DRAFT

APPRAISAL OF USAID-ASSISTED NATIONAL HAND PUMP PROGRAMS IN SRI LANKA, THE PHILIPPINES, INDONESIA, HONDURAS, AND DOMINICAN REPUBLIC

Prepared for U.S. Agency for International Development
Office of Health/Bureau of Science and Technology

by

Ir. E.H. Hofkes

February 1983

The Pragma Corporation
Falls Church, Va.
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Many persons helped me in making the contribution, here reported, to the appraisal of the AID Hand Pump Program. I wish to express my appreciation to all those who gave so generously of their time and knowledge in the course of this consultancy. Especially, I should like to mention:

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During the appraisal mission, the evaluation team (McJunkin, Donaldson, Potts and Hofkes) met several times in somewhat more reflective sessions, to review preliminary findings and impressions, and to compare notes. These review sessions were of great benefit to me for keeping on track with the work.

Those who learn most from an appraisal effort, are the evaluators themselves. This being so, it follows that there exists an obligation to further share with others any information that was obtained during the appraisal mission and may be useful to them. I will be happy to do so.

Ebbo H. Hofkes

SUMMARY AND RECOMMENDATIONS

A. Objective and Scope of Appraisal

1. Since 1966, USAID has promoted, in a substantial number of developing countries and in collaboration with institutions in the U.S. and elsewhere, various activities which collectively may be referred to as the AID Hand Pump Program: a technical cooperation effort aimed at the development of a sturdy, reliable handpump to meet the requirements of rural water supply programmes in Third World Countries. A handpump design (herein further referred to as the AID-type) has resulted from this cooperation effort.

2. An appraisal effort was carried out to provide USAID, through its Bureau of Science and Technology/Office of Health, with a consolidated assessment of the AID Hand Pump Program. The consultant's contribution, reported here, aimed at providing an external, objective expert opinion.

3. The consultant's contribution involved:

i) Visits to five countries [1]) where AID-assisted national handpump programs have been, or are being carried out, for the purpose of on-site assessment of the residual effect of the AID technical cooperation work in the areas of design development, local manufacturing, installation practice and maintenance of the AID-type handpump.

ii) Review a considerable number of reports and technical documents [2]) that have been generated by or are related to the AID Hand Pump Program generally, or AID-assisted national handpump programs specifically.

iii) Interviews of key personnel of USAID, Georgia Tech and WASH; of U.N. organisations active in the water supply and sanitation sector, such as UNICEF, UNDP, World Bank, and WHO; of non-governmental organisations such as Peace Corps, CARE, ITDG (U.K.), TOOL (Netherlands), Helvetas (Switzerland); and several experts in bilateral aid agencies, as well as others who have been involved in, or are familiar with all or part of the AID Hand Pump Program.

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[1]) Countries visited: Sri Lanka, Philippines, Indonesia,; Honduras, Dominican Republic.

[2]) List of reviewed reports and technical documents under "References"

4. The objective of the consultant's contribution to the appraisal effort, was to help establish an adequate knowledge base for guidance of the following groups:
   - national government agencies responsible for planning and/or implementation of rural water supply programs and projects
   - manufacturers of handpumps
   - technical personnel involved in handpump design and development
   - AID Mission staff
   - AID/Washington
   - other donor agencies, and
   - international organizations active in the rural water supply sector of developing countries.

B. Observations and Recommendations

1. Laboratory Evaluation of Handpump to Support Field Trials

It has become more and more clear that laboratory evaluation of handpump under properly controlled conditions is both cheaper and much quicker to carry out than field trials which, by their very nature, are always far less controlled. Laboratory evaluation including full technical assessment of a handpump design, can indicate potential areas of weakness and provide early warning of failure. In other words, laboratory testing of handpumps, under controlled conditions, can help filter out design weakness that otherwise would not fail to show up under actual-use field conditions.

Obviously, field trials of handpumps are indispensable for providing validated information on handpump performance under actual-use, field conditions. Laboratory evaluation of pumps should be carried out to support field trials, not substitute for these.

Currently, AID-type pumps, i.e. units manufactured in several countries (e.g. Honduras, Dominican Republic, Nicaragua, Indonesia), are being laboratory tested at a special testing facility established at Georgia Tech, Atlanta. Further, an AID-type pump manufactured in Honduras, is under test with the British CA Testing and Research (CATR) Institute, at a controlled testing facility near Braintree, England.

Laboratory evaluation of handpumps, under controlled conditions, is a relatively new development which only started, in a well-designed manner, in late 1979. The AID Handpump Program which runs already since 1966, would probably have greatly benefitted from an earlier start of this type of work.

2. Integration of Various Activities under the AID Hand Pump Program

It is interesting to note that there is a 10-year interval between the finalization of the original AID/Batelle pump design plus prototype manufacture (1966), and the first extensive field trials (1976). This is particularly noteworthy, when one compares the AID-type pump development with similar projects (e.g. India Mark II Pump, IDRC/Waterloo pump, New No.6 pump/Bangladesh, Volanta/Upper Volta, Shinyanga and Morogoro pumps/Tanzania), in which field trials followed closely on the final pump design stage.

USAID should consider further support of local manufacture of handpumps, but this should not necessarily be tied to the promotion of the AID-type handpump. The appraisal results, here reported, and other available information indicate that the AID Hand Pump Program has been less successful in those countries where locally manufactured handpumps with an established market and potential for upgrading already were existing. The assistance and financial support available through the AID Hand Pump Program could perhaps have produced better results through national projects for redesigning and upgrading one or more of the existing pump models in selected countries. For example, UNICEF in Bangladesh systematically helped improve an existing pump, the No.6 model, by introducing a host of relatively small design modifications, and so arrived at a good-quality pump which was expertly called the New No.6 pump (not the "UNICEF" pump). Similarly, in India, UNICEF, in close cooperation with the government and interested manufacturers, used field-proven components from various existing handpumps to develop the India Mark II pump design which is very successful.

Also eligible for USAID support should be feasibility studies in situations where these are required to determine the appropriate mix of assistance to local manufacturers (small-scale, private interprises), and market development for handpumps.

Promotion of the AID-type pump as a potential candidate for large-scale use may be appropriate in those countries where suitable handpumps are not yet available, but where the capabilities for local manufacturing of pumps are present and can be mobilized.

3. The Need for Creating Handpump Maintenance Infrastructure

Handpumps must receive an adequate amount of maintenance and care, to give reliable service. The AID-type handpump certainly is no exeption to this rule. A leading principle in any handpump water supply project should be that a pump is selected under full consideration of its maintenance requirements, and the needed skills, tools and spare parts. Obviously, the technical design of a handpump should be cost-effective and suited to the operating conditions, but nothing much is achieved if the pump's maintenance requirements are not projected against what is feasible in terms of technical skills, finance and social organization.

Currently, the accepted approach to handpump maintenance is that a major part of regular maintenance duties should be carried out at the village-level, by persons selected from the community, and trained as pump caretaker (pump attendant). To develop village-level maintenance takes a prolonged and determined effort. Actually, villagers used to taking water from open well, have no experience with the maintenance requirements of a handpump. In their view, it thus often is so that a "new" problem is introduced by installing a pump on the well. If a new pump installation makes drawing of water much easier and quicker, the users of the pump may have a direct incentive to maintain the pump and care for it. Health education may also help stimulate an appreciation of the pump, if it succeeds in explaining to the water users the relationship between safe water and health protection.

The AID Handpump Program, sofar, has paid very limited attention to the maintenance aspects although these are inherent to any installing of pumps. To claim that, AID-type pumps in several of the participating countries, were only installed for field trial and performance monitoring purposes, is not a valid argument. It should be remembered that water supply is a basic need, and the covering of existing wells for installation of an AID-type pump is only justified if the new pump has proven to be reliable.

In all countries visited by the consultants, there appeared to be a great need to expand and upgrade the training effort in the AID-assisted national handpump programs. Suitable training aids to be used in the training and education effort are urgently needed, particularly in the local language and with extensive graphical presentation for the more elementary levels of instruction.

It has to be noted that, in several of the participating countries, cooperation with the host country government agencies appeared to be very limited. While it is true that effective working arrangements are often difficult to establish, there surely exist no other option than to try and develop them. Patient, prolonged and understanding work is required assisting the host country government agencies to develop the needed capabilities for handpump project implementation and maintenance organisation.

4. International Collaboration

USAID should help find an effective means of collaboration with other bilateral aid agencies, as well as with international organisations. At the national level, this is urgently needed in many countries. An example, is the need to reduce the proliferation of different kinds of handpumps and other water supply equipment. It is also needed at the regional and global level, in order to facilitate the transfer of handpump technology, training methodology, testing procedures, and training and instruction materials.

Many efforts are directed, by a host of national and international organisations, to the improvement of handpump technology available for rural water supply programmes. USAID needs to ensure that is is directly in touch with these efforts; is monitoring their results; and has the mechanism in position to provide national officials involved in AID-assisted handpump programmes with the necessary exposure and access to this technology.

5. Choice of Technology for Manufacturing the Pump

One important attribute (characteristic) of a handpump for large-scale water supply programmes, is the degree of complexity of the technology required for manufacturing it, i.e. the production processes and materials used.

The AID-type handpump requires casting, machining, and assembly technology at a relatively high level. For example, it requires a number of pivot pins to pass through several drilled holes, all of which have to line up and provide a sliding fit. It also requires that two machined-surface flanges match adequately. As a result, special jigs and fixtures are needed that are not always readily available. Where the precision of manufacture is less than envisaged, unexpected wear may develop at points such as the screwed joint of the pump body and the pump base. Such wear was actually observed in many of the pumps inspected.

Present manufacturing capabilities being what they are in most developing countries, the relatively high precision and close tolerance called for on the AID-type pump design may make manufacturers/foundries apprehensive of high rates of rejection and, thus, unprofitable rates of production. They may also be afraid that the specifications for raw materials and finished metal would prove to be beyond their ability to comply with. It must be recognized that, in several countries, pig iron is scarce.

Thus, it may be questioned whether the chosen technology for manufacturing the AID-type pump (i.e. casting, machining) is really the most appropriate in all countries where USAID-assisted projects have sought to introduce the pump. For instance, The India Mark II deepwell handpump is of welded-steel construction, while India's industry base and capabilities are certainly not less than those of most other developing countries.

6. Technical Comments and Conclusions

Materials Choice

Brittle materials (e.g. cast iron) should basically not be used in pump components that are subject to shock loading either during operation of the pump, or during transportation to the well site. The cast iron handle of the AID-type pump clearly is susceptible to breakage.

Corrosion resistance is essential for all hand pump parts, especially those that are in direct contact with the water. Serious corrosion was observed in many AID-type pumps inspected in the field.

Quality Control Standard

Handpump designs should avoid the need for a high level of quality control and very close manufacturing tolerances. It appears to be difficult for manufacturers, in many countries, to meet the standard of quality control required for producing a good-quality AID-type pump.

Cylinder Size

The choice of cylinder diameter should not be made without full consideration of the conditions under which the pumps will have to operate in a specific country. Selecting a 2-inch pump cylinder, instead of the 3-inch I.D. cylinder used commonly for the AID-type pump, may be a realistic and effective design modification in several countries.

Bearings and Pivot Pins

Bearings and pivot pins should be able to function without requiring frequent maintenance. It is probably unrealistic to assume that the type of frequent maintenance (e.g. greasing) that is needed for the AID-type pump's, pump rod sliding blocks will be routinely provided.

The bushings used in the pump handle pivot points of the AID-type pump design represent a problem, as they frequently work loose. A sleeve bearing material such as Rulon J in combination with pins made of (stainless) steel hardened to about 35 Rockwell C may perform better. The ability of this bearing combination (or a combination of equally suitable materials) to operate satisfactorily without lubrication, would significantly extend the useful life of the pump handle pivots.

Spout

At many AID-type pump sites, a "wavy", unstable outflow of the water from the outlet was observed. The outlet of many AID-type pump inspected in the field, had been modified by the pump users.

Valves

The footvalve (flapper value) used in the AID-type pump design is of particular concern, as it is a frequent cause of pump failure. Currently, in several AID-assisted handpump projects a hard plastic poppet-type valve is being developed, which hopefully will remedy the serious footvalve leakage problem.

Excessive corrosion of the footvalve's iron seat, and around it, was noticed frequently. The hard plastic poppet-type valve under development, may also alleviate this problem. Another option is to use the footvalve of the "Dempster" cylinder, with an appropriate method to fix it in the AID-type pump.

1. The AID Hand Pump Program

1.1 Introduction

Since 1966, US AID has promoted, with a substantial number of developing countries [1]) and in collaboration with institutions in the U.S. and elsewhere, various activities which collectively may be referred to as the AID Hand Pump Program: a technical cooperation effort aimed at the development of a sturdy, reliable handpump to meet the requirements of rural water supply programmes in Third World Countries. A handpump design (herein further referred to as the AID-type pump)[2]) has resulted from this cooperation effort.

In most of the countries involved in the AID Hand Pump Program, part of the cooperation effort was directed at determining the feasibility of locally manufacturing the AID-type hand pump. In those countries where a sufficient market potential was identified and where adequate local manufacturing capabilities were found to exist, AID has - under various arrangements, and with funding from several regional bureaux and country missions - proceeded to cooperate with national government agencies, local manufacturers and others concerned, towards the implementation of a relatively small production run of AID-type pumps of acceptable quality and price.

Further work under the AID-assisted National Hand Pump Programs involved the selection of suitable well sites and the installation of locally manufactured AID-type pumps for monitoring and evaluation of performance under field conditions; assessment of maintenance and repair requirements; training in pump installation, maintenance and repair; and in some cases, limited surveillance of the water quality of the wells pumped by the installed AID-type pumps.

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1) The Program has been active in the following countries:
Costa Rica, Dominican Republic, Ecuador, Honduras, Nicaragua, Indonesia, Sri Lanka, Philippines; Liberia, Togo; Marocco Tunesia.

2) Also known as the AID/Battelle pump.

The rationale of this AID cooperation effort is that the handpump has to be accepted as a very important, often critical, element in rural water supply programmes. Handpumps frequently offer an economical means of obtaining an accessible, adequate supply of safe water in situations where a protectable spring or similar source of water supply is not available.

AID launched and continued its handpump development effort for one basic important reason: the record of rural water supply hand pump programmes is not good. In fact, these programmes are beset with problems.

Information collected by IRC 1) shows that handpumps installed for community (village) water supply purposes, often suffer from inadequate design, poor quality of manufacture, and weak maintenance provisions generally. Failure rates of 50% and more within two year after installation, are not uncommon. The problems have a worldwide dimension, as they are experienced in most countries where handpumps are used on a large scale.

The problems are of considerable concern to USAID, in view of the Agency's substantial involvement in rural water supply and sanitation programmes in many countries, as evidenced by the following figures:

AID Funding, Water Supply and Sanitation [2])
in million US $ (1978-1982)

	FY 1978	FY 1979	FY 1980	FY 1981	FY 1982
DA	59,9	78,5	118,7	71,2	60,7
ESF	166,5	192,1	139,5	237,9	163,0
Total	226,4	270,6	258,2	309,1	223,7

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1) International Reference Centre for Community Water Supply and Sanitation, WHO Collaborating Centre in The Hague, Netherlands.

2) AID Policy Paper "Domestic Water and Sanitation", May 1982 Table 1, p.5.

1.2. Brief Survey of USAID-assisted National Hand Pump Programs and other Project Activities

AID/Battelle Handpump Development Project

This project, started in 1966, aimed at developing a study handpump, suitable for use in developing countries, and capable of being manufactured locally. The project was carried out by Batelle laboratories, of Colombus (U.S.A.).

The project was organized in three stages. The first stage involved a study to determine the requirements imposed upon handpumps under the conditions prevailing in Third World Countries; to identify the shortcomings of existing pumps; and to develop detailed criteria for the design of a suitable pump. In this phase, extensive laboratory tests were conducted to produce the necessary information base for the final envolvement of a new pump design. The second stage involved the design, construction and evaluation of a prototype pump, and a possible set-up for a typical small-scale workshop for the manufacture of the new pump. This phase was later expanded to include some additional tests of the developed pump model to determine its characteristics in comparison with existing models.

In the third stage of the project, some field evaluation was conducted which included collaboration with several manufacturers in the production of pumps, the preparation of an instruction manual for installation and maintenance.

Under a separate contract a field evaluation programme of the AID/ Battelle pump was conducted in three countries; Bangladesh (in cooperation with UNICEF), Nigeria (with CARE), and Thailand (with AID mission). The final design of the AID/Battelle pump was developed in late 1976.

Costa Rica

USAID-assisted handpump activity in Costa Rica began in January 1977, in collaboration with the Ministry of Health. Following local manufacture of 30 AID-type pumps, field trials were conducted over the period May 1977 - September 1979. Other pumps field tested for comperative evaluation of the AID-type pump were: Dempster 210F, and

Kawamoto Daiichi "Lucky". As a result of the field tests, some design modifications were introduced to improve the Costa Rican AID-type pump.

Nicaragua

USAID-assisted handpump activity in Nicaragua began, as in Costa Rica, in January 1977. Arrangements were made for the local manufacture of 30 AID-type pumps, which were subsequently installed at selected wells for field trials. Also field tested, for comperative evaluation, were the Dempster 210F, Marumby (Brasil) and Waterloo/IDRC pumps.

Dominican Republic

In early 1978, an assessment was made of existing manufacturing capabilities for producing the AID-type pump locally. An analysis was made of the local manufacturing costs, for comparison with the costs of importing the pump. In August 1978, Georgia Tech was contracted to help develop local manufacturing capabilities and conduct field tests. A prototype AID-pump was available from Nicaragua. Of the first 24 pumps manufactured locally, 21 were installed on selected wells.

Honduras

Following a survey of the need for an AID-type pump, arrangements were made for the local manufacture of a first production run. A number of these pumps have been installed in selected project areas.

Bolivia

The need for a suitable handpump was assessed and found to be substantial, with an estimated immediate market for 9,000 units. Sufficient manufacturing capabilities were also identified.
However, the World Bank-funded Ingavi Integrated Rural Development Project already had developed a low-cost, locally manufactured handpump (the "Ingavi" pump) which appears to be prefered for use in rural water supply projects in Bolivia.

Indonesia

USAID-assisted handpump activity in Indonesia began in early 1978. A feasibility study for manufacturing the AID-type pump locally, was carried out. In September 1978, Georgia Tech was contracted to assist a selected foundry/workshop in producing 230 AID-type pumps, and to arrange for field tests. Some 60 of the pumps were installed on selected wells, of which 35 in the Bandung area, 10 in districts near Jakarta, and 11 at a number of schools for sanitary technicians. Results from the field tests, were fed back to the manufacturer, in order to help upgrade the quality of AID-type pump production. Later, CARE has been installing some 450 AID-type pumps in several of their rural water supply projects in Indonesia. Some government agencies and aid organisations are reported to consider the AID-type pump for their water supply projects.

Sri Lanka

A feasibility study of locally manufacturing the AID-type pump in Sri Lanka, was carried out by Georgia Tech in October 1979. The study concluded positively, and a suitable foundry/machine shop was identified. Local production of the AID-type pump began in March 1980. Arrangements for field testing of the locally produced pumps were made, and actual field trials were conducted from September 1981 to August 1982, with active monitoring of field performance.

Togo and Benin

A feasibility carried out in Togo concluded that the AID-type pump would not be suitable for the requirements of that country. The same conclusion was found to apply to Benin. Many of the wells are very deep (50m and more). The AID-type pump, even whit a small (2-inch) diameter cylinder, has been designed for depths of up to 35-40m.

Liberia

No foundries /machine shops with adequate manufacturing skills and equipment for producing the AID-type pump were found in Liberia.

Tunisia

In April 1980, a study was carried out by Georgia Tech to determine whether a USAID-assisted handpump program would be feasible. A survey of foundries, machine shops, plastics manufacturers, and retail stores indicated that local manufacture of the AID-type pump would be a viable alternative to the existing costly import of pumps. In August 1980, Georgia Tech was contracted by USAID/Tunesia to provide technical assistance in local manufacturing, and to arrange for field performance monitoring of the pump. In January 1981, a prototype AID-pump was produced, and subsequently a first run of 40 AID-type pumps was produced by April 1981.

Marocco

Some handpump activity was carried out in Marocco, under the AID Hand Pump Program. However, it has not been possible to determine what the purpose and the scope of this activity was.

Philippines

Following a feasibility study of locally manufacturing the AID-type pump, Georgia Tech was contracted by USAID/Manila to identify a suitable foundry/workshop, to help develop manufacturing capabilities, and to arrange for the production of a first production run of the AID-type pump. Later, installation of these pumps at selected well sites was undertaken, and field performance monitoring was organised.

Other Activities

Currently, the AID-type pump, i.e. a unit manufactured in Honduras, is under test at the British CA Testing and Research (CATR) Institute, at a test site near Gosfield, East Anglia, England. This testing is carried out for the UNDP/World Bank Project of Testing and Technological Development of Rural Water Supply Handpumps (INT/81/026). CATR is examining the AID-type handpump using the procedures that have been established for the testing of some 25 pre-selected pumps under evaluation by the UNDP/World Bank project.

A similar performance and endurance test, on AID-type pumps manufactured in different countries (e.g. Honduras, Dominican Republic, Nicaragua, Indonesia) is being carried out at Georgia Institute of Technology, in Atlanta, using a pump testing facility especially designed and constructed for the purpose.

2. Appraisal

2.1. Scope of Appraisal

The purpose of the appraisal effort reported here, is to provide AID, through its Office of Health/Bureau of Science and Technology, with an external, objective, expert opinion on the AID Hand Pump Program.

The appraisal concentrated on determining, to the extent possible in the available amount of time, the residual produced by the AID-assisted national handpump programs, in terms of:

- handpump technology development
- technical suitability of AID-type pump design
- local manufacturing capabilities
- market for locally produced AID-type pump
- institutional development (i.e. maintenance structure)
- skills of national personnel involved
- acceptance of pump by users
- community involvement in pump selection, installation and maintenance.

An assessment of health benefits that may have been obtained through the installation of the pumps, formed no part of the present study.

The appraisal aimed at contributing to the knowledge base available to the following groups:

- national government agencies responsible for planning and/or implementation of rural water supply programs and projects
- manufacturers of handpumps
- technical personnel involved in handpump design and development
- AID Missions
- AID/Washington
- other donor agencies, and
- international organizations active in the rural water supply sector in developing countries.

In each country visited, the pump sites to be inspected were selected in the project areas concerned. The appraisal team had little difficulty finding users willing to provide information on the pumps.

At each pump site, an attempt was made to obtain tentative answers to the following groups of questions:

On pump's condition and surrounds

- wear of pump head components, any visible corrosion, any indication of pilferage or vandalism
- any evidence of failure or malfunctioning of below-ground pump parts
- any accumulation of dust or sand on moving parts
- whether or not greased/lubricated
- pump's surrounds clean?
- if there are more than one pump, any noticeable difference in condition; any marked user's preference? If so, what might be the reason.

On the well

- (estimated) depth of water in the well
- water delivery rate when pump operated (any marked difference for slow/fast pumping speed)
- ease of pumping; force on the handle required for pumping (high/ normal/low).

On quality of water pumped

- general appearance of water; clear? any turbidity or sand/silt
- other indications, e.g. temperature.

There was opportunity nor time to have water samples tested at the pump sites visited.

On the water users

- rough estimate of number of people using the pump regularly
- for what type of water use they rely on the pump
- how users operate the pump
- children allowed to play around and with the pump (e.g. hanging on the handle)

- types of containers used, and whether filling is easy/difficult
- pump appreciated by the users?

On the village/hamlet

- indications of wealth, such as radio, TV, tile or metal roofs, cattle
- soap available? can people afford it?
- did water supply situation improve, in terms of availability and reliability, through the installation of the pump?

US AID-assisted HANDPUMP PROGRAM in SRI LANKA

1. Background

The country has an area of 65,600 sq km. The maximum length of the Island is 353 km; at its widest point it measures 183 km. The relief features a mountainous area south of the centre with heights up to 2,438 m, surrounded by broad plains. The drainage is radially patterned.

Sri Lanka receives precipitation mainly from convectional rains and from two monsoons. The south-west monsoon brings rain mainly from May to July to the southern and western lowlands and the central hills. Rain from the north-east monsoon falls in December and January in the northern and eastern sectors of the island.

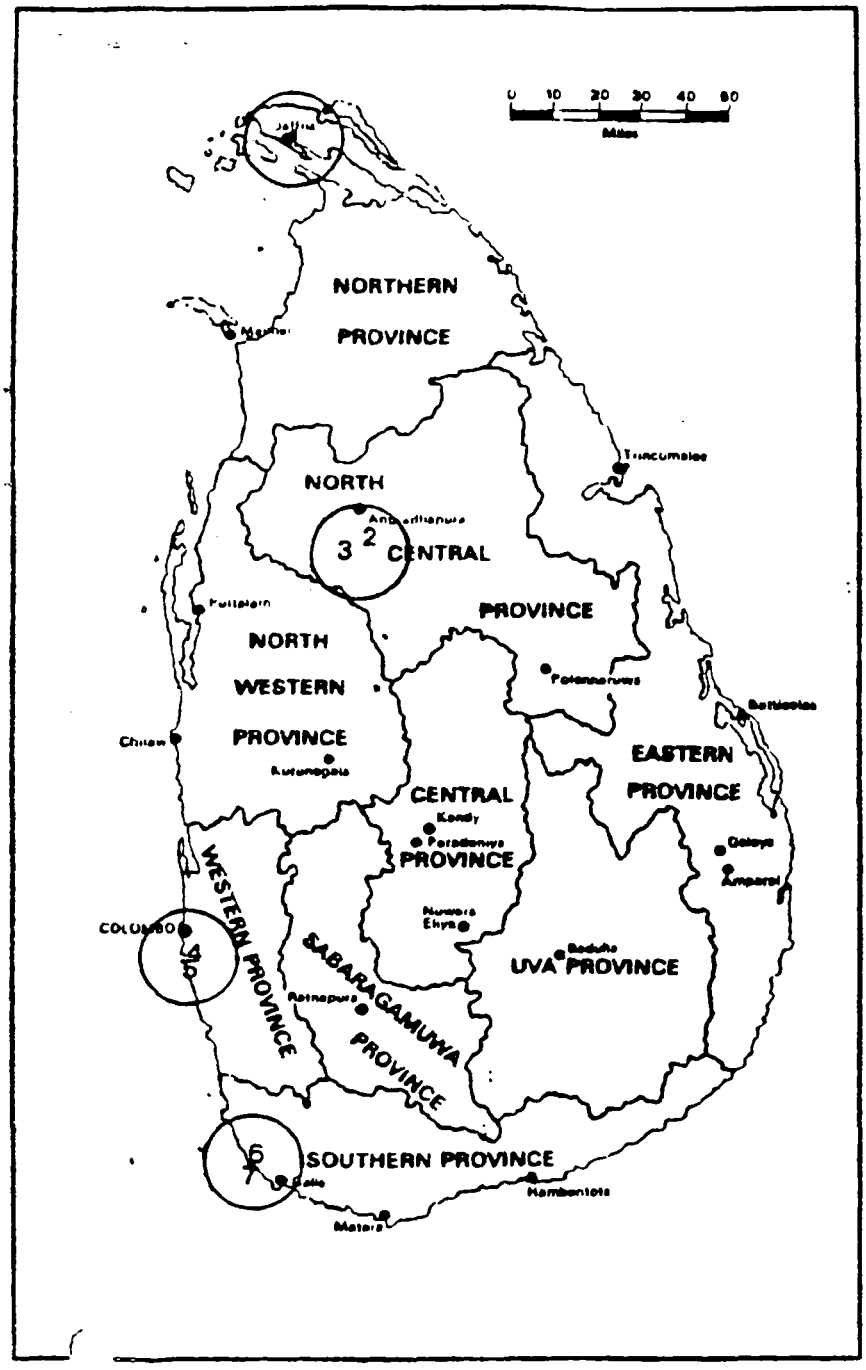
The Dry Zone area receives only about 750 to 1000 mm, and less in some parts. This rain falls within 3 to 4 months of the year; the dry period is prolonged, with an average duration of 6 to 8 months.

Sri Lanka has a population of 14.9 million (1980) of which 70-75% rural. There are about 150 urban centres, 22,000 rural village communities (mainly 2,000 to 5,000 people), and 5,200 Estate communities as distinct from the village communities.

Agriculture is the principal economic activity of the population and rice is the main food crop. Tea, rubber and coconut are grown extensively. The other crops of importance are cocoa, cinnamon, cardamoms, cloves, nutmeg and citronella.

Cholera, typhoid and other water-related diseases are prevalent. The city of Colombo has a particularly high incidence of cholera and other communicable diseases. There has been a recent increase in the incidence of infectious and parasitio diseases. About 40% of all hospital admissions are associated with inadequate drinking water supply and unsanitary living conditions.

The country is divided into 9 provinces, 24 districts, 157 divisions and 3,614 Grama Sevakas (village service units). There are 12 Municipal Councils, 34 Urban Councils, 83 Town Councils, and 542 Village Councils



Sri Lanka

2. Rural Water Supply Sector

Water supply sector development is incorporated into the national development plans. During the Decade to 1990, the Government plans to supply piped water to the entire urban sector. Rural coverage through drilled and dug wells (4/5) and piped schemes (1/5) is planned to serve half the rural population by the end of the Decade. The recent emphasis on urban water schemes will, over the Decade, increasingly shift to the rural areas.

Major constraints on development of the sector are shortages of local and foreign finance, and of experienced technical personnel. The Government points also to the magnitude of the problem and the fact that there is inadequate construction capacity in the country and an inability for the private sector to develop and manufacture the necessary supplies of materials and products. Sectoral progress, at present, is not keeping pace with population increases.

Government policy is to aim for minimum levels of service initially. Any services above the basic level will be charged for. The central government will bear the costs of construction of new schemes while local authorities are expected to share the costs of distribution. In the case of augmenting existing medium-scale or major supply schemes, the local authorities have to bear the full costs. Central government has, however, accepted the need to provide direct subsidies to rural communities where necessary.

It is recognised that in order to achieve the Decade target service levels, an increasing proportion of national resources will have to be allocated, and that within the sector there has to be an increasing emphasis on rural areas. Tariff policies will be revised to improve the financial viability of water supply schemes.

When the Decade Plan was being drawn up, the Government took the step of establishing a Coordinating Committee under the Ministry of Local Government, Housing and Construction, as a forum to coordinate the various programmes and projects. This Committee has set the targets to be accomplished during the "Water Decade Plan" implementation that may well extend to the year 2000 and beyond.

The 10-year Investment Plan for water supply and sanitation development is expected to cost about $ 1,000 mln (1980) estimate. It would require at least 75% of the total funding requirements in external assistance, which has to be sought from bilateral and international donors.*

There has been a recent move to centralise project identification. In the past, the Government relied entirely on the local authorities to propose projects. Now the Ministry of Local Government, Housing and Construction has issued questionnaires, and is preparing from the responses, lists of priority schemes.

The Government points out that senior level personnel are heavily burdened with work, and that while external assistance can reduce financial constraints it can at the same time increase the difficulty of planning and implementation. There exists also the problem that the Government is finding it more and more difficult to finance local costs. Donor agencies* should consider financing more than just the foreign exchange element of projects. Increased technical assistance is called for to cover in-country training for all categories of personnel and in sufficient numbers to allow for the inevitable exodus of trained staff.

3. Hand Pump Development in Sri Lanka

3.1 Sri Lanka will participate in the UNDP/World Bank Project for Field Testing and Technological Development of Handpumps. There is a tripartite agreement between the National Water Supply and Drainage Board (NWSDB), UNICEF and the World Bank setting out the activities to be undertaken in this joint project. The field trial area is in Kalutera District where UNICEF is drilling wells and will be installing handpumps. UNICEF is to purchase one or two main models

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* Bilateral donors active in Sri Lanka: USAID, ODA (UK), DANIDA/ Denmark, FINNADA/Finland, DGIC/Netherlands, etc.

of handpump, plus a few other pumps for comparison purposes. Pumps under consideration include: India Mk II, AID-type ("Diasson") pump; and Savordaya. Pumps capable of being produced locally will have a strong preference.

3.2 AID-type Handpump ("Diasson" pump)

3.2.1. General Comments

The AID-type hand pump ("Diasson" pump) as manufactured in Sri Lanka, appears to be a quality pump and - although it surely is less than perfect - it might serve in extending rural water supply coverage as it becomes more widely available in the Sri Lankan market.

However it may be questioned whether any wide-spread installation of the "Diasson"/AID-type pump should follow so closely on the pilot manufacturing and limited field trials of the pump. These, in fact, are still underway. The performance of the pump at the well sites selected for field monitoring, does indicate a need for improvement ("debugging") of the pump design, and for further upgrading of the quality of manufacture. It should be remembered that water supply is a basic need, and the covering of existing wells for installation of the "Diasson"/AID-type pump will only be justified if the new pump has proven to be reliable.

The pump was inspected at some 40 sites, and at many of these it was found to be not properly functioning, and in some cases completely inoperative.

3.2.2. User's Acceptance of AID-type pump

The acceptance of the "Diasson"/AID-type pump seems to be good, and in several of the rural communities visited, village representatives expressed appreciation for the improved water supply brought about by the installation of the pump.

However, the users' appreciation was not generally reflected in great care or attention for the upkeep of the pump. Pump failure is

not routinely reported to the District Development Council nor corrected by the villagers themselves.

A very important factor influencing the users' acceptance of a handpump water supply, is the relative ease (convenience) of obtaining water by pumping it from a well. In Jaffna District (Dry Zone), a high level of cooperation from the villagers - and also of the local government staff - has been reported. Reports of inspection visits say that all pumps in this District had visible signs of recent lubrication. In the districts visited by the appraisal mission (Kalutera, Habantota, and Kandy), the site observations indicated that the pumps are well-accepted by the beneficiary communities.

3.2.3 Sector Organizational Development

In the course of the USAID-assisted Hand Pump Program in Sri Lanka, close liaison was maintained with the Ministry of Local Government, Housing and Construction, the National Water Supply and Drainage Board as the national implementing agency in the water supply sector, and the manufacturer of the "Diasson"/AID-pump, Somasirin Huller Manufactoring Co. There were also contacts and exchange of information with UNICEF, WHO and UNDP.

The Ceylon Institute for Scientific and Industrial Research (CISIR) was subcontracted by GeorgiaTech to carry out laboratory tests on the AID-type pump manufactured in Sri Lanka. CISIR and Georgia Tech, in cooperation, established a "Life Cycle Test Procedure for Accelerated (Simulative) Pump Testing", and subjected the AID-type pump to this type of testing. The CISIR subcontract involved only $ 5,000 from the overall budget of $ 230,000 deployed for the USAID-assisted Hand Pump Program in Sri Lanka.

The mechanism and procedure used in the selection of well sites for field performance monitoring of the test pumps, appears to have been inadequate. For instance, some pumps were installed at a randomly selected site near a Village Awakening and Housing Scheme of the Prime Minister's Office. Other pumps were placed at remote places, almost impossible to find let alone capable of being monitored

closely. At yet another site (in fact, next to a Local Government Agent's office) a barbed wire fencing had been placed across the platform where the AID-type handpump was mounted.

Another serious shortcoming was, that no provision whatsoever had been made in the budget of the District Development Councils nor in the budget of village councils or from other community financial resources, so that there was no way to meet the (relatively small) costs of buying grease and other maintenance requirements.

3.2.4 Technical Appraisal

It was somewhat disappointing to observe that the "Diasson"/AID-type handpump as manufactured in Sri Lanka, shows several weaknesses that could - and should - have been remedied before the pump was installed on the wells for field testing and performance monitoring. As the field "tests" were conducted with a pump which is still being improved, it is difficult to analyse from the field data what the real performance of the pump under actual-use conditions is. As things are, field performance is clearly very much influenced by the existing weaknesses of the pump. "Debugging" of the pump design should have been done prior to the field monitoring of its performance.

The weaknesses the inspected "Diasson"/AID-type pump showed - in spite of its rugged appearance - may be summarized as follows:

- foot valve leaking or not functioning;
- pump rod disconnected from piston;
- considerable play in the alignment of handle, yoke and pump rod; this makes for a "jittery" operation of the pump;
- pivot points show serious wear under heavy use, particularly if bushings are not properly fitted*;

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* However, the hardened pins used in the pump's pivot points perform very well; virtually no wear of them was observed at any of the inspected pumps.

- threaded connection (screwed) of pump body and pump base are liable to damage, especially due to misalignment and re-installed after dismantling for maintenance; the threaded connection is also liable to corrosion and loose fit;
- pump base is not always tightly bolted onto platform; in many instances, several bolts were missing.

The AID-pump uses a three-pivot pump handle/pump rod arrangement of which the ease of operation is very sensitive to the amount of grease used for assuring the smooth movement of metal-to-metal sliding parts. In the absence of any greasing - as was the case for most of the pumps inspected -, the pump suffers from a somewhat "jittery" mode of operation.

ANNEX I

SRI LANKA

Key Persons Met

USAID/Sri Lanka Mission Colombo	William Schoux, Asst. Director James Meenan, Capital Development-Officer.
Ministry of Local Government, Housing and Construction Kalutera District	Harold P. Fernando, Senior Asst. Secretary, S. Wisegehara, Superintendent-of Construction Works, K.B. Gratton, Technical Officer A. Amratetapa, Technical Officer
Habantota District (AGLW)	M.S. Issadein, Superintendent of Construction Works.
Kandy District (AGLW)	C.B. Rambukwella, Staff Assistant, Construction Works.
National Water Supply and Drainage Board (NWSDB) Ratmalana	N.D. Peiris, Chairman T.B. Madugalle, General Manager
WHO/Sri Lanka	D. Konchady, WHO/UNDP, Project Manager.
UNICEF/Sri Lanka	Rafael Dias Diaz, Chief Water and Sanitation Section. Krishna Tewari, Project Officer (Water Supply) Sören Person, Project Officer (Well Drilling)
Somasiri Huller Manufactoring Co. (Manufacturer of AID-handpump in Sri Lanka	M.D.P. Dias, Managing Director

MINISTRY OF LOCAL GOVT., HOUSING & CONSTRUCTION
NATIONAL WATER SUPPLY & DRAINAGE BOARD
"WATER-EVERY DROP IS PRECIO

14 MT. LAVINIA
MY No
YOUR No.
GALLE Rd., RATMALANA
July 2.....

Dr (Mrs) H. Badran
Resident Representative
UNICEF
5, Queens Avenue
off Queens Road,
Colombo 3
SRI LANKA

Mr. Melvin J. Loewen
Special Projects Coordinator
World Bank
1818 H Street N W
Washington D.C. 20433
U S A

Dear Madam/Sir:

Handpumps Field Testing in Sri Lanka

The Republic of Sri Lanka is actively pursuing the goals of the International Drinking Water Supply and Sanitation Decade. This ten-year global effort has set a target that by 1990 all people should have access to clean water and adequate sanitation. Sri Lanka prepared its national drinking water plan in 1980 and when the United Nations launched the Decade in November of that year the Republic was ready to start specific projects. Many projects are now under execution by various government ministries and agencies, some with the assistance of multilateral, bilateral and voluntary agencies.

One aspect of this broad-ranging programme is the provision of drinking water in rural villages. To provide clean water for all villages of Sri Lanka by 1990 will require thousands of handpumps. Some of these pumps are now imported but over the longer range the Government, and more specifically through the National Water Supply and Drainage Board (NWSDB), is seeking to promote the local manufacture of these pumps. This would save foreign exchange, create local jobs and make new pumps and replacement parts more readily available in the villages of Sri Lanka.

To support these goals the United Nations Development Programme (UNDP) has asked the World Bank to undertake a global programme to test and develop handpumps to meet local conditions. This is being done in two phases. The first phase is testing a variety of existing pumps in a laboratory in England. The second phase - to test and design pumps appropriate to the host country - is now being undertaken in field trials in about 15 developing countries. Sri Lanka is one of those countries selected for the field trials and we are pleased to participate in this programme.

One of the areas in Sri Lanka identified as most suitable for this field trial is in the Kalu[illegible]ra District where UNICEF is now drilling wells and installing pumps. The NWSDB and the World Bank have agreed with UNICEF on a cooperative effort to conduct field testing in Kalutara, with the three parties contributing the goods and services listed below:

TELEGRAMS: 'WATERBOARD' RATMALANA
TELEX: 21482
TELEPHONES:
GEN. OFFICE 071-4441
CHAIRMAN 071-4488
VICE-CHAIRMAN 071-5990
WORKING MEMBER 071-5991
GENERAL MANAGER 071-4442

a) UNICEF is planning to drill wells, purchase and install about 300 pumps over the next two years in the Kalutara District. UNICEF is planning to purchase one or two main models of pumps but will also favourably consider the purchase of several other models in small numbers so that a proper comparison can be made in field performance. The exact number of each model to be provided by UNICEF will be worked out between the UNICEF Project Manager and the World Bank's Regional Handpumps Project Supervisor.

b) The World Bank with funding provided by UNDP Project No. INT/81/026 will provide :

1) a UN Volunteer, or a locally hired technician, qualified for monitoring performance of pumps,

2) a vehicle for the use of the technician,

3) Petrol and spares for operation of vehicle,

4) Organization of the complete monitoring system in cooperation with the NWSDB and UNICEF.

5) Over-all supervision of the monitoring activities through the Regional Handpumps Project Supervisor,

6) Analysis and integration of the Sri Lanka field test data into a global report, and

7) Advice to local manufacturers in the design and manufacture of handpumps.

c) The NWSDB will provide:

1) A part-time engineer to serve as liaison between the field personnel and NWSDB and other government agencies, and

2) Housing for the technician.

If you agree with this statement of responsibilities I shall be pleased for you to countersign below the three original copies of this letter. The project, which is expected to run for two years, will become effective upon tripartite signature of this letter.

Sincerely yours

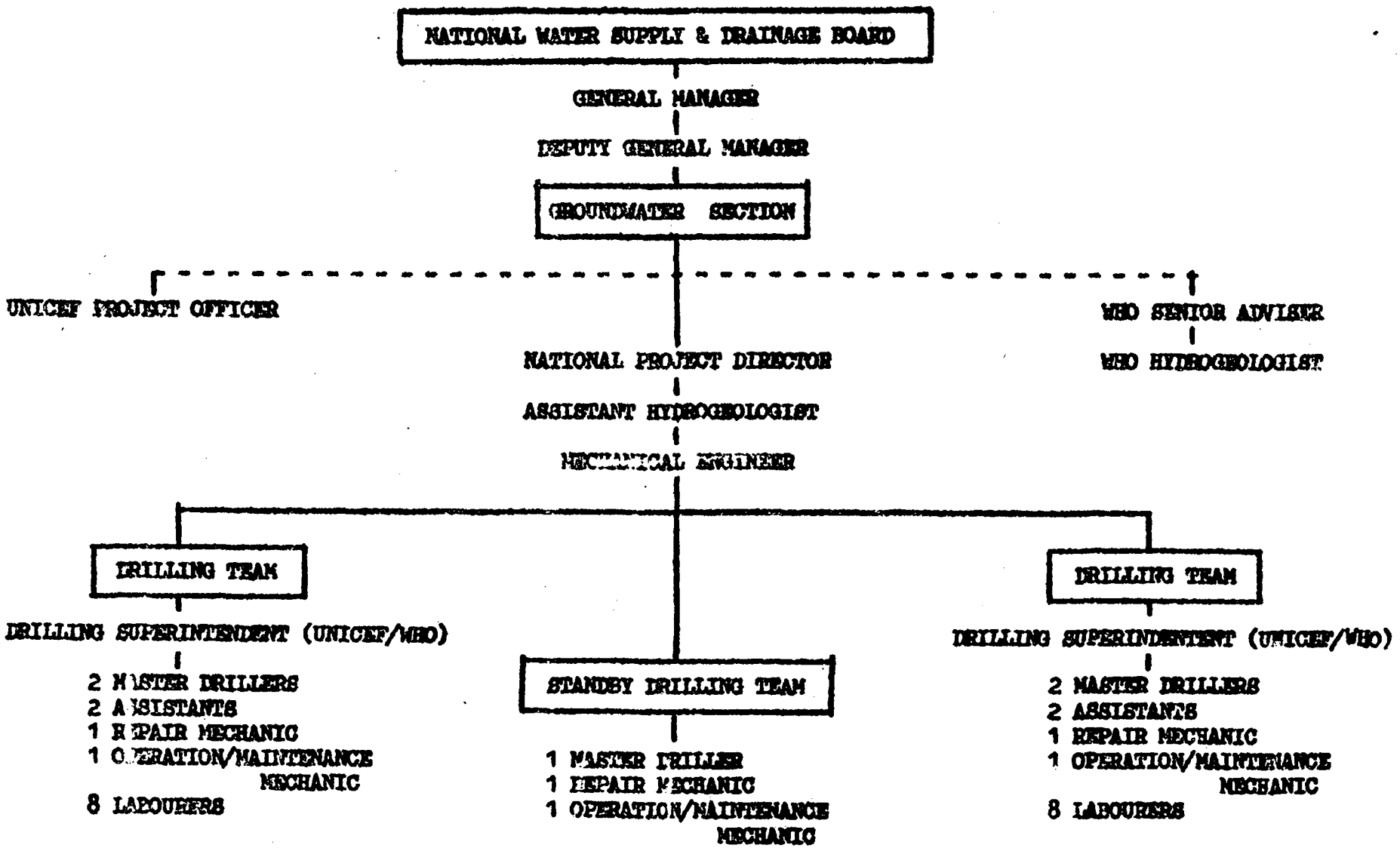
N. D. Peiris,
Chairman
National Water Supply and Drainage Board

.....date .....
Dr. (Mrs) H. Badran
Resident Representative
UNICEF

.....date .....
Melvin J. Loewen
Special Projects Coordinator
The World Bank

ATTACHMENT VI(9)

ORGANIZATIONAL STRUCTURE OF GROUNDWATER SECTION
NATIONAL WATER SUPPLY & DRAINAGE BOARD



ANNEX 4

Test Procedure - Life Cycle Test

CISIR/Georgia Tech/ test simulation

Total Volume of Water used in Three Years

$$(200 \text{ users}) \frac{6 \text{ gal}}{\text{days user}} \times \frac{(365 \text{ days})}{\text{year}} \times (3 \text{ years}) = 1{,}314{,}000 \text{ gal}$$

Pump Output Volume per stroke

Bore 3" ; Stroke 6"

Volume = $nr^2.h$ = 42 cu inch

0.18 gal/stroke

Total Strokes in Three Years

$$1{,}314{,}000 \text{ gal.} \times \frac{1}{0{,}18 \text{ gal.}} \text{ strokes} = 7{,}3 \times 10^6 \text{ strokes}$$

Testing Time to simulate Three Years Use

$$7.3 \times 10^6 \text{ strokes} \times \frac{\text{Minute}}{44 \text{ strokes}} \times \frac{\text{hr}}{60 \text{ min.}} \times \frac{\text{day}}{24 \text{ hrs.}} \times \frac{\text{month}}{30 \text{ days}}$$

= 3.8 months

= 115 days

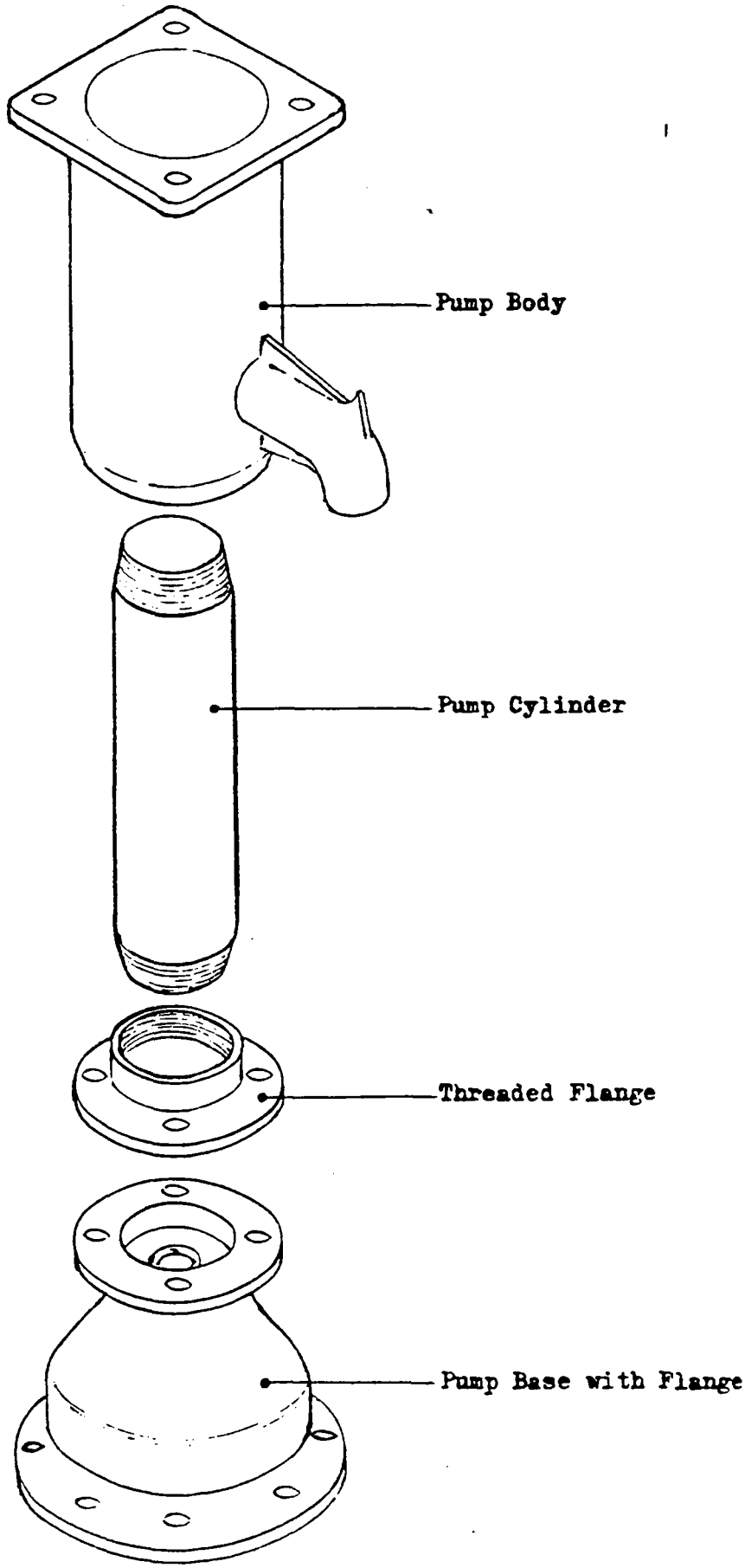


FIGURE 7. Manufacturer's Modification

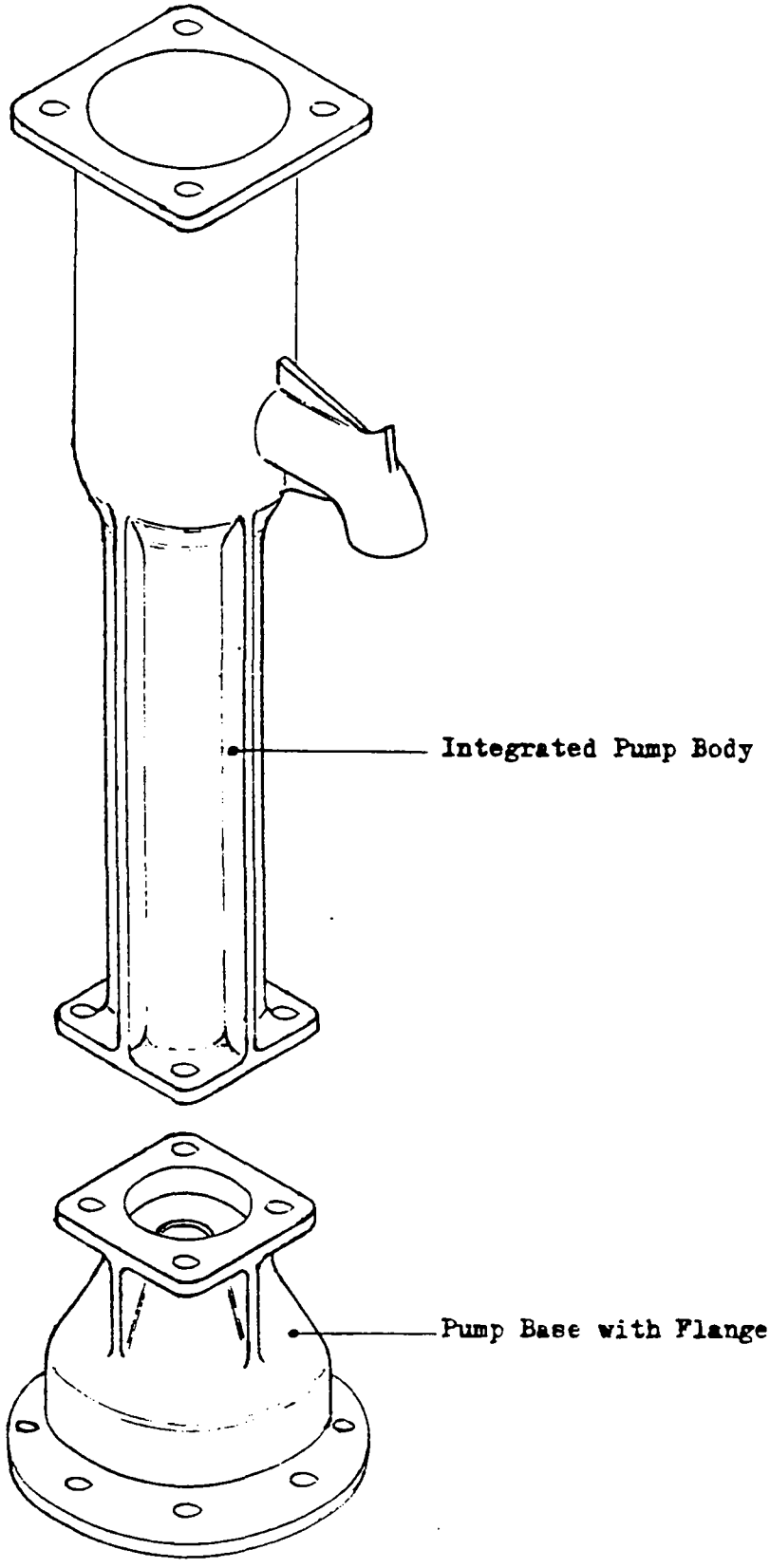


FIGURE 6. Suggested Modification

USAID-assisted Hand Pump Program in the Philippines

I. Background

The Philippines is an archipelago composed of 7,107 islands of which 11 account for 95% of the total land area of 301,000 sq.km. It streches 1,851 km from Batanes Islands in the North to Tawi-Tawi Islands in the South. It is 15 degrees north of the Equator. There are only two distinct seasons; the rainy season from June to October, and the dry season from November to May.

The population is about 48 million, of which some 7.5 million live in Metro Manila. Rural population is estimated at 64% of the total.

2. Rural Water Sector

Water supply service in the rural areas covers only 42% (1980). The remaining unserved rural population of about 22 million obtains water, often of doubtful quality, from such sources as open dug wells, streams, lakes, springs, and from rain collectors. Moreover, the rural coverage indicated is only nominal, as many of the existing water systems are known to be inoperative.

The Government's basic rural water supply policy is for complete coverage throughout the country.*) This would require an improved organizational structure of the sector, the establishment of local water supply institutional structure (water districts, associations and cooperatives), and encouragement and support of self-help activities of the rural communities.

There are 75 principal units of local government (i.e. provinces and major municipalities); these embrace about 60 towns, 1,500 municipilaties and 43,000 rural communities (Barangays).

In general, rural population will be provided with point sources and communal faucet distribution systems, while urban areas are to have individual house connections. The basic approach is to organise water

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*) A comprehensive "Water Supply Program 1981-1990" has been prepared jointly by the Ministry of Public Works, the Ministry of Health, and the Ministry of Human Settlements.

districts for the larger urban centres and municipalities, and water associations or cooperatives for the smaller, rural communities. These local organizations will own, manage and maintain the water systems.

The Local Water Utilities Administration (LWUA) promotes, with technical and financial assistance, the establishment and management of Water Districts to serve communities of 20,000 people and over. Several LWUA-assisted water supply projects are currently under implementation with external support from IBRD (World Bank), ADB (Asian Development Bank) and DANIDA/Denmark.

The Ministry of Local Government and Community Development (MLGCD) is promoting water supply associations and cooperatives to operate and maintain rural water supply systems in the provinces covered by the Provincial Development Assistance Program (PDAP).

The Ministry of Public Works Bureau of Water Supply (MPW/BWS) has been active, since the early 1950s, in drilling wells and installing handpumps: the Magsaysay pump (previously called "Liberty" pump) on deep wells, and various commercially available pumps on medium-depth and shallow wells. The MPW/BWS rural well program appears to have been generally successful, with the well and platform construction and pump models used providing a fair amount of sanitary protection.

To indicate the scope of the MPW/BWS rural well program, the following data of the 1981 program is given:

Level I	(point source, well with handpump)	
2,000	deep wells	
4,100	shallow wells	covering some
36	developed springs	1,6 million people
130	improvement of existing systems	
Level II	(communal faucets)	
1,000	water systems	for some 0,6 million people

Level III (house connections)	
extension and upgrading of existing systems, and some new schemes.	for some 0,15 million people.

The Rural Water Works Development Corporation (RWDC) promotes water supply systems for communities under 20,000 people. Up to 90% of the initial costs may be provided by RWDC on a grant basis. The RWDC-program aims at ensuring that by 1990 all rural village communities in the Philippines would be equipped with a handpump/well installation. Furthermore, as more and more village communities are connected to the electric grid due to the progressing electrification of the country, the communities requesting a deepwell/submersible pump installation will be provided with such a (level II) installation, provided they are prepared and able to pay the operating costs.

RWDC has an ongoing Shallow Well Program designed to put in place an average 10,000 wells per year (see Annex 1), over the period 1981-1990. The RWDC program for 1981 provided for the drilling of about 8,000 wells, each equipped with the so-called RWDC pump, a modified version of the Dragon handpump available in the market throughout the Philippines. The RWDC-pump is locally manufactured and costs about P. 160 (approx. US $ 20). In addition, some 25,000 medium-depth handpumps will be required; a pump design for this application is under development for use on 4-inch diameter casing wells.

UNICEF is supporting, over the period 1980-1983, the construction or rehabilitation of some 3,000 water supply systems for 2,500 rural communities (Barangays). An essential element of the UNICEF program is the committment of the rural communities concerned to operate and maintain the systems. Design criteria include: one point source per 25-50 households, within 250 m walking distance and providing a water supply of 60 litres/capita per day.

UNICEF is also assisting in the establishment of laboratory facilities for bacteriological and chemical examination of water, in more than 30 provincial and municipal health laboratories; these will serve in the water quality surveillance of the 3,000 water supply systems included in the UNICEF-program. Water users' associations are promoted in the Barangays (rural communities), to participate in the planning, construction and maintenance of the water systems.

Furthermore, a mass education campaign on health, water and sanitation is being carried out in the 2,500 Barangays concerned.

3. Existing Handpumps in The Philippines

Magsaysay pump

The Magsaysay pump was inspected at various sites. The pump is of simple, sturdy construction. It has apparently benefitted from step-by-step design improvement resulting in a good amount of reliability. The handle-lever/pump rod arrangement appears to be less critical than in most other pumps. Platform design is adequate, with good drainage at most sites.

The pump is used for deepwell applications in the USAID-assisted Barangay Water Program (depth normally about 30m, deepest well reported 70m). An improvement might be to turn the spout 90° which would allow the user to check the filling of his water container while pumping.

Views expressed by both users and water program officials confirmed the Magsaysay pump's good comparative performance in actual-use conditions. The big wooden handle is somewhat heavy and cumbersome to operate; occasional difficulty in pumping the wells is reported.

RWDC-Pump

The RWDC-pump is a modification of the traditional cast iron pump (called various names such as Jetmatic, Dragon, Wilson and Samson pump), which has been in use in the Philippines already for 20-years and more. Most of the parts of the RWDC pump are inter-changeable with the traditional pump.

The RWDC-pump's technical specification was established in 1980 *). The pump was developed for use on small-diameter shallow tubewells, it is of rugged design for heavy use. A stainless steel cylinder is used. The overall weight is approx. 19.5 kg.

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* The specification has been revised, on minor points, in 1981.

The pump requirements of the RWDC-program are supplied on tender by a number of local manufacturers, with the largest supplying 500 of units/month and several others a smaller number. An initial 11,000 RWDC-pumps were tendered for production, and some 8,000 actually shipped to various field sites. However, installation capacity appears to be weak and unattentive so that several thousands of pumps are presently "unaccounted for", in the sense that is unknown whether they actually have been installed or not.

4. USAID-assisted Hand Pump Program in the Philippines

4.1 USAID Involvement

USAID and its predecesor agencies have, over the last 30 years, assisted the Philippine Government in various programs for drilling wells and installing handpumps in rural areas of the country. Only in the last few years, however, has some emphasis been put on the development of organizational structures and local capabilities to maintain the wells and pumps.

USAID assistance has been, and is being provided, in the Barangay Water Program (BWP) which for Level I water service (point sources) installs handpumps on existing or newly drilled wells. It is BWP policy to use deep-set pumps (i.e. at 30m depth and more), because of the contamination risk associated with shallow wells. Medium-set pumps (from 15m up to 30m deep) are considered in certain specific situations only.

Cooperation between the BWP program and USAID/Manila, with GeorgiaTech assistance, led to 10 well sites being selected for installation of the AID-type handpump. These were manufactured by Tri-Star Metal Industries Inc., of Binondo, Metro Manila. Most of the selected well sites were existing ones, with an old Bagsaysay pump. The depth of the selected wells ranged from 25-40m, with the static water level at 8-15m depth. The AID-type pumps were installed in the period November-December 1981 for field testing and performance monitoring. Monitoring was the responsibility of the Provincial or City Water Works Engineer, with assistance from USAID/Manila.

4.2. Appraisal of AID-type Pump

A number of AID-type pump installations were inspected. The performance of the pump was appraised by technical inspection on site, users' opinion was sought, and the pumps' performance was discussed with senior officials of the government agencies involved, the BWP-program and others.

Generally, the users of the AID-type pump as installed on the test sites, appear to be pleased with it. The performance in terms of yield and ease of pumping, and the overall appearance are rated good. However, the interest to have the pump perform at its best through attentive care and proper maintenance was certainly not strongly evident at most of the sites visited. Rather the opposite appeared to be the case. In one instance, a school had been built on top of the well, so that the pump stood enclosed in a classroom where it was completely inaccessible for other users. In fact, it had been decided to use the well for a submersible pump, and people had tried to remove the AID-type pump. In the process, the pump handle had been broken (probably due to slamming it with a hammer) in an effort to unscrew the pump stand from the pump base. The responsible Water Engineer indicated that he hoped the AID-type pump would be repaired and re-used on another well.

At a few well sites, the general condition of the installed pump showed it was clearly cared for and properly maintained. In one particular village, it was evident from the smooth operation of the pump that it is perhaps better to oil the pump rather than attempting to grease it (as is instructed in the pump installation and maintenance manual). The sliding blocks in the pump head had been removed at one well site (near a primary school). This produced a remarkable ease of operation although the pump had no trace of grease at all.

The footvalve of the AID-type pump constitutes one of the weakest parts of the design. In too large a number of pumps the footvalve was not functioning properly, or completely inoperative.

At many pump sites, the drainage of the platform was not adequate. In fact, the platform frequently was found to be quite slippery.

Office of the President
Malacañang, Manila

LETTER OF INSTRUCTIONS NO. 770

INITIATING A NATIONWIDE COMMUNAL WATER PUMP PROGRAM

T O : The Minister of Local Government and Community Development
The Minister of Public Works, Transportation and Communications
The Minister of the Budget

WHEREAS, the provision of adequate water supply at reasonable rates is a primary objective of the New Society;

WHEREAS, surveys show that only one-third of the rural areas have access to artesian wells and the remaining two-thirds, estimated at about 20 million people, have no adequate water supply;

WHEREAS, there is immediate need for the implementation of a national program for construction/rehabilitation of water supply to areas not covered by National, Provincial, or City water resource agencies;

NOW, THEREFORE, I, FERDINAND E. MARCOS, President of the Philippines, do hereby Order and Instruct:

1. The Minister of Public Works, Transportation and Communications, the Minister of Local Government and Community Development, and the Minister of the Budget shall design and implement a communal water pump system program with the objective of having a reliable and adequate water source within 500 meters of each household throughout the nation.

The Program shall consist of (a) the rehabilitation of existing but unserviceable wells and pumps, and (b) the construction of new wells and pumps, using the latest available low-cost methods. The national government shall provide technological assistance and necessary material, while local governments and barangays shall provide labor.

2. The Ministry of Public Works, Transportation and Communication, through the Task Force on Rural Water Supply, shall direct and manage the "Bagong Lipunan Communal Water Pump Program."

3. Actual construction shall be done by private contractors, by the Bureau of Public Works, or by local residents under the supervision of the Task Force on Rural Water Supply, whichever is found to be most economical.

4. The projects contemplated herein shall not cost more than one thousand pesos each, for materials including the pump. Labor shall be provided or mobilized by local government units and barangays and shall constitute the local counterpart in this program.

5. A total of at least 10,000 pumps shall be completed and turned over to communities by December 31, 1979.

6. The Ministry of the Budget shall earmark and release to the Task Force on Rural Water Supply, the maximum amount of ten million pesos (P10,000,000) in initial implementation of this Program, chargeable to the funds provided as aid to Local Government Units under P.D. No. 144. The Task Force shall, in addition, be alloted the sum of one million pesos (P1,000,000) from the Special Activities Fund, for operating expenses and supervision costs incidental to the Program.

Done in the City of Manila, this 23rd of November, nineteen hundred and seventy-eight.

ANNEX

54

OFFICE OF THE PRESIDENT

OF THE PHILIPPINES

Malacañang

LETTER OF INSTRUCTIONS NO: 683

ESTABLISHING BASIC POLICIES FOR THE WATER SUPPLY SECTOR

WHEREAS, drinking water is a basic requirement to sustain life ;

WHEREAS, only about 50 percent of the population of the Philippines is presently served with public water supply systems;

WHEREAS, it is a primary concern of the Government in promoting the welfare of the people to hasten the availability of water supply services in the whole country, with special attention to the rural areas;

WHEREAS,the approved Philippine Development Plan for 1978-1987 therefore, aims to increase the public water supply coverage to about 85 percent of the total Philippine population within ten years;

WHEREAS, there is a need to restructure the water supply sector so that gaps and overlaps in responsibility will be eleminated; and

WHEREAS, it is necessary to establish certain basic policies to attain these objectives in the most efficient manner;

NOW,THEREFORE,I,FERDINAND E.MARCOS, President of the Philippines, by virtue of the powers vested in me by the Constitution, do hereby order the implementation of the following basic policies for the water supply sector;

(1) The attainment of complete coverage of water supply services for the whole country is a declared policy of the State shall be effected primarily through:

a) The rationalization of the organizational structure for the water supply sector;

b) The formation of water districts, associations, cooperatives or corporations for the construction, operation and maintenance of water supply systems in preference to systems directly operated and managed by local governments; and

(c) The encouragement of self-help and self-reliant water supply projects.

(2) Agencies involved in water supply shall strive to attain financial independence, thereby minimizing Government subsidy, by increasing their own internal revenue generation capabilities and by providing services within the cost repayment capabilities of the beneficiaries.

(3) The levels of water supply service to be developed shall vary according to technical, economic, organizational and financial considerations. These levels of service are as follows:

Level I - Point sources (such as rain collectors, wells and springs); generally for rural areas where houses are scattered too thinly to justify a distribution system.

Level II - Communal faucet systems; generally for rural areas where houses are clustered densely enough to justify a piped distribution system with a faucet provided for a number of households.

Level III - Individual house connections; generally for urban areas.

(4) The rationalization of the water supply sector structure shall be pursued in accordance with the following strategies:

(a) The Metropolitan Waterworks and Sewerage System shall concentrate its operations in Metropolitan Manila and other contiguous areas that may later be included in its service coverage.

(b) The Local Water Utilities Administration shall promote water districts in cities and municipalities with a population of at least 20,000 each. It will support these water districts through institutional, technical and financial assistance.

(c) The Bureau of Public Works shall be mainly responsible for the construction of wells and development of springs in rural areas.

(d) The Department of Local Governments and Community Development shall be responsible for the formation of water associations and cooperatives that will operate and maintain water supply systems for communities in the provinces covered by the Provincial Development

Assistance Program (PDAP). It shall provide institutional, technical and financial support to these associations and cooperatives.

(e) A Task Force on Rural Water Supply under the National Water Resources Council shall, until such time that a permanent institution of the Government to handle the rural water supply sector is evolved, be responsible for the formation of water associations and cooperatives that will construct, operate, and maintain water supply systems in the rural areas of non-PDAP provinces. This Task Force shall provide technical, institutional and financial assistance to these associations and cooperatives. It shall also make studies and recommendations on the appropriate institution that will eventually be responsible for the rural water supply sector on a permanent basis. The Task Force is hereby authorized to call upon any agency of the Government for assistance in accomplishing its tasks.

(5) The National Water Resources Council shall be responsible for coordinating the implementation of the above policies. It shall submit to the President of the Philippines, periodic reports on the status of the entire water supply sector and the performance of each of the above agencies in relation to the overall policy framework for water supply.

Done in the City of Manila, this 30th day of March in the year of Our Lord, nineteen hundred and seventy-eight.

March 1978

(SGD.) FERDINAND E. MARCOS
President
Republic of the Philippines

ANNEX 3

Philippines
BWP/AID-Handpump
MONITORING SHEET

Well Location: Date of Installation:

---

1. Date
2. Pump Condition (G,F,P)
3. Pump Maintenance (G,F,P)
4. Apron Condition (G,F,P)
5. Apron Maintenance (G,F,P)
6. Flow Rate *
7. Leak Rate **
8. Pumping Difficulty (H,A,E)
9. Water Availabilityz
10. Water Acceptability
11. Water Quality
12. Parts Replaced
13. Monitoring conducted by
14. Comments and Recommended Actions

* measured by number of strokes required to fill a (standard) container

** measured by number of strokes required before water starts flowing from spout after pump not used for 1 hour.

ANNEX 4

EXAMPLE

Ilyan Talim
Lucena City District

Medium/deep-set BWP/AID-handpump installed on existing well; 23 November 1981.

Pump performance	:	Good 52 strokes to fill 19-liter square looking oil bucket
Mechanical State	:	excellent
Depth of well	:	90 ft.
Depth of Static Water level	:	32 ft.
Depth of cylinder	:	60 ft. No suction pipe
Diameter of casing	:	4 inch
Diameter of drop pipe	:	1½ inch
Pump rod diameter	:	3/8 inch
Users	:	10 households + school (200 children)
Remarks	:	Yellowish sediment in water (occurs seasonably)

ANNEX 5

PHILIPPINES

Key Persons Met

- USAID Capital Development Office	Carlos E. Crowe General Engineering Advisor Oscar T. Bassa Mech. Eng/Water Supply
- Barangay Water Programme (BWP) Ministry of Local Government and Community Development (MLGCD)	Gasper Nepomoceno, Project Manager Art Rama; Chief of Engineering Noël Viaje, Research Engineer Dr. S. Cooper, Geohydrologist T.J. McClellan, Engineering Consultant to USAID
- Luzon Foundry Ltd. (Philippine Valve Mfg-Co.)	George Chiu, General Manager Rene B. Galera, Vice President Technical Operations
- World Health Organization WHO Regional Office for the Western Pacific.	Dr. Liv Guo-Bin, Director Env. Health and Health Technology Dr. Edwin W. Lee, Dr. Albert P. Talboys Reg. Adv. in Env. Health
- Asian Development Bank	David A. Howarth Manager, Water Supply Division Dr. J. den Toom Senior Economist.

- Provincial Engineers Office (PEO) (Provincial Dev. Assistance Project (PDAP) Pompanga Province San Fernando	Engr. Roberto M. David Officer in Charge. Atty Orlando A. Santiago Maj. Josez S. Jamara Engr. Ricardo Cruz
- City Engineers Dept. Lucena City Quezon Province (also integrated Development Project)	Virgilio D. Delin Water Works Engineer

US AID-assisted Hand Pump Program in Indonesia

1. Background

Indonesia comprises some 13,700 islands, with 1,176,000 sq.km land surface. It is the fifth most populous country in the world; only the People's Republic of China, India, USA and USSR have larger populations. Estimated population is 147 million.

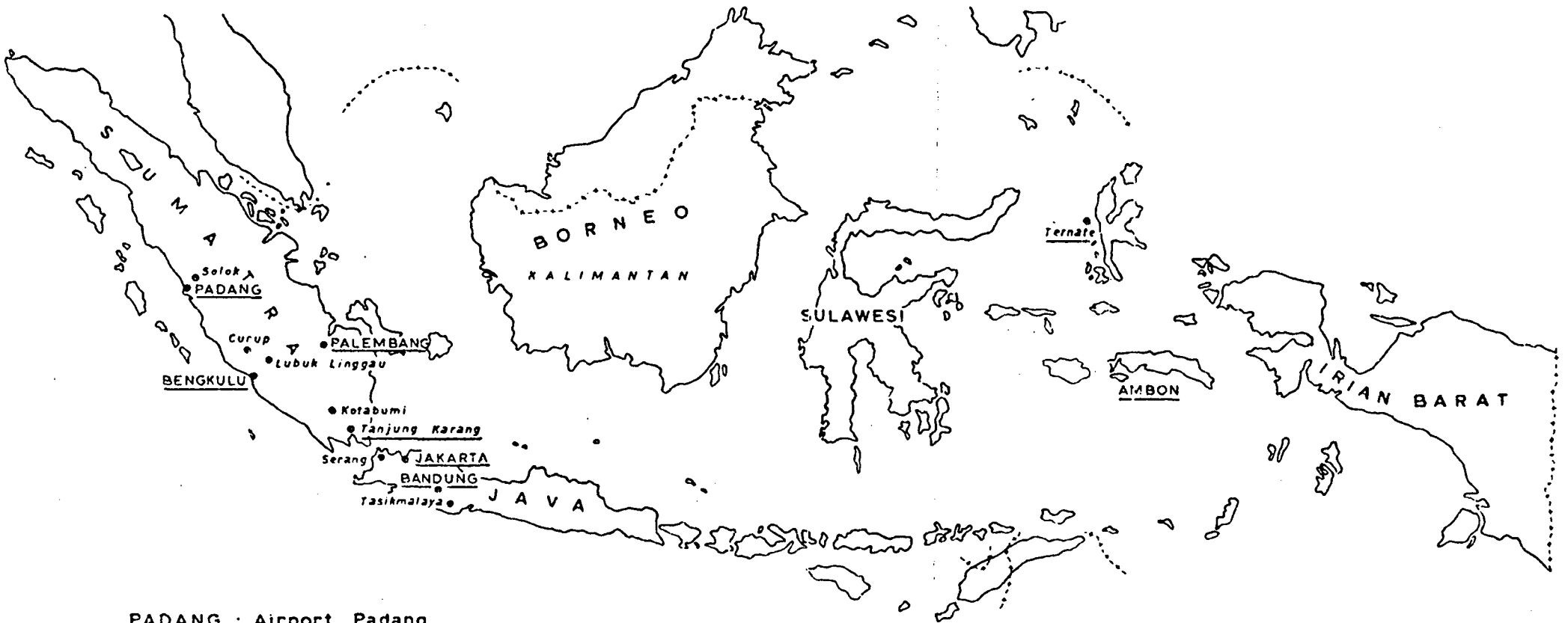
The climat is tropical and humid, with little temperature variation. The dry season, under the influence of the East Monsoon, is from May to September; the wet season, with the West Monsoon, is from November to April.

The main islands are Java, Sumatra, Kalimantan, Sulawesi, and Irian Jaya (West New Guinea). Java is the most densely populated island; 63% of the total population of Indonesia live there. Jakarta, centre of government and of economic activity, has over 6 million people. West Java has the largest population of all 26 provinces of Indonesia, with 23 million people. Its land area is 46,300 sq km. The central part is mountainous, the northern part (with Jakarta) is a flat plain.

There is a high incidence of water-related diseases, including gastro-entric diseases, diarrhoea and parasitic diseases. For infants and children, these are the main causes of death.

Average mortality is about 20 per 1,000 persons annually of which 50% children between 1 and 5 years old. Infant mortality is very high: 100-125 per 1,000 live births, before reaching age of 1 year.

WATERSUPPLY PROJECTS IN INDONESIA



PADANG : Airport Padang

2. Rural Water Supply Sector

2.1 General

In the rural areas, the main sources of water supply are shallow wells (unprotected), ponds, irrigation canals, streams and rivers, all of which are polluted. People traditionally bath once or twice daily in a river, pond or canal, and also take their domestic water requirements from these sources.

2.2 Sectoral Planning and Organization

The National Development Planning Agency, BAPPENAS, is the focal point for planning of the water supply sector, as for other sectors. Inter-ministerial coordination is the mechanism through which the 5-year National Development Plan (Repelita) is programmed and implemented. The specific rural water supply targets set in Repelita III (1979-1984) and IV (1984-1989) are:

1979 rural population coverage:	20,6 million	(18%)
1984	27,3 million	(22%)
1989	57,5 million	(42%)

Three Ministries have major responsibilities in rural water supply programme implementation:

(i) Ministry of Health, through Directorate General of Communicable Disease Control, Directorate of Hygiene and Sanitation;

(ii) Ministry of the Interior, through the Provincial Governors and the Kabupaten (Regency) heads;

(iii) Ministry of Public Works, through Directorate General for Housing, Building, Planning and Urban Development (Cipta Karya), and the Provincial and Kabupaten Offices of Public Works.

The most recent planning[1] of the National Rural Water Supply Programme in Indonesia is reflected in the following breakdown of types of water supply:

Type of water supply	% of rural population	number of users/unit
- Protected Shallow Well with Handpump	45%	± 100
- Deepwell (drilled/bored) with Handpump	20%	± 100
- Small Piped Water System (usually gravity flow, occasionally with motor pump; no treatment of the water)	15%	3,000-5,000
- Protected spring with communal tap(s)	5%	± 500
- Developed Artesian Spring with Storage Tank and Communal Taps	5%	± 500
- Small Water Treatment Plants using surface water (usually pumping facilities required; one unit may serve several villages)	3%	up to 50,000 and more
- Rainwater collector systems	3%	single family
- Infiltration galleries	2%	or small
- Other	2%	community

The important role of handpumps both for use on shallow wells and on deepwells, is evident.

Planned budget allocations for rural water supply are: Rp.52,800 mln. for 1979-1984. (Repelita III) and Rp. 121,810 million for 1984-1989 (Repelita IV).

In the last few years, handpump installation activity already has been substantial. In the period 1974-1978 (Repelita II) the programme was as follows:

1974-1975	2,500 pumps
1975-1976	3,380 pumps
1976-1977	3,670 pumps
1977-1978	±4,000 pumps

1) Second National Workshop for Planning of the Water Supply and Sanitation Decade Programme (1981-1990), Denpasar, Bali, 29 September - 2 October 1982.

The number and types of water supply systems as provided or being planned under the INPRES-Programme (funds of the Central Government, administered by Ministry of Health (DGCDC) under special Presidential Instructions), are shown in the following table:

Number of Water Supply Systems Installed

Year	Rainwater Collectors	Spring Protection	Artesian Wells	Handpumps Shallow	Handpumps Deep	Piped Systems
74/75	163	81	33	10.127	-	96
75/76	445	160	50	14.199	-	146
76/77	500	150	25	14.175	-	150
77/78	500	200	30	18.120	1.061	150
78/79	500	200	50	25.000	2.000	150
79/80	500	200	50	23.000	2.000	150
80/81	500	200	50	25.000	2.500	150
81/82	1.000	700	25	70.000	3.500	150
82/83	1.000	860	50	75.000	4.000	190
83/84	1.000	900	50	75.000	4.000	200

The years from 80/81 onward are estimates

Present government policy is to emphasize the provision of an adequate quantity of water of acceptable quality, rather than to dilute the limited resources to provide water of high drinking water standard quality at a few places. Thus, whereas piped water systems remain the ultimate objective, the more traditional types of water supply listed in the above table will continue to be installed until such time that piped systems become economically feasible.

This policy is also mandatory because there exists a degree of resistance at the local level. Community involvement is very important. Although hundreds of workers at the Kabupaten and Kecamatan (township) level have already been trained in the design and construction supervision of simple piped water systems, the villagers have difficulty in accepting these systems as they do not fully understand

the technology involved: water flowing through pipes, and the use of storage tanks, pumps and motors. It will, therefore, take considerable effort to educate the villagers to accept piped water systems, and it will be even more difficult to have them properly used and maintained by the communities.

3. Current-Hand Pump Installation and Requirements

UNICEF

UNICEF is assisting the Government of Indonesia in installation of shallow and deepwell handpumps, drilling of wells, and other small water supply systems. Project areas are in: West Sumatra, Central Java, Jogjakarta District, Bali Lombok, South Sulawesi, South-East Sulawesi, and Madura. The UNICEF-assisted handpump installation projects involve some 21,500 shallow handpump wells, and 6,750 deep handpump wells. The handpump procurement currently is about 2,000 pumps annually, with quality checking by SUCOM (Superintending Company of Indonesia).

Asian Development Bank (AsDB)

For the water supply component in a large ADB-financed project in South-East Sulawesi, handpumps have been ordered from P.T. CELCO Ltd, of Bandung; the pump ordered is the S.B. (AID-type) pump. Procurement and quality-checking are handled by P.T. BORIMEX Imports and Exports, of Jakarta.

CARE

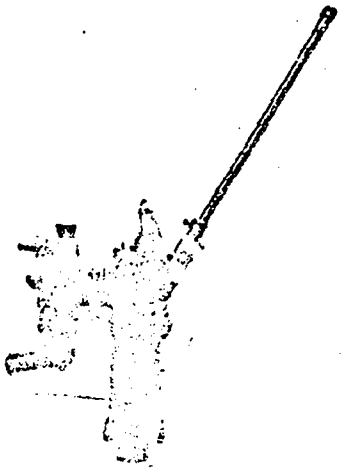
CARE has been procuring 250 S.B. (AID-type) handpumps for its rural water supply project in West Java, and another 200 S.B. pumps for its project in Lombok.

Ministry of Trans-Migration (Government of Indonesia)

The Ministry has bought 50 S.B. (AID-type) handpumps for various sites in re-location villages.

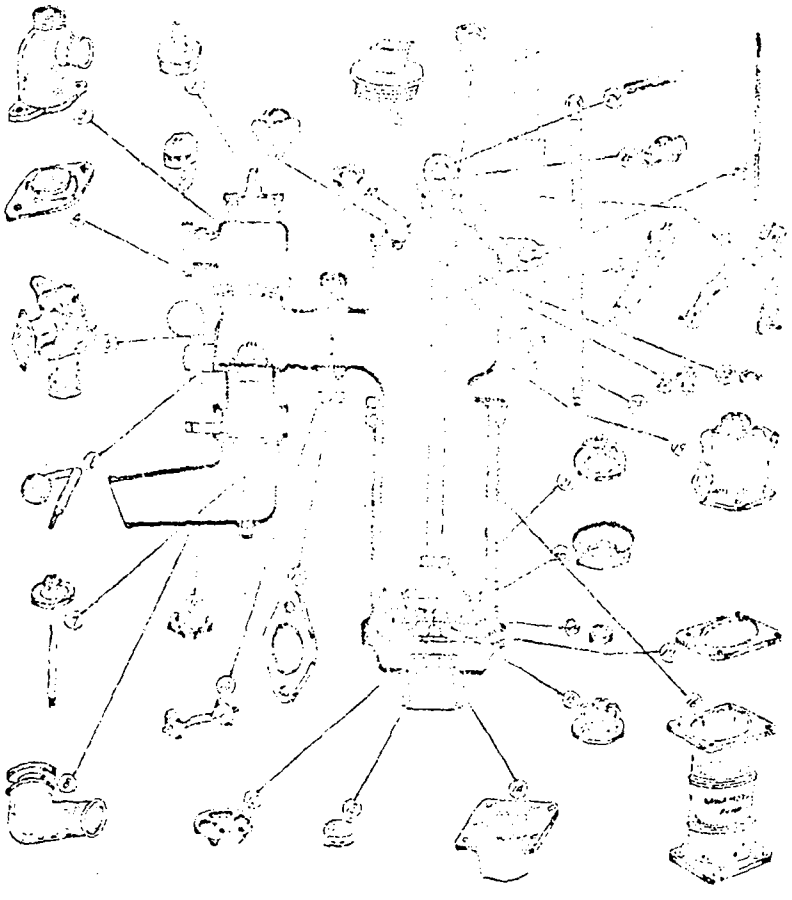
"JETMATIC - DRAGON"

Model. No. 2 (C).-



CONSTRUCTION :

Model No. 2 (C)



No.	Name of parts
1	Hose joint
2	Cap
3	3 way spout upper body
4	Check valve
5	3 way spout body
6	Change lever
7	Change valve
8	Spout
9	Hook
10	Bolt & Nut
11	3 way spout packing
12	Valve cover
13	Valve weight (Valve)
14	Valve
15	Lower plunger
16	Cylinder porcelain enameled inside
17	Rubber packing
18	Valve weight (Pump)
19	Chamber
20	Upper cup
21	Upper plunger
22	Priming cap
23	Priming cap packing
24	Handle
25	Lever
26	Double rod
27	Shaft
28	Head
29	Pin
30	Gland
31	Packing box
32	Cover washer
33	Gland bushing

4. Existing Handpumps Available or Tested in Indonesia

Dragon Jetmatic pump * S/W

This is the most popular handpump in Indonesia, and widely available in the market. Spare parts are also readily obtainable. A good quality Dragon/Jetmatic pump can give acceptable field performance, but locally manufactured (low-priced) imitations of the pump are generally not of an adequate standard of quality. Weight: 23 kg; cylinder lining of various materials incl. porcelain enameled liner.

New No.6 Handpump (Bangladesh) S/W

Conventional piston pump for shallow well use, developed with UNICEF-assistance in Bangladesh. This pump was tested in Indonesia in 1979-1978, but proved not successful.

Moyno (USA) D/W

Non-conventional, helical-rotor pump. One imported unit of this type of pump was tested in West Java province, and performed well. Installation was easy, and acceptance by the users good. However, the cost of the pump is high. The starting torque of the pump is somewhat difficult to overcome for users of slight stature (i.e. women and children); also the pump handle position is fairly high.

Due to strict clearances in the pump rotor assembly, the pump is probably not suitable for local manufacture. Pump spout design would have to be modified to suit the preference of Indonesian users.

"Hesty" SL 101 (Australia) D/W

This pump was very well received by the users on the sites where it was installed, mainly in UNICEF-assisted water supply projects with Australian financial aid. Unfortunately, spare parts for this pump were not available in the Indonesian market.
Weight: 38,5 kg; cylinder: galvanised iron 2 inch, with brass lining; brass piston with stainless steel ball valve; leather cups.

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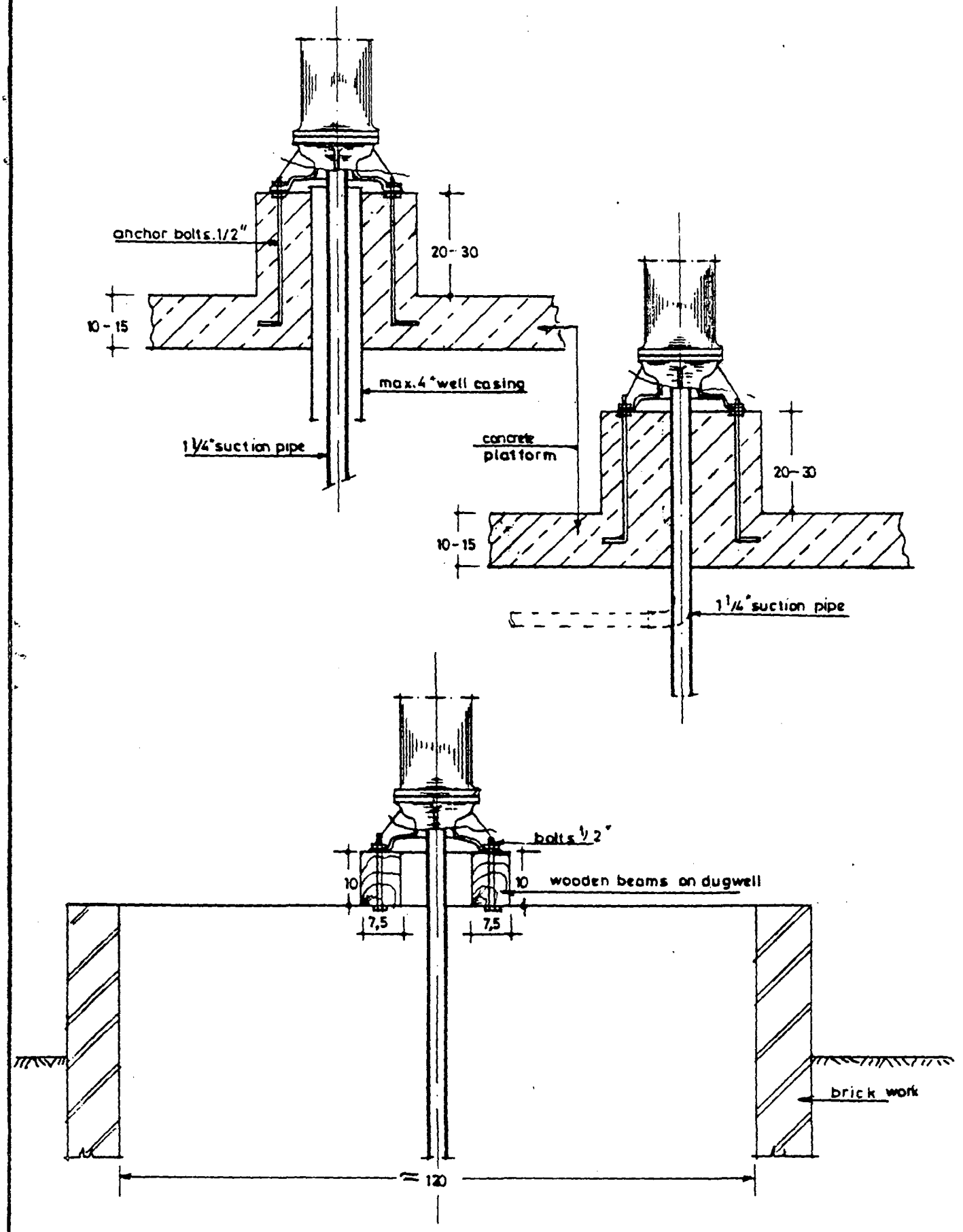
* also called "Quick", "Lucky", "Jetmatic", "Kawamoto Daichi", "Usaika" and other local names.



dimensions in cm

GOVERNMENT OF INDONESIA MINISTRY OF HEALTH DIRECTORATE OF HYGIENE AND SANITATION	RURAL WATER SUPPLY WEST JAVA PROYEK AIR MINUM PEDESAAN JAWA BARAT PROJECT OFFICE JALAN SEDERHANA 7 – BANDUNG	OTA 33
KABUPATEN	SCALE 1 : 10	FOUNDATION POSSIBILITIES BANDUNG PUMP
KECAMATAN	DRAWN A.Sadjo.S	
DESA	DATE 5 - 12 - 78	
CONSULTANTS WACO B.V. ROTTERDAM	APPR.	REPORT NO. FIG.NO 2

"Korat" (Thailand)

An imported unit of this pump was tested in an area near Jakarta. The pump was appreciated for its easy operation, and robustness. Due to various difficulties, the test was unconclusive.

Dempster (USA) D/W

Several imported units of the "Dempster" pump have been tested at sites in West Java, Central Java, East Java, Jokjakarta District, and D.K.I. Jaya District. A special team (Teamleader: Dr. Sutiman, Institute of Technology, Bandung) conducted the testing and evaluation of the "Dempster" pump for the Ministry of Health.

The field performance of the "Dempster" pump was found to be good; problems experienced with wearing parts were due to inadequate maintenance. It was recommended to prepare installation and maintenance manuals for the pump, in the local language (Bahasa Indonesia). Other measures designed to build up a support structure and organization for maintaining the pump, were also recommended

"Bandung" pump S/W

This is a locally manufactured pump of sturdy construction, developed under the Netherlands-assisted West Java Rural Water Supply Project. The pump's design incorporates several features of existing pumps in Indonesia. It is adapted to the stature and strength of the users, especially women and children. The pump has generous bearings. The spout has been specially designed for the "Kendis", the Indonesian type of water jar. Cylinder: 9,6 cm diameter. The pump can use the standard "Dragon" steel cylinder lining, or a special PVC liner.

Metal Industries Development Centre (MIDC), of Bandung, was actively involved in adapting the "Bandung" pump design to the capabilities in casting and machining that are available in Indonesia.

The wearing parts such as the cup seals, flapper valve and cylinder lining are the same as for the (Kawamoto) Dragon pump, and thus widely available in the Indonesian market. The pump is manufactured in several places; e.g. in Bandung (West Java), and Batur Jaya, Batur Lepen and Klaten (East Java).

It appears that the casting and machining required for the "Bandung" pump can be provided locally at an acceptable standard of quality. For maintaining the pump, only two different sizes of spanners are needed.

AID-Type/S.B. ("Sumber-Baya")*

The AID-type handpump is being manufactured in Indonesia in considerable number, and installed in rural water projects of several agencies (e.g. CARE, Ministry of Transmigration) under the name "S.B." or "Bandung" pump.

During 1979, some 15 of these pumps were tested under the supervision of the Ministry of Health, with assistance of WHO, under the National Rural Community Water Supply and Sanitation Project (INO-BSM-001).

CARE/Indonesia is involved in several rural water supply projects (co-financed by USAID) in which handpumps are installed. They use the "S.B." pump and also the popular "Dragon/Jetmatic" pump. Health education and training in handpump maintenance is being provided in the project in West Java. The present S.B. pump used is one with a modified footvalve.

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* "Sumber-Baya" means source of water.

BALAI PENELITIAN BAHAN - BAHAN

(MATERIALS TESTING INSTITUTE)

Jl. Sangkuriang No. 14 Telp. 82028, BANDUNG.

Alamat Kawat ; bpb. Tromol Pos ; 32

Laboratorium untuk : bahan logam; bahan kimia; bahan organik; bahan bangunan; barang teknik.

PENYELIDIKAN No. / Report Nr. : S 9/79/57. Bandung. May 18 1979.

Bahan/Barang / Material : Sample hand pump.

DIBUAT UNTUK / Excecuted for : RURAL WATER SUPPLY WEST JAVA PROJECT OTA 33/J-7
Jl. Sederhana 7 Bandung.

Contoh diterima tanggal / Sample received on : May 11, 1979.

HASIL PENYELIDIKAN
TEST RESULT

DESCRIPTION :

We have received one suction hand pump marked " BANDUNG PUMP ", with the following dimensions :

Total height	730	mm
Lining , length	225	mm
inner diameter	98	mm
Stroke	155	mm

This pump was tested as requested by Rural Water Supply West Java.

TEST RESULTS :

1. Suction head :

Depth (meter)	Capacity / Stroke (CC)	Efficiency (%)
0,6	1630	96.1
3.0	1220	71.9
6.0	1160	68.4
7.0	1090	64.3
8.0	1060	62.5
9.0	1050	61.9

2. Leakage : No leakage observed when it is pressed hydrostatically at 4 atm.
3. Lining : The lining surface and the seam of the lining are smooth.
4. The Valves : The valves are working well.
5. General functioning : The lever system is working well.
The finishing of the pump is good and no harmful edges are visible.

5. AID assisted Handpump Program in Indonesia

The AID-assisted Hand Pump Program in Indonesia involved the manufacturing of 230 AID-type S.B. pumps, and the installation of 180 of these pumps at suitable wells. Of the remaining pumps, 33 were placed at 11 schools for sanitarians, so that the students would become familiar with the installation method and regular maintenance of the pump. Water quality examination (bacteriological and chemical) was carried out to check the water quality of the water pumped.

The Program intended to have a field trial of the locally manufactured AID-type pumps in 8 different areas of Indonesia, with the objective to monitor of the pump's performance under different physical conditions and under varying levels of users' involvement and support. However, the planned field trial and monitoring activities did not actually take place.

The purest appraisal would take into account life cycle costs per unit of water delivered/pumped. For this, sufficient data are not available. However, from the field data gathered, as supplemented by information from interviews and selected documents, it may be stated that:

The AID-type handpump can be - and is being - manufactured in Indonesia atan acceptable level of quality. Several manufacturers are producing the pump at a competitive price, as compared with other pumps of the same class.

The following field observations were made concerning the pumps inspected:

(i) Users at many well sites had fixed a piece of PVC pipe as a modification of the spout so as to control the flow of water from the outlet. In this way, apparently, it is easier to fill the water jars.

(ii) At many of the well sites, the people had built a shed to segment a bathing unit of the platform. This is apparently needed to provide some privacy during bathing. Platform design should be re-considered in order to provide the desired bathing section.

(iii) The S.B. pump represents, on all well sites, a considerable improvement (in terms of hygiene and safe water supply) over the traditional wells many of which were still present and all of which appears to be polluted.

(iv) Heavy usage (e.g. from 5 am - 10 pm) was indicated by the users at all well sites. Pivot points showed wear caused by ultra-heavy use of the pumps. Villagers indicated usage by 150 - 1,000 (!) people.

(v) Bushings were frequently missing. These should be press-fitted in when used in the pump, or another pivot design must be found.

(vi) Some pumps showed bouncing-back (spring-type) operation. This indicates slow recharge of the well resulting in underpressure when the pump is operated.

(vii) According to the users, the piston leathers typically had been replaced 2-3 times in some 2½ years of use. This is quite acceptable in view of the heavy usage of the pumps.

(viii) Pumps at various wells showed signs of care and attention. In one case the pump had been nicely repainted, in another the pump rod/ lever connection had been repaired by welding which is not easily done. At yet another site a rubber slab had been inserted between the pump stand and the pump head. This is not really necessary, but it makes for an easier fitting of the pump head.

(ix) At one site, the old (polluted) shallow well next to the S.B. pump was no longer in use. The rope was disconnected from the bucket down in the well. Apparently the people had not cared to repair the bucket hoisting gear, and were using the new handpump exclusively.

(x) Pivot pins, on inspection, showed hardly any wear. If hardened, the pins perform their function very well.

(xi) Lubrication and/or oiling was evident at practically all pumps inspected.

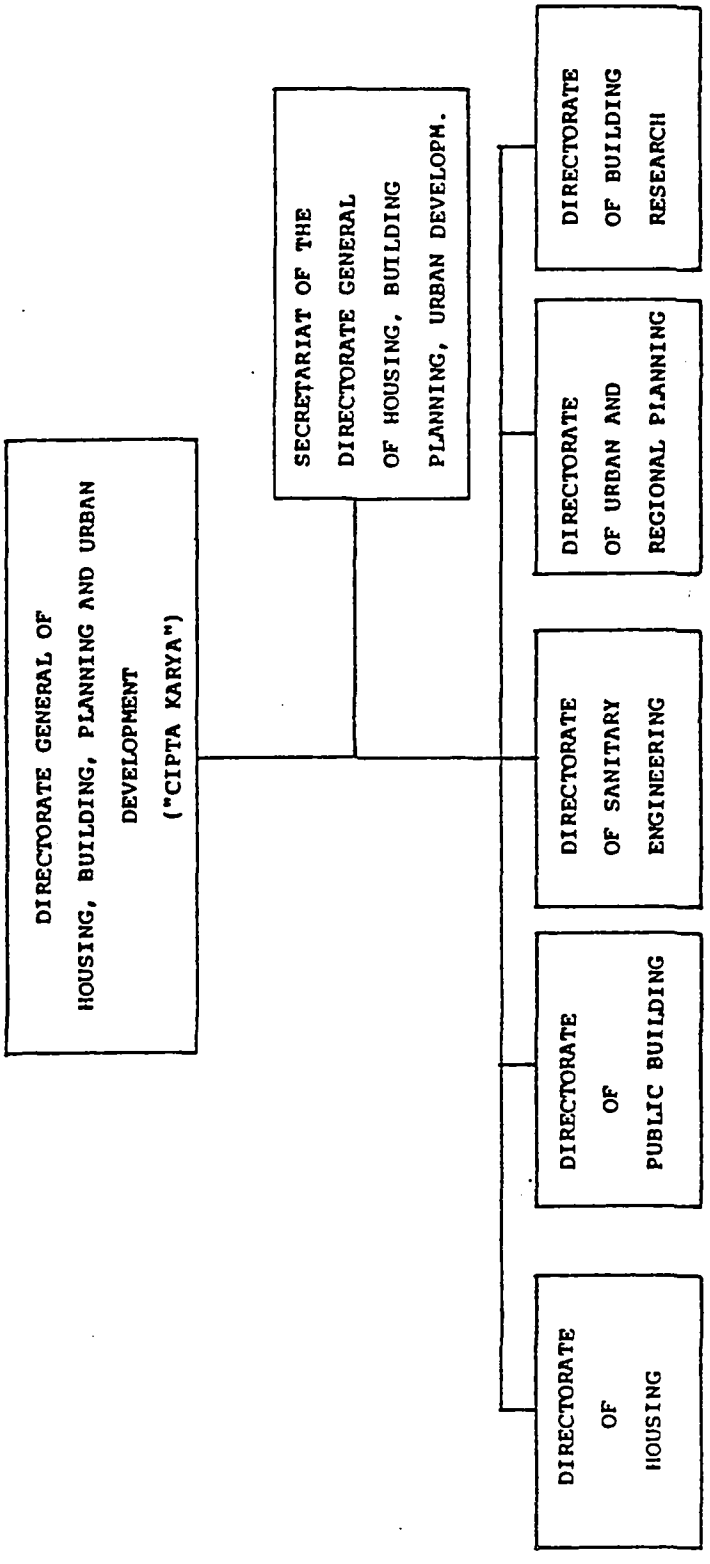
It may be noted that there exists an Indonesian standard handpump specification (SII, Standard Industri Indonesia No.0259-79) entitled "Pompa Air Tangan Torok Dangkal", issued by the Ministry of Industry.

INDONESIA

Key Persons Met

USAID/Indonesia, Jakarta	David Calder
CARE/Indonesia, Jakarta	Ellis Franklin
CARE/Indonesia, Jakarta	Donna Krishna
Ministry of Public Works (Directorate General of Housing, Building, Palnning and Urban Development), Jakarta	Suratmo Notodipuro Darmawan Saleh P. Djajardi Haryano Ali
Ministry of Health, Jakarta	Wadyu P.H. Widodo R.H. Harris (WHO)
WHO, Jakarta	Dr. W.L. Reyes S. Pancaroglu
UNICEF, Jakarta	Mesbahuddin Akther
UNDP, Jakarta	Moon Sup So
IWACO Consulting Engineers, Jakarta	Matthieu van Melick
Metal Industries Development Centre, Bandung	S. Abdurahim A. Dethioux
West Java Rural Water Supply Project, Bandung	Dr. B. van Bronkhorst R. van Kerkvoorden Hans Hoffman
CELCO Industrial Co. Ltd. Bandung	Tano Tjakrasasmite

ANNEX 1: ORGANIZATION CHART OF THE DIRECTORATE GENERAL OF CIPTA KARYA OF THE MINISTRY OF PUBLIC WORKS



ANNEX 2: ORGANIZATION STRUCTURE OF THE DIRECTORATE OF SANITARY ENGINEERING

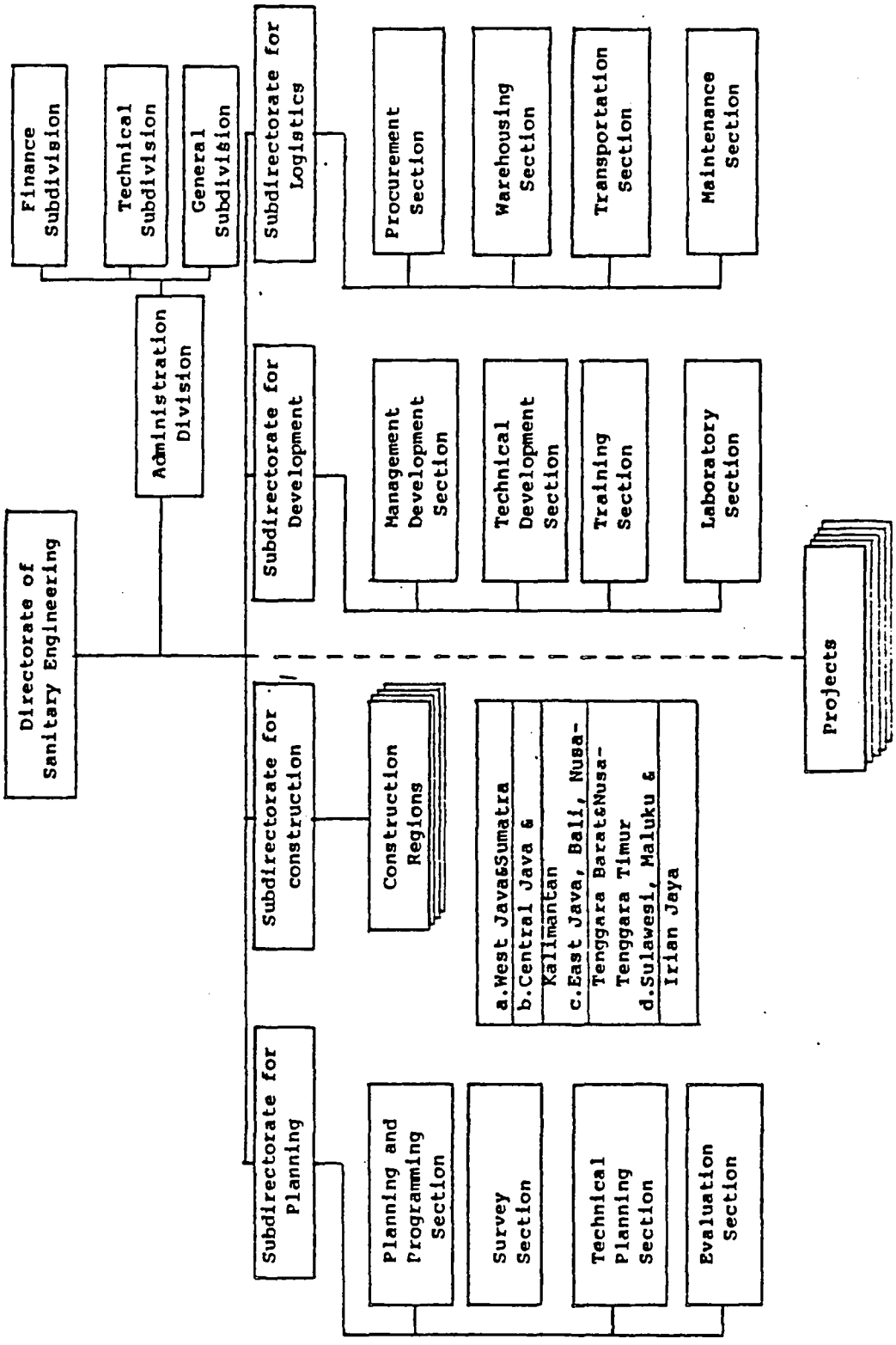


Table 7.

INSPECTION OF PUBLIC HANDPUMPS Date:.....

K a b u p a t e n	: .....
K e c a m a t a n	: .....
D e s a	: .....
Exact place, kampung + block	: .....
Responsible for maintenance	: .....
Type of well	: tube/dug well
Depth of well/or screen	: .....
H a n d p u m p	: present/removed/never installed
Pump installed/date/by	: ...../.....
Pump out of order since/date	: ...../.....
Type of pump	: suction/lift pump
Manufacturer of the pump	: .....
Material lining dug well	: .....
Material suction pipe, size	: iron/p.v.c./ .....
Material screen	: slatted iron/p.v.c./Johnson
Depth of water level if known	: landsurface ..... meter
Capacity measured	: ..... lt/5 minutes
Cap. increasing in wet season	: yes/no
Cap. decreasing in dry season	: yes/no
Number of users	: .....
Used for drinking water	: yes/no
Is preference given to other water supply	: yes/no why ? .....
Nearest toilet	: ..... meter
Taste of water	: good/salt/muddy/.....
Smell of water	: normal/bad/.....
Colour of water	: normal/light/milky/brown
Construction general	: good/normal/bad/out of order
H a n d l e	: good/normal/bad/out of order
Bearings, levers	: good/normal/bad/out of order
Seals, leakage	: good/normal/bad/out of order
Sub structure, concrete slab	: good/normal/bad/out of order
Spoil gutter, surrounding	: open/clogged up/not existing
Reservoir	: not existing/dimensions .....
Distance to nearest well/handpump	: .....
Pump protection	: with/without guard, fencing, pumproom
Water sample taken	: yes/no
Under pressure during pumping	: yes/no
Pump paid by/price	: ...../.....

USAID-assisted Handpump Program in Honduras

1. Background

Honduras covers an area of 112.000 sq.km. The estimated total population is 3,85 mln people (1980) of which 64% rural, in some 20,000 communities. The economy depends heavily on agriculture, with bananas and coffee as the main exports. The estimated GNP per capita in 1980 was US $ 530.
Main towns: Tegucigalpa, San Pedro Sula, Choluteca, La Ceiba. The principal causes of death are infectious and parasitic diseases, malnutrition and respiratory diseases.

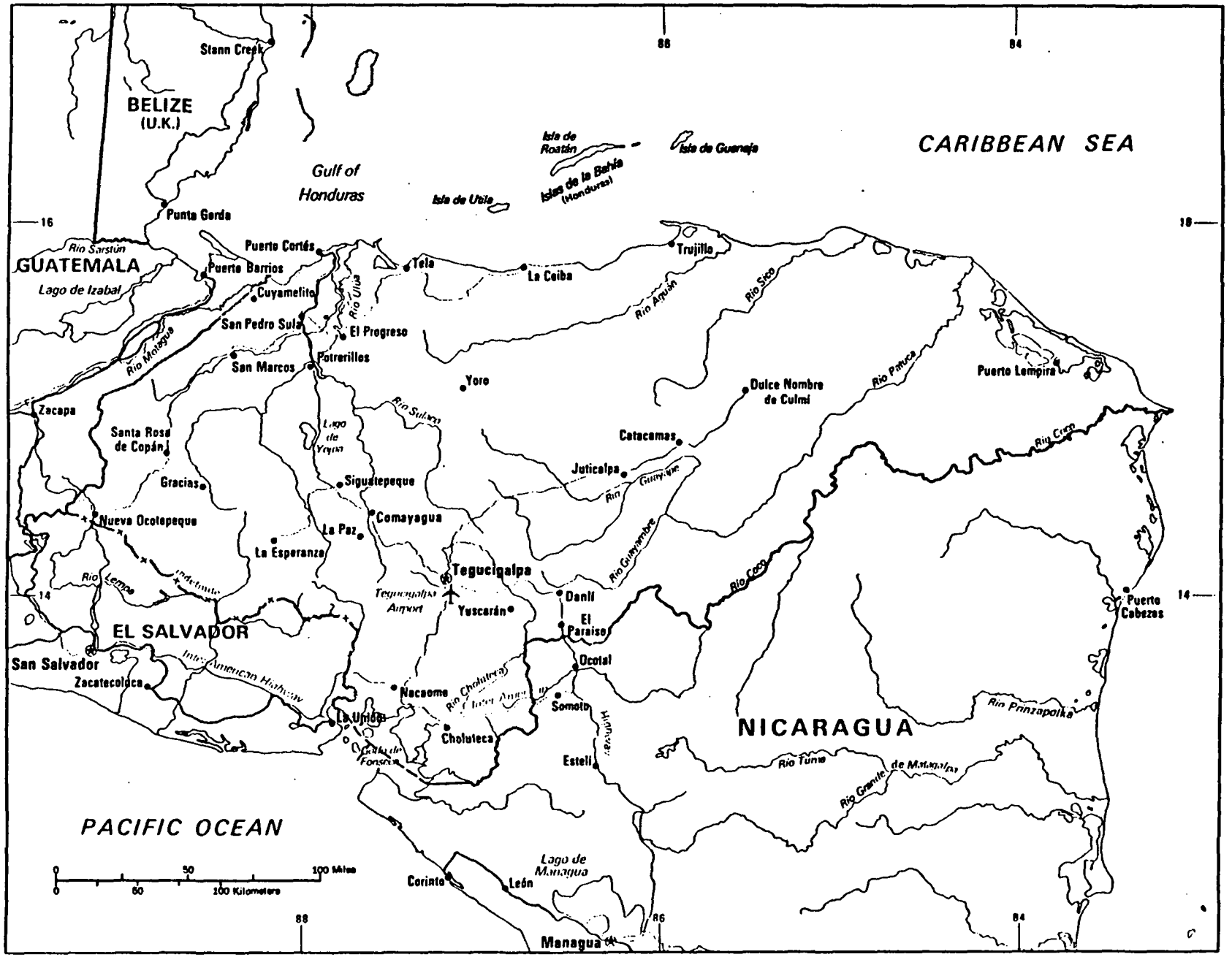
2. Water Supply Sector

The principal (government) agencies in the water supply sector are:

- Servicio Autonomo Nacional de Acueductos y Alacantarillados (SANAA) (National Autonomous Water Supply and Sewerage Service) responsible for urban and rural water supply systems as well as for sewerage in the main urban centres; presently in charge of over 100 water supply systems.
- Ministerio de Salud Publica y Assencia Social (MSPAS) (Ministry of Public Health and Social Welfare), through the Directorate of Environmental Sanitation responsible for environmental health in small rural communities, and the smaller municipalities.
  SANAA has primary responsibility for all communities of more than 200 people and MSPAS for the rural communities of less than 200 people.

Planning for the Water Supply Sector is the responsibility of CONSUPLANE (High Council for Economic Planning), through its Technical Secretariat which draws up and coordinates the programmes of the various water supply and sanitation agencies involved. It is also responsible for integrating water supply and sanitation sector development into the national development planning.

Honduras



507476 1-76 (541405)
Lambert Conformal Projection
Standard parallels 9°20' and 14°40'
Scale 1:3,400,000
Boundary representation is not necessarily authoritative

Railroad
Road
Airport

The government has placed high priority on health services for the rural and peri-urban population, with emphasis on basic sanitation programmes.

Major constraints to sector development are the weak implementation capacity of the government agencies and institutions concerned, in terms of project preparation, project execution and maintenance of water supply and sanitation facilities. There is a lack of staff, and considerable deficiencies in training of personnel.

The present water supply and sanitation services are mostly in dubious shape, many completely outdated and inadequate. Maintenance services are virtually absent.
Important sector programmes are:

- PRASAR Proyecto de Aqua y Saneamiento Rural.
- PROSABA Programa de Saneamiento Basico.

Water Supply Coverage	planned 1983	estimated
Urban		
house connections	47%	
standpipes	29%	
Rural		
house connections (piped water schemes)	18%	15%
other supplies	56%	18%

The implementation of the planned coverage programme for the Decade would require substantial external financial and technical assistance, especially soft loans and grants. The strengthening of institutional and organisational capabilities is very important. Moreover, a policy of providing adequate salaries is essential to attract and retain professionals and technical staff for the sector.

External agencies active in the sector are:
CADB, USAID, CARE, UNICEF, and PAHO.

The sector's motto is: "Construyendo una vida mejor" (Work for a better life). For example, the PRASAR programme is a joint venture of the communities, SANAA, MSPAS, and USAID. It is said that cooperation with the communities is actively sought.

Some 40 % of the national investment in the public health sector is reported to be apportioned to water supply and sanitation, with half of it coming from external assistance. The current National Plan (1979-1983) aimed at increasing water supply and basic sanitation coverage particularly in the rural and peri-urban areas. The envisaged funding was $ 35 mln from national resources, supplemented by $ 49 mln external assistance.

3. USAID-assisted Water Supply and Sanitation Program

USAID has been assisting, and continues to assist the PRASAR project involving:

- 180 new piped water schemes
- 50 extensions of existing piped water schemes
- 21 waste water disposal schemes
- 3.000 dug wells equipped with handpumps
- 800 rehabilitation of existing wells
- 25 windmills installation for water pumping
- 18.000 latrines (dry disposal)
- 14.000 water-seal latrines
- and health education

The envisaged handpump installation has only been partly realized. The handpump used are AID-type pump manufactured in Honduras, and the Dempster 23 F (imported).

Currently, the AID Mission is working to restruct the loan agreement, modifying the project's "mix" of types of water systems, with a greater emphasis on dug wells with handpumps. Because only 90 wells are reported to have been constructed under the project (which originally called for 3,000 wells by the end of 1983) the project needs to be re-programmed. A new programme plan is being drafted in consultation with the government agencies concerned. Greater emphasis will be given to stimulating community participation. If the people to be served are not interested, it will be difficult for any water system to be effective.

A difficulty is that project staff morale has detoriated due to prolonged delays in salary payment, and serious problems in the supply of materials.

---

* Comayaqua was the first capital of Honduras. It is an attractive colonial town built by the Spamards in the 17th century.

4. Project Appraisal

Some 54 wells sites (dug and drilled wells) selected from the site index sheets and site maps were inspected, most were new pump installations, with the pumps (Dempster 23 F; AID-type pump) installed the period April-August 1982. Also inspected were Sanpar pumps installed on several of the wells; this a locally manufactured pump. The depth of the water in the wells was in the 8-15m range. The estimted number of users varied between 10-15 families (50-75 persons). An improved version of the Sanpar pump is currently developed by the manufacturer.

If the pump fails to operate, the villagers remove the cover and draw water using rope-and-bucket. Another problem is that many wells dry up during the dry season.

5. Observations and Comments

Lack of Active Market

At the foundry/workshop producing the AID-type handpump (Molino Harinero Sula S.A., in San Pedro Sula) a stock of over 50 AID-type pumps and 12 Dempster (model 28 EX)* was held. It was reported there is no active market for these pumps.

Inadequate Drainage

Inadequate drainage of spilled water was common, especially in San Pedro district which is a flat plain area. Concrete aprons have been constructed around the handpumps. However, waste water typically collects in pools in the road site drains, increasing the risk of well water contamination through ground seepage and serving as a breeding place for flies, bees, and musquitos.

This problem received attention from project personnel. The community was asked to improve the drainage of waste water by placing a stones and gravel fill in the channel leading away from the pump platform.

Micro-irrigation

Micro irrigation using spill-over water from the handpumps is an added project goal.

* i.e. Dempster PVC (Crestline) Flush Cap Cylinder 3-inch size; ASTM D 2685

HONDURAS

Honduras, January 1983
1 US $ = Lps 2 Lempira.
Languages: Spanish, English

NATIONAL

CONSUPLANE
Conseje Superior de Planificacion
(High Council for Economic Planning)
Technical Secretariat
Secretaria Technica
Edificio Banco Atlantida, 3e piso
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Tel: 22-1219
22-7001

Secretario Ejecutivo,
José Luis Florez Escobar

MINSALUD/MSPAS
Ministerio de Salud Publica y
Assistencia Social
(Ministry of Public Health and
Social Welfare)
División de Saneamiento Ambiental
Palacio de los Ministerios
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Lic. Luis A. Canales
Dr. Guillermo Octavio Florez
Jefe de Depto
SESAMO
Ing. Jorge Rafael Florez
Jefe de Depto de Saneamiento
Basico

PROSABA
Programa de Saneamiento
Basico

PRASAR
Proyecto de Aqua y Saneamiento Rural

CEDEN
Comité Evangelico de Dessarrollo y
Emergencia Nacional
(Evangelical Committee for National Development and Emergencies)

SANAA
Servicio Nacional de Acueductos
y Alcantarillados
(National Autonomous Agency for
Water Supply and Waste Water Disposal)
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Ing. Jorge Tivino, Director
Ing. Oscar Diaz
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Ministerio de Recursos Naturales
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Universidad Nacional de Honduras
Tegucigalpa

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Ave. New Orleans No. 69
San Pedro Sula
Tel: 54-0895

Molino Harinero Sula S.A.
(Funimaq Pumps)
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San Pedro Sula
Tel: 54-1205

CDI
Centro de Dessarrollo Industrial
Tegucigalpa

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W. Hudson Smith
George Flowers
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Edmundo Madrid

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Martha E. Milk
Head, Health Division

CADB
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Tegucigalpa

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Justin R. Jackson, Director

USAID-assisted Handpump Program in the Dominican Republic

1. Background

The main urban centres are Santo Domingo, San Juan, Santiago de Caballeros and San Pedro de Macoris. The Dominican Republic forms together with Haiti what is historically called Hispanolia.

2. Water Supply Sector

Available data indicates that, in 1980, about 56% of the urban population was served by house connections, while only an estimated 12% of the rural population had access to an adequate water supply.

The principal (government and semi-government) agencies in the water supply and sanitation sector are:

INAPA Instituto Nacional de Aqua Potable y Alcantarillado
(National Institute for Water Supply and Waste Water Disposal)

- Secretaria de Salud Publica y Assistencia Social
(State Secretariat for Public Health and Social Welfare)

CAASD Corporacion del Acueducto y Alcantarillado de Santo Domingo

Under INAPA and the State Secretariat for Public Health, there is a special program organisation, SESPAS, Servicio Especial de Programa de Aqua y Saneamiento.

SESPAS was established especially to direct more effort to serving the rural population's needs. The agency first serveyed some 2,800 towns and villages (with 300-5,000 inhabitants) to provide an information base for the program. Financial and technical assistance was obtained from the Inter-American Development Bank, USAID, PAHO, UNICEF and several other organisations.

For organising the program, the country was divided into six zones, and cooperation with the village communities was established through the assistance of promotors assigned to the zones, for health promotion and community development.

With the number of installed water systems increasing new construction has been held up, as operation and maintenance problems became more numerous and serious.

The promotors play an important part in assisting each participating community to provide its agreed contribution for the installation of the water supply system. The promotors, familiarity with the local conditions and customs enable them to develop close collaboration with the communities involved. Although promotional activities are primarily the responsibility of the promotors, the engineers and other project personnel are also involved in promotion work and health education.

3. Project Information

A USAID-provided Health Sector Loan II (1979-1983; $ 8,000,000)* was designed to provide water supply and sanitation facilities, and health education to rural communities in the western part of the country. The communities vary in size between 400 and 2,000 inhabitants.

The project emphasis is on community participation and training, through active cooperation with community health committees assisted by the health promotor assigned to the community. Community participation involves helping drill the wells, dig trenches (where piped gravity-flow system are used), and pay a monthly contribution per family for maintenance and spare parts.

The project calls for some 2,000 wells , one for every ten families. Lack of hydrogeological data and expertise have resulted in a high rate of dry wells, and this has had a negative effect on community interest.

A local foundry is manufacturing an AID-type handpump. At the time a pump is installed , two people from the community are reportedly trained in handpump maintenance.

Where appropriate, gravity-flow systems are installed as they are generally more cost-effective provided that the source of water is safe.

---

* Sector Loan II expires November 1983

A 20-gallon household storage container has been designed, and manufactured in some 20,000 number. It is made of fiberglass with a faucet-type outlet, and the form is that of a flying saucer.

4. AID-assisted Handpump Program

4.1. Background

The Secretaria de Salud Publica (Ministry of Public Health) obtained bids for 1,000 AID-type handpumps (shallow-well as well as deep-well pumps), at US $ 128 for both models, from ETINCA (Equipo Technico y Industrial), a foundry and machine shop in Santo Domingo. A prototype of the AID-type pump was available from Nigaragua.

For field testing, the pumps were mounted on concrete aprons extending five feet around the wells, with a concrete pedestal supporting the pump. A section of PVC pipe is so placed that it forms the well opening; it also prevents spilled water from entering the well.

Later, the Ministry of Health has increased its order for the AID-type pump from 1,000 to 2,600 units.

Initially, 21 pumps were field tested in the Cibao Valley area, and an additional 25 pumps were installed later.

Pump design modifications were needed with ease of maintenance as the overriding requirement. Another interesting design modification is a reducer piece fitted to the spout giving a better controlled outflow of water for filling narrow-necked water containers.

Up to December 1982, some 750 pumps were installed of which about 400 on existing wells, and 350 on newly drilled or dug wells.

The pump manufacturer, ETINCA, did originally plan to only produce the castings, with other suppliers subcontracted to provide all other parts. However, delays in delivery seriously hampered the supply of parts. Moreover, many parts so supplied proved to be of poor quality, and difficult to fit. The manufacturer's willingness to continue is remarkable, Very few sales of the AID-type pump outside the AID-financed project have been made. The main one was to FUDEC, the Evangelical Foundation for Community Development, which is active in several parts of the Dominican Republic.

4.2 Field Inspection

AID-type pumps in the arid Azua region were inspected. The pumps have been installed in the period January - May 1982.

Many were without any grease, "screaming" when operated. Bushings frequently were absent.

In many of the pumps, the footvalve was not functioning properly, or not at all.

An additional problem was the water quality (i.e. high salinity, high iron contact) at several of the wells. At one well site the pedestal was covered with a brownish iron precipitate.

Drainage was inadequate at most of the well sites.

Bolts fixing the pump base to the platform were frequently loose or absent.

Pivot pins inspected after removal from the pumps pivot points, showed little or no wear.

Where bushings were missing, the pump handle frequently had badly worn out, resulting in eliptical pivot holes.

However, in spite of no or little maintenance care (e.g. greasing), many of the pump were still working, probably due to the actual light usage by a relatively small number of users.

Some of the pumps, especially those sitting on deep wells (i.e. 30-40m depth of water), were giving only small quantities of water. This was probably due to a very limited recharge of water into the wells, which is not uncommon in the type of geological formations concerned. At other well sites, the pumps were found to give no water at all.

Wells are usually drilled up to a depth of 30m (100 ft). If no water is found at that depth, the well is regarded as dry, and abandoned. Average drilling cost is reported at Dom. Pesos 2,000 (US $ 1,330) for the well, and Dom. Pesos 1,500 (US $ 1,000) for the pump and its installation costs.

Inspected in the Cibao Valley region (Santiago area) were a dozen AID-type handpumps installedin the period September-November 1978, thus being in place about 4 years. Most were on shallow wells (with the water at 3-5m depth), a few on medium-depth wells (10-12m). All were of the earlier (predecessor) model of the AID-type pump which is built of steel components welded together; in contrast, the present AID-type pump uses cast iron components.

Although the old AID-type model pumps were apparently well-constructed, and under light usage only (by single family or by a few families living in the vicinity of the pump), most of them were either inoperative or badly worn, and near to the end of their useful life. A few pumps which clearly had received a good deal of maintenance care (e.g. generous greasing) were still performing well.

At several sites of inoperative, abandoned pumps, the water users had re-opened the wells for drawing water with rope-and-bucket. At others, people had apparently other water sources at their disposal. Nearly all houses near pump sites or around, had well-constructed rainwater collectors. Responding to questions, people readily confirmed that most of the pumps installed 4 years ago, were now inoperative.

In several instances, innovative pump users had introduced modifications to the pump, such as rolling slide rings or open-tube sliding blocks which (amply greased) had improved the ease of operation in an admirable way. At one site, a broken pump handle had been nicely repaired by welding the pieces together.

A noteworthy feature of the old (steel) AID-type model pump is that the pump base has 20 holes which apparently originally were considered necessary for mounting the pump in any selected position on the apron. Field experience clearly had not confirmed the need for this installation facility; accordingly the present AID-type pump has a much smaller number of holes in the pump base.

4.3. Technical Comments

a. Field observations indicate that it is difficult to fix the pump base tightly to the apron, as the metal-concrete interface does not

accomodate the unavailable roughness of the concrete surface. An insert of rubber or similar material would help ensure a more lasting tight fitting of the pump to the apron.

b. A 90° positioning of the spout to the handle (instead of the usual in-line positioning) would allow for easier filling of water containers and would facilitate the use of the pump generally.

c. Quality inspection of the AID-type pumps upon delivery by the manufacturer to the government store, apparently is becoming stricter and more effective, with recently some 38 out of 100 pumps rejected from one particular lot. A further improvement might be to paint the pumps only after they have been accepted. This would enable a closer inspection, and the painting of approved pumps would visibly mark them as such.

DOMINICIAN REPUBLIC

January 1983
1 US $ = Dom. Peso 1,48
Per diem: US $ 79
Working hours:
Government: 7.30 - 14,30
Banks: 8.30 - 12.30

Main Centres: Santo Domingo
San Pedro Silva
San Juan
Santiago de Caballeros

NATIONAL

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Under-Secretary, (Public Health)

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Santo Domingo
tel: 566-8776

Mr. Tobias Fernandez Dotel
Administrador

Tuberias y Materiaces Plasticos C.por.A
Santo Domingo
manufacturer of Robo-screen
and footvalve for handpumps

INTERNATIONAL

USAID
Av. Leopoldo Navarro
American Embassy
Santo Domingo

Dr. Oscar Rivera, Health and
Population Div.
Secretary: Diana de Baez
Manual Valdez

OPS/OMS
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Santo Domingo

INSTRAW
U.N. Organization for the Development
of the Role of Women
Santo Domingo

UNDP
Naciones Unidas Programa para el Desarrollo
Santo Domingo
Tel: 533-7575

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AID Hand-operated Water Pump in Liberia
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ANNEX I

CONSULTANT'S ITINERARY

Phase I

18 Sept. 1983	Travel Amsterdam - New Delhi
19 Sept.	Arrive New Delhi 13.00 hrs.
20 Sept. (Monday)	WHO South-East Asia Regional Office
	UNICEF South Central Asia Regional Office
21 Sept.	Travel New Delhi - Bombay - Colombo
	Arrive Colombo 19.45 hrs.
22 Sept.	USAID/Sri Lanka Mission
	Ministry of Local Government and Housing
23 Sept.	Field Trip - Kalutera District
	Stay in Hambantota
24 Sept.	Field Trip - Hambantota District
	Stay in Kandy
25 Sept.	Field Trip - Kandy District
	Return to Colombo
26 Sept.	Work in Hotel
27 Sept. (Monday)	UNICEF/Sri Lanka
	National Water Supply & Drainage Board
	Ministry of Local Government and Housing
28 Sept.	Wind up work in Colombo
	Travel Colombo - Singapore
	Arrive Singapore 18.30 hrs
	Stay in Singapore
29 Sept.	Travel Singapore - Manila
	Arrive Manila 13.00 hrs.
	USAID/Manila
30 Sept.	Luzon Pump Manufacturing Co.
	Head Office Barangay Water Programme
	Ministry of Local Government
1 Oct.	Field Trip - San Fernando & District
2 Oct.	Field Trip - Lucena City & District (Ilyan Talin)
3 Oct.	Manila; work in Hotel
4 Oct. (Monday)	WHO Western Pacific Regional Office
	Review appraisal results with,
	McJunkin (USAID/S&T/ HEA),
	Donaldson (WASH), Potts (Georgia Tech)

5 Oct.	Asian Development Bank
	Debriefing USAID/Manila
6 Oct.	Travel Manila - Jakarta, via Singapore
	Arrive Jakarta 17.00 hrs.
7 Oct.	CARE/Indonesia
	WHO/Jakarta
	UNICEF/Jakarta
8 Oct.	Travel Jakarta - Bandung
	Arrive Bandung 9.00 hrs.
	Field Trip Bandung & District
	Stay in Bandung
9 Oct.	Visit West Java Rural Water Supply Project Office
	Metal Industries Development Centre
	CARE/West Java Office, Bandung
	Travel Bandung - Jakarta
10 Oct.	Work in Hotel
11 Oct. (Monday)	Ministry of Work & Housing
	(Directorate of Sanitary Engineering)
	World Bank Resident Staff Office
12 Oct.	Ministry of Works & Housing
	(Directorate of Sanitary Engineering)
	Ministry of Health
	(Directorate of Hygiene & Sanitation)
13 Oct.	Series of final visits, Jakarta
	Travel Jakarta - New Delhi, via Bangkok
	Arrive New Delhi 2.10 hrs.(14/10)
14 Oct.	Attend Regional Seminar at
& 15 Oct.	WHO South East Asia Regional Office
16 Oct.	Travel New Delhi - Amsterdam
	Arrive Amsterdam 8.15 hrs. (17/10)

Phase 2

15 Jan. 1983	Travel Amsterdam - Atlanta
	Arrive Atlanta 17.30 hrs.
16 Jan.	Visit Handpump Testing Facility, at
	Georgia Institute of Technology
17 Jan. (Monday)	Travel Atlanta - Miami - San Pedro Sula
	(Honduras) arrive 14.30 hrs.
18 Jan.	Ministry of Health/San Pedro Office
	Field Trip - San Pedro District
	Molino Harinero Sula, S.A.
	(Foundry/Machine Shop)
	Manufacturer of AID-type handpump
19 Jan.	Field Trip - Puerto Cortés District
20 Jan.	Field Trip - Comayaqua District
	Travel San Pedro Sula - Tegucigalpa
	Arrive Tegucigalpa 18.00 hrs.
21 Jan.	USAID/Tegucigalpa
	Pump Distribution Center
22 Jan.	Travel Tegucigalpa - Miami
	Arrive Miami 18.40 hrs
	Stay over Miami
23 Jan.	Travel Miami - Santo Domingo (Dominican Republic)
	Arrive Santo Domingo 20.00 hrs. (delayed)
24 Jan. (Monday)	USAID/Santo Domingo
	Equipo Technico Industrial, C.por A.
	(manufacturer of AID-type handpump)
	Field Trip - Haina
25 Jan.	Field Trip - Azua District
26 Jan.	Field Trip - Santiago District
27 Jan.	INAPA - National Institute for Potable Water
	Work in Hotel
28 Jan.	Tuberias y Materiaces Plasticos, C.por A.
	(Manufacturer of footvalve AID-pump and
	Roboscreen)
	USAID/Santo Domingo
29 Jan.	Work in Hotel
30 Jan.	Travel Santo Domingo - Miami - Washington
	Arrive Washington 15.59 hrs.
31 Jan. (Monday)	Peace Corps,

1 Feb.	World Bank
	AID/S&T/HEA
	AIDIS Meeting
	WASH
2 Feb.	World Bank
	WASH
	AID/S&T/HEA
	PAHO
3 Feb.	Travel Washington - New York (Shuttle)
	Arrive New York 9.30 hrs.
	UNICEF
	UNDP
4 Feb.	UNDP
	Various meetings
	Travel New York (JFK) - Amsterdam
	Depart JFK 21.10 hrs
	Arrive Amsterdam 10.10 hrs. (5/2)
6 through 11 Febr.	Complete Final Draft Report and Forward to Pragma (with copy to AID/S&T/HEA for information)

End of Project

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