91.3%
   4.2 Fair platform : 4.0%
   4.3 No platform constructed : 4.7%

5. Condition of platform drainage

   5.1 Good drain provided : 93.9%
   5.2 Stagnant water : 4.6%
   5.3 No drainage constructed : 1.5%

6. Handpump installed by

6.1	District Mobile Maintenance Teams	: 83.95%
6.2	Contractor	: 16.05%

7. Operational condition of handpump

7.1	Working properly	: 66.30%
7.2	Minor repairs required	: 28.60%
7.3	Major repairs required	: 4.30%
7.4	Out of order	: 0.80%

8. How often has the handpump broken down?

8.1	Never	: 33.04%
8.2	Once	: 44.16%
8.3	Twice	: 14.30%
8.4	More	: 6.50%

9. Nature of breakdown

9.1	Pump head (above-ground mechanism)	: 8.50%
9.2	Below-ground mechanism	: 91.50%

10. Total maintenance cost for spare parts incurred for 633 pumps = Rs. 22,283.35, giving an average per pump of Rs. 35.20.

11. Total number of months the surveyed pumps have operated = 10,522, giving an average of 16.6 months per pump.

APPENDIX XII

ORGANOGRAM ON OPERATIONAL STRUCTURE OF THE HANDPUMP REJUVENATION AND MAINTENANCE PROGRAMME AND THREE-TIER MAINTENANCE SYSTEM

PRESENTED BY:

RAYMOND L.M. JANSSENS
ASSISTANT PROJECT OFFICER, WES
UNICEF, NEW DELHI

The purpose of the organogram, indicating the organisational set-up of the rejuvenation and maintenance, and caretaker programme, is to identify the potential areas of constraint in the implementation process.

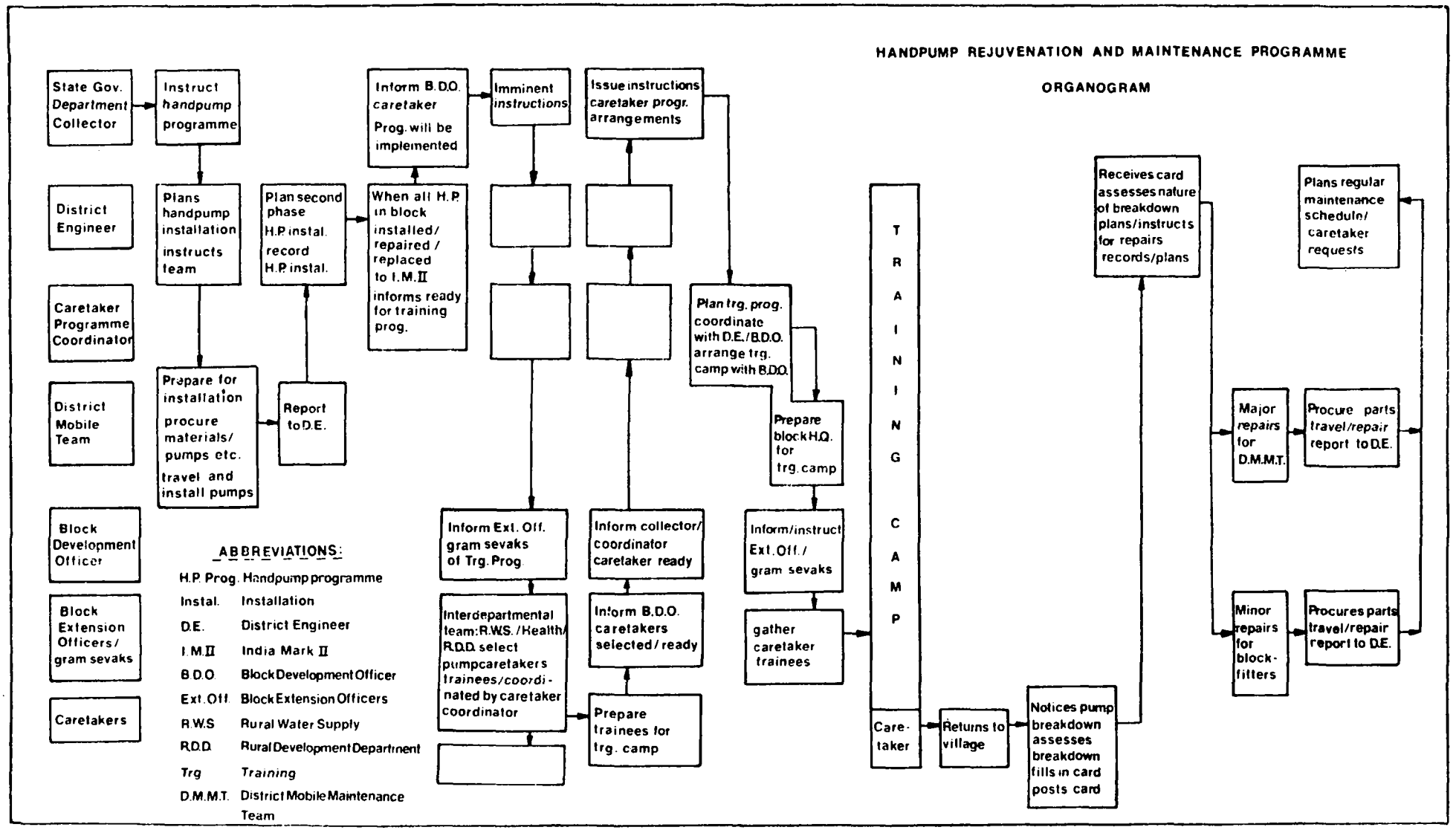
The organisational structure is presented in vertical lines of varying lengths, depending on the number of persons and levels involved in the implementation, and serves to illustrate the communication problems which arise within the various levels.

The problem is not limited merely to communication within the vertical heirarchy, but also extends to co-ordination between the several departments comprising of administrative and technical personnel involved in the programme..

Communication and co-ordination problems thus clearly indicate the necessity for a State Project Co-ordinator who would co-ordinate and streamline the functioning of the handpump rejuvenation and maintenance programme, and the handpump Caretaker Training Programme.

The organogram also suggests an alternative method for reporting breakdowns at the village level.

The present system requires the caretaker to intimate both the block level and the district level in the event of breakdowns. An alternative method advocates that such intimation be sent directly to the district level. The District Engineer can then assess the nature of repairs indicated by the problem mentioned, on the basis of which he could decide whether the repairs are of a major or minor nature. Repairs would thus be attended to by either the block mechanic (for minor repairs) or the district mobile team (for major repairs), as opposed to the present system which calls upon both levels simultaneously, which can result in an occasional overlapping of repair operations.


HANDPUMP REJUVENATION AND MAINTENANCE PROGRAMME
ORGANOGRAM
State Gov. Department Collector
Instruct handpump programme
Inform B.D.O. caretaker Prog. will be implemented
Imminent instructions
Issue instructions caretaker progr. arrangements
District Engineer
Plans handpump installation instructs team
Plan second phase H.P. instal. record H.P. instal.
When all H.P. in block installed/ repaired / replaced to I.M.II informs ready for training prog.
Caretaker Programme Coordinator
District Mobile Team
Prepare for installation procure materials/ pumps etc. travel and install pumps
Report to D.E.
Plan trg. prog. coordinate with D.E./B.D.O. arrange trg. camp with B.D.O.
Prepare block H.Q. for trg. camp
Block Development Officer
Block Extension Officers/ gram sevaks
Caretakers
Inform Ext. Off. gram sevaks of Trg. Prog.
Inform collector/ coordinator caretaker ready
Inform/instruct Ext. Off./ gram sevaks
Interdepartmental team: R.W.S./Health/ R.D.D. select pumpcaretakers trainees/coordinated by caretaker coordinator
Inform B.D.O. caretakers selected/ ready
gather caretaker trainees
Prepare trainees for trg. camp
TRAINING CAMP
Care-taker
Returns to village
Notices pump breakdown assesses breakdown fills in card posts card
Receives card assesses nature of breakdown plans/instructs for repairs records/plans
Plans regular maintenance schedule/ caretaker requests
Major repairs for D.M.M.T.
Procure parts travel/repair report to D.E.
Minor repairs for block-fitters
Procures parts travel/repair report to D.E.
ABBREVIATIONS:
H.P. Prog. Handpump programme
Instal. Installation
D.E. District Engineer
I.M.II India Mark II
B.D.O. Block Development Officer
Ext. Off. Block Extension Officers
R.W.S Rural Water Supply
R.D.D. Rural Development Department
Trg Training
D.M.M.T. District Mobile Maintenance Team

APPENDIX XIII

REPORT OF THE SUB-COMMITTEE ON COMPARATIVE MAINTENANCE COSTING

(Double Guide Cast Iron Pump, Jalna Sholapur and sub-standard copies IM II Design and Approved Production India Mark-II Pump)

PAPER PRESENTED BY:

KENNETH R. MCLEOD
PROJECT OFFICER, WES
UNICEF, NEW DELHI

Members of the Sub-Committee: The members appointed to the sub-committee were Mr Kenneth R. McLeod, Project Officer, UNICEF, New Delhi; Mr M.Subramaniam, Superintending Engineer, TWAD Board; Mr K. Muthuswamy, Executive Engineer, TWAD Board; Mr M.A. Sattar Baig, Executive Engineer, Panchayati Raj, Andhra Pradesh; Mr V.K. Jain, Superintending Engineer, PHED, Madhya Pradesh; Mr T. Kanagarajan, Assistant Project Officer, UNICEF, Hyderabad; Mr B.B. Panda, Executive Engineer, PHED, Orissa; and Mr D. Das Gupta, Superintending Engineer, PHE Directorate, West Bengal.

A survey was conducted in six states where approved production India Mark-II pumps had been installed for periods exceeding one year. In total, 586 installations were checked; however, from the survey were selected the ten oldest installations in each of the six states as an example, to arrive at an average spare parts cost. The spare parts average cost was Rs.36.10 per pump per year, and unlike the maintenance structure in the past, this figure covers continuous operation. Many double guide pumps in the past allocated some Rs.300 for spare parts alone, exhausted this amount in 3 months operation, if maintenance was kept up to the mark. I would suggest the maintenance of Double Guide Cast Iron pumps, if they were efficiently serviced for a period of one year, the spare parts alone, would cost in excess of Rs.1,000 per pump per year.

However, for the sake of this exercise let us look at the cost of supporting a viable maintenance structure to service the India Mark-II installation for a period of three years, ensuring at the same time a constant supply of potable water to a village.

The Three-Tier System

District level Mobile Maintenance Team. Covering 500 installations.

One Junior Engineer, one driver, one mechanic, two helpers, and a mason. The mason can be trained as a helper and it would seem this often results in the team as a unit carrying out installations and platform construction as a package operation.

The working group agreed that the support of a team unit, salaries and allowances for the above personnel, depreciation of the vehicle over five years, diesel fuel - oil and lubricants, maintenance of the vehicle, projected over three years would be covered by Rs.60,000 per team per year. Add to this the spares for India Mark-II @ Rs.65 (nearly double the survey result) per pump per year for 500 installations.

Total Rs. 32,500

Add Block level Inspector/Mechanic covering 50 units @ Rs.6,000 salary

per year multiplied by 10 to cover 500 installations, i.e.

Rs.60,000

Total cost of 500 pumps $\frac{\text{Rs.}152,500}{500}$ = Rs.305 per pump per year.

The working group accepted Rs.305 as a realistic figure allowing for all contingencies projected over three years; however, to cover a margin a final cost was rounded at Rs.320 per pump per year. Consider that present cost factors indicate that the India Mark-II properly installed, supported by the three-tier system can be fully covered at a rate between Rs.150 and Rs.200 per pump per year.

The comparison, using figures supplied by the TWAD engineers and agreed to by engineers from West Bengal, Orissa and Andhra Pradesh the present day maintenance costs were nominated covering (1) Cast Iron Double Guide Pumps, and (2) Jalna, Sholapur, and sub-standard copies of the India Mark-II design.

(1)	CI double guide	Rs.650 per pump per year
(2)	Jalna, etc.	Rs.500 per pump per year

Appreciate that the figures above represent present day estimates, whereas the projected annual figure of Rs.320 for genuine India Mark-II represents a projection for three years hence.

The three-tier system is designed to support India Mark-II standardisation and cannot be expected to form a viable support to the sub-standard installations. The figures quoted for the latter did not and cannot support a viable maintenance system. It is suggested that even one team for every 100 sub-standard pumps would not provide viable maintenance, whereby a constant supply of potable water could be guaranteed to the village.

In conclusion, based on the maintenance costs alone, it is obvious that standardisation to the India Mark-II Pump must be a priority and the conversion programme as defined in each state "Plan of Action" executed as soon as possible. Furthermore, for the ongoing programme only first quality India Mark-II pumps must be supplied from approved and reputable manufacturers, who can meet the standards as defined under Crown Agent quality control inspection procedures.

A G E N D A

A N D

A T T E N D A N C E

NATIONAL CONFERENCE ON DEEPWELL HANDPUMPS

AGENDA

TUESDAY, JULY 10, 1979

REGISTRATION

INAUGURATION

SESSION I

PRESENTATION OF DATA COLLECTION PROFORMAE	Dr John D. Skoda Senior Programme Officer, UNICEF
STATUS PAPER ON THE NATIONAL RURAL WATER SUPPLY PROGRAMME	Shri A. Sankaran Adviser, CPHEEO Government of India
PLANNING AND MANAGEMENT OF RURAL WATER SUPPLY FACILITIES IN TAMIL NADU	Shri K. Madhava Sarma Managing Director TWAD Board, Tamil Nadu

SESSION II

STATUS PAPERS

TAMIL NADU	Shri R. Krishnaswamy Chief Engineer TWAD Board, Tamil Nadu
MADHYA PRADESH	Shri P.N. Qazi Engineer-in-Chief PHED, Madhya Pradesh
ANDHRA PRADESH	Shri N. Ramachandra Rao Chief Engineer Panchayati Raj, Andhra Pradesh

WEDNESDAY, JULY 11, 1979

SESSION III

STATUS PAPERS

ORISSA	Shri B.B. Panda Executive Engineer, PHED, Orissa
WEST BENGAL	Shri A.K. Poddar Chief Engineer, PHE Directorate West Bengal
GUJARAT	Shri S.K. Shah Chief Engineer, PHED, Gujarat
KARNATAKA	Shri B. Subbaiah Chief Engineer, PHED, Karnataka

MAINTENANCE EXPERIENCE OF HANDPUMPS

PUDUKOTTAI DISTRICT	Shri M. Subramaniam Executive Engineer TWAD Board, Tamil Nadu
TIRUCHIRAPALLI DISTRICT	Shri K. Muthuswamy Executive Engineer TWAD Board, Tamil Nadu
MADURAI DISTRICT	Shri K. Murugesan Executive Engineer TWAD Board, Tamil Nadu
HANDPUMPS AND QUALITY CONTROL	Shri G.B. Hale Regional Engineer Crown Agents, Bangalore

SESSION IV

STUDY OF THE INDORE SANITATION PILOT PROJECT	Shri V.K. Jain Superintending Engineer, PHED Madhya Pradesh
WATER, HEALTH AND COMMUNITY PARTICIPATION	Dr E. Victor District Health Officer Tirunelveli District, Tamil Nadu
CARETAKER PROGRAMME IN TIRUNELVELI DISTRICT, TAMIL NADU	Shri M. Francis Project Coordinator, UNICEF
TUBEWELL AND HANDPUMP PROJECT IN UTTAR PRADESH	Shri Virendra Kumar Superintending Engineer U.P. Jal Nigam, Uttar Pradesh

THURSDAY, JULY 12, 1979

FIELD VISITS

CARETAKER TRAINING PROGRAMME (MADURAI DISTRICT)
CARETAKER REFRESHER TRAINING COURSE (RAMNATHAPURAM DISTRICT)
HANDPUMP INSTALLATIONS (MADURAI DISTRICT)

GROUP DISCUSSION ON THE MAINTENANCE SYSTEM AS OBSERVED DURING THE FIELD TRIP

FRIDAY, JULY 13, 1979

VALEDICTORY SESSION

INTRODUCTION TO THE DOSSIER ON THE HANDPUMP PROGRAMME	Shri Raymond L.M. Janssens Assistant Project Officer, UNICEF
PRESENTATION OF HANDPUMP SURVEY RESULTS	Shri Raymond L.M. Janssens Assistant Project Officer, UNICEF
ORGANOGRAM ON THE ORGANISATIONAL STRUCTURE OF THE THREE-TIER MAINTENANCE SYSTEM	Shri Raymond L.M. Janssens Assistant Project Officer, UNICEF
REPORT OF THE SUB-COMMITTEE ON COMPARATIVE MAINTENANCE COSTING	Shri Ken McLeod Project Officer, UNICEF
PRESENTATION OF THE CONFERENCE RECOMMENDATIONS AND RESOLUTIONS BY THE WORKING GROUP	Shri K. Madhava Sarma Managing Director TWAD Board, Tamil Nadu

CLOSING SESSION

SUMMING UP OF THE PROCEEDINGS, RECOMMENDATIONS AND RESOLUTIONS OF THE CONFERENCE	Shri A. Sankaran, Adviser, CPHEEO Government of India
	Dr John D. Skoda Senior Programme Officer UNICEF
VALEDICTORY ADDRESS	Shri Muthu Mayor of Madurai, Tamil Nadu
VOTE OF THANKS	Shri V. Venugopalan Deputy Adviser, CPHEEO Government of India

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16. Shri E. Ring
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