WATER ASSESSMENT REPORTS FOR UNICEF

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By
Arif Hasan

ARIF HASAN & ASSOCIATES, ARCHITECTS AND PLANNING CONSULTANTS
37-D, MOHD. ALI SOCIETY, KARACHI-75350 (PAKISTAN) PHONE: 432361

Contents

AN EVALUATION OF THE BIAD/UNICEF WATER AND SANITATION PROGRAMME FOR RURAL BALOCHISTAN

By
Arif Hasan
Architect and Planning Consultant

and

Yunus Sheikh
Environmental Engineer

Arif Hasan & Associates, Architects and Planning Consultants
37-D, Mohd. Ali Society, Karachi - 75350 (Pakistan) Phone: 432361

INTRODUCTION

This report is the result of a request by UNICEF to evaluate the design concept and technical details of the BIAD/UNICEF Water Supply and Sanitation Programme for Balochistan.

To make this evaluation possible, the Pir Alizai Cluster Scheme in the Pishin District and the Goth Gohar Khan and Allah Dino Rind Cluster Schemes in the Naseerabad District were visited. We also studied the drawings, tender documents and other related documentation available for these clusters. The Chib Kalmati Cluster Scheme in Gawder was not visited but its designs a documentation were studied.

During these site visits, we were able to talk to the notables of the areas, the users or prospective users, and in one case the contractor and the site engineer.

In addition, we had detailed discussions with some of the UNICEF staff members in Quetta. These included Mr. Ahad, Mr. Richard Johnson, Mr. Mat Ahnfors, Mr. Eric de Boer, Mr. K.H. Ziai and Ms. Farida Nosherwani.

Discussions were also held with Shehzada Sheharyar Khan of Kalat, Sardar Akram of Mastung and Malik Noor Ahmed and Shaihaq Baloch, both architects of the Quetta Development Authority, Quetta.

Our visit to Balochistan lasted from the March 20 to March 26, 1985.

ARIF HASAN
YUNUS SHAIKH

Karachi: April 11, 1985

Contents

Chapter One

THE CONCEPT AND THE REALITY

1. THE ROLE OF BIAD

1.1 Integrated Area Development

The Balochistan Integrated Area Development (BIAD) is an organisation which was created to provide water, sanitation, basic health and social welfare services to the rural population of Balochistan. The BIAD programme and establishment is being financed by international agencies who through the UNICEF, are also providing technical assistance and monitoring the development work.

1.2 Existing Line Departments and BIAD

In Balochistan, as in the other provinces of Pakistan, there is an irrigation department, a health department, a social welfare department and an education department. These are organised at divisional, district and *tehsil* levels, and are financed by provincial and federal government funds. Some of these "line departments", as they are called, have done a considerable amount of work in their fields, with comparatively small funds and limited technical expertise.

One of the aims of this massive foreign assistance for Balochistan, should have been to have their programmes implemented through these departments. This would have strengthened the departments technically and organisationally, and improved their operational skills. Their experience in the province, even if it is one of failure, can be of great value to the schemes being implemented by the BIAD/UNICEF programme.

1.3 Problems of Co-ordination

There are of course problems of co-ordination between these departments, which make the working of an 'integrated' programme, as envisaged by BIAD, difficult. These problems are, as a matter of face, given as a reason for the creation of BIAD. However, they could have been overcome by involving the Local Administration and Union Councils. The administrative structure for co-ordination, with the involvement of the local authorities, would have been a very major contribution for future planning and implementation of similar programmes in the province.

1.4 Two Parallel Organisations

The formation of BIAD has created a situation where two parallel organisations will be contributing to the development in Balochistan. Their approach to, and solutions for the problems they deal with will differ, as will their long term objectives. This duality will be damaging to the overall development in the province. BIAD will always be conscious of the fact that once international assistance is withdrawn, it will either have to be would up or change its nature of operation. The line departments however are here to stay, and are truly national in character.

1.5 The BIAD Image

Because BIAD is the result of massive international assistance, it has acquired a certain image in the province. This image is further supported by the sophistication of the rural water supply schemes, which have been or are being implemented. It is also partly responsible for the high rates quoted by contractors for the Experimental and Phase 1-A Schemes.

1.6 BIAD and the Line Departments: Possible Association

BIAD is a reality. It is important however that the line departments are somehow drawn into the BIAD/UNICEF schemes and benefit from them. If a correct association is arrived at then the technical competence and operational skills of these departments can be greatly improved. This is in the long term, of greater importance to development in Balochistan than the present water and sanitation schemes. A unified approach to the problems in Balochistan by both organisations should be aimed at. This could be arrived at by combining the experience of the line departments in the province with the yet untapped, research and experimental capabilities of UNICEF.

2. AIMS AND OBJECTIVES OF THE BIAD/UNICEF PROGRAMME

2.1 Better Quality of Life

The aim of the programme can be summed up in one sentence: that is, to improve the quality of life of the rural population of Balochistan. This is to be achieved by reducing the exceptionally high rate of child mortality and morbidity, through primary health and education programmes.

2.2 Entry Point and Community Participation

The important factor in achieving these aims is through improving the quality and quantity of potable water and creating community organisations. For these reasons water has been made an entry point into the lives of the communities. For acquiring this water the communities are required to participate in some manner (they participate by digging the trenches for the water lines) thus coming together and forming organisations to do the work. As the management of the water schemes will also be the job of the community, these organisations will continue to exist thus becoming institutions.

2.3 Other Programmes

Other programmes such as sanitation, community health and education will follow on the base established by the entry point programme.

3. THE CURRENT SCHEMES AND THE BIAD/UNICEF AIMS

3.1 Technical Considerations and Programme Aims

The concept and design criteria for the water schemes in the experimental and phase 1-A schemes should have been developed specifically to promote the aims of the BIAD/UNICEF programme. Technical considerations should have been of secondary importance.

3.2 Cluster Concept: Disadvantages

Purely Technical Decision: The "cluster concept" which groups a number of villages together in a water scheme is the result of a purely technical decision. The cluster committee will only manage the water supply of the cluster. For the other programmes village committees will be required. Software programmes would have benefited enormously if a village committee could have been made to manage a decentralised village water scheme. Cluster communities could have followed if and when necessary, and would have been more powerful as they would have been backed by functioning village organisations. Innovations and research can reduce the cost of water through a decentralised scheme, and the theory that a centralised scheme is cheaper is not necessary true. This is discussed in detail in Chapter-2 of this report.

Sophistication of Design: Centralisation, because of the cluster concept, has resulted in considerable sophistication in the design of the schemes. This has been further complicated by the use of imported machinery and gadgetry, in many cases inappropriate to design requirements. Considerable sums are spent by local authorities in the maintaining and operation of similar schemes for urban areas. However, these schemes are subject to constant failure, in spite of the technical competence and comparative affluence of the urban local bodies.

Contracts for the Notables or Non-cooperation: As the schemes involve a considerable amount of civil works there is pressure by the notables of the area to be given contracts for executing them. When these contracts are not forthcoming, the *Khans*' threaten not to allow the communities to dig the trenches for the water lines. In one case the UNICEF subsequently made trench digging a part of the contract sum. This has set a bad example. Other community leaders are also demanding that trench digging should be a part of the contractors work. Decentralisation would not only remove these problems but make it possible for the community to participate more positively.

Cluster Committee: Operation and Maintenance: The cluster committee in all cases consists of the notables of the villages that form the cluster. The social structure in the different areas of Balochistan varies considerably. In the Pashtoon areas the village is invariably inhabited by one single ethnic group. In some cases ethnic groups which form a cluster have old rivalries. The size and affluence of the villages also varies considerably, creating an unequal power relationship between them. In the Baloch areas the village is inhabited by the landlord, his family and their serfs - peasants not being an appropriate word in this case. The landlord controls every aspect of life in the village, and in many cases is the local councillor. Details of the notables attitude to the schemes is discussed in Chapter - 2.

Given the social structure in the village, and the attitude of the notables, it is doubtful if cluster committees will be able to run schemes which urban local authorities have difficulty in operating efficiently and economically. For the same reasons it is also doubtful if "participation", except in certain Pashtoon areas, where an important part of the population is self-employed, has any real meaning. There is very fear that some of these schemes will fall into disuse when operational and maintenance problems arise, or they will be run erratically by a handful of people, who will strengthen their political power through controlling and financing their operation. These *Khans* and feudals will become water-lords in addition to being landlords (for details see Chapter - 3).

3.3 Quality of Water

In the surface water schemes (dam and canal source) the quality of water does not improve sufficiently enough to effect health positively. The removal of sediment has been taken care of, but the removal of pathogins and bacteria is only nominal.

4. REASONS FOR INAPPROPRIATE DESIGNS

4.1 Lack of Research

The main reasons for inappropriate designs for the water schemes is that sufficient research was not carried out into the existing manner of water acquisition, its relation to the ecology of the area, the social and cultural life of the people, and to local technology and artisanal skills.

Social structure, especially if the cluster system was to be adopted, should have been studied and analysed to determine the cohesiveness of the cluster groups and their organisational and technical potential. This should have then been related to the type of operational and maintenance problems that are likely to arise for the schemes which have been designed. For the experimental cluster, different alternatives should have been worked out. These alternatives should have then been analysed in terms of their social and economic benefits, possible operation and maintenance problems and their cost effectiveness.

Special attention should have been given to the opinion of women, who in many cases are responsible for acquiring water. How the proposed schemes effect their personal and social life, is a very important factor.

A study of the schemes implemented by the irrigation department should have been made. Their costs, operational and maintenance problems should have been identified along with the social changes they have brought about.

4.2 No Terms of Reference for Consultants

Based on the above research, proper terms of reference or design criteria should have been provided to the

consultants. Working within the parameters set by this research, the possibility of an inappropriate design for these schemes would not have arisen.

5. CRITERIA FOR DESIGN

5.1 Anthropological Research

The BIAD/UNICEF schemes serve the rural areas of Balochistan. This is the most obvious and important factor which has been overlooked by the consultants. Most of the communities in the area are very small. In some cases they are as small as seven households in Wado, in the Chib Kalmati Cluster, and fourteen households in Kondul, in the Pir Alizai Cluster. Many of the cluster villages are some distance from each other. All those visited by us have sufficient independent water resources and it almost seems as if they have no major water problems. All that is needed is to improve the quality of water so as to effect the health situation positively, and may be to make the collection of water more convenient. The term convenient here also needs to be defined. It is possible that some communities consider their present manner of water acquisition quite convenient and that piped water may bring about changes that effect their lives adversely. Therefore, relating the concept and design details to the anthropological findings, is the first criteria for an appropriate design.

5.2 Decentralisation Related to Existing Social Structure

Large organisations bringing together different ethnic, rival or politically unequal groups, generally disintegrate. Alternatively power becomes vested in the hands of a dominant group. This makes a mockery of the concept of equal participation. To prevent this from happening, a small well knit, either ethnic or related to productive activity, should be developed. It is essential therefore, that the water supply schemes should be decentralised as far as possible.

5.3 Schemes Should Be Duplicatable

The schemes should be easily duplicatable by the line departments after the donors and their money are withdrawn, and even in stages by motivated community leaders. This means, they should be as low cost as possible. To this end, locally available and simple equipment should be used, and that too only when necessary. Construction should utilise local artisanal skills and materials, and research should relate these skills and materials to modern technology and needs. This would be a real contribution to development in Balochistan and would lead to social change from the grassroots. The economical designs thus achieved will serve a much large number of villages. They will also be easy and economical to maintain and operate.

5.4 Schemes Should Help Software Programme

The design, construction of new, or modification of existing water supply systems and their operation and maintenance by the community, should help in the promotion of the software BIAD programme. This is possible only if we try and build on what exists, rather than impose a new structure based entirely on technical considerations.

5.5 Standards for Design

The hardware programme, through research and detailed analysis of water samples, should create its own standards, and then design to achieve them. WHO standards must be discarded as they lead to an unrealistic and economically expensive design solution.

6. STUDY OF THREE DIFFERENT TYPES OF SCHEME

6.1 The Three Schemes

In Chapter - 2 three different types of schemes in phase 1-A have been studied. These schemes are:

a) Pir Alizai Cluster in the Pishan district. This scheme belongs to the experimental phase and is functioning. The source of water is a tube well.

b) Goth Gohar Khan and All Dino Rind Clusters in the Naseerabad district. These schemes belong to phase 1-A and are under construction. The source of water is a perennial canal.

c) Chib Kalmati Cluster in Gwader district. This scheme is under construction and belongs to phase 1-A. The source of water is a lake created by a dam on Akra Kaur.

The first two schemes have been visited by us, the users and notables of the area interviewed and the drawings and tender documents studied. The last scheme however has only been studied of paper.

6.2 Methodology of Study

a) The new/proposed scheme: An evaluation

- Concept
- Design details
- Operation and maintenance
- Tender rates

b) Pre-BIAD/UNICEF scheme situation or the existing situation in the case of schemes that have not been completed.

c) The impact of or reactions to the programme.

d) Possible operations. These have been worked out keeping in view the concepts and criteria discussed in this chapter.

Chapter Two

STUDY OF THREE WATER SUPPLY SCHEMES

1. GENERAL TECHNICAL COMMENTS COMMON TO ALL SCHEMES

1.1 WHO Standards/Own Standards

Before the consultants were asked to prepare the design, UNICEF should have formed the design standards for each scheme regarding the quality of water because each scheme has a different source of water.

As per the standards, water should have been analysed for chemical and bacteriological contents for the adoption of different processes. WHO standards should not have been adopted because their requirements cannot be met by the processes recommended by the consultants. In order to meet these standards the recommended processes will have to be further modified and that will increase costs considerably. For example, the removal of turbidity and of bacteria will never reach the WHO standards by simple sedimentation and filteration. In case of tube well schemes, no bacteriological contamination will be removed either.

Recommendation

It is recommended that UNICEF should look into these problems and set its own standards. To achieve these different processes, which are low cost and economical, research should be carried out. If this is not done then the question will remain as to whether we are supplying an improved quality of water or just water which is better looking, and that too after enormous expense.

1.2 Design Criteria in Existing Schemes

After studying all the schemes we find that the technical design criteria which have been adopted are based on general design practice. It would have been more appropriate if criteria could have been based on the living habits of the people and climatic conditions.

If the following points had been considered before the schemes had been designed, it would have reduced their cost considerably.

a) Population

Population should have been based on average maximum growth of 3 per cent instead what has been adopted. Rural populations, especially in feudal areas, have a very small growth factor. The system cannot absorb surplus labour.

b) Design Period

New water systems are normally made large enough to meet the needs and wants of growing communities for an economically justifiable number of years. Choice of relevant design period is generally based on: 1) the useful life of component structures and equipment, taking into account obsolescence as well as wear and tear; 2) the ease or difficulty of enlarging contemplated works, including consideration of their location; 3) the anticipated rate of population growth and water use by the community and 4) the performance of contemplated works during their early years when they are expected to be under minimum load.

Taking into consideration the above mentioned points and the consideration of growth rate at 3 percent maximum, the design period could have been taken between 10 to 15 years.

c) Design Flow/Variation in Water Demands

Water consumption changes with the seasons, the day of the week and the hour of the day. Variations are usually expressed as ratios to the average demand. As such the factor of 1.5 times which has been used to calculate maximum flow condition in the system, is not justified in the case of these clusters of villages, as the supply of water is based on time duration and is not continuous. The villagers during the time water is supplied, fill up their tanks or utensils in the houses and use the water later.

d) Stand-Post

The usual practice in urban areas is to provide one tap for 10 hours, in case water is supplied for 2 hours every day. The standard has been arrived at through investigation and research into the use of water in low income urban areas. In rural areas some criteria can be adopted depending on the size of the village and research results. In the present schemes, however, no clear policy on the number of houses per stand-post has been adopted.

e) Water Consumption

The figure of 1- GPCD could have been reduced after studying the living habits in different villages. At present it seems like an ad-hoc decision.

2. PIR ALIZAI CLUSTER

2.1 An Evaluation of the Scheme

a) The Concept

The concept of this scheme is to supply water from one central point by means of a tube well to an overhead water tank, and then into the distribution system. The scheme serves 5 villages which are located at a maximum linear distance of 5 kilometers from each other.

This concept has the following advantages and disadvantages.

Advantages

- It is a central system and as such links up different villages together. If there is no friction it can make villages inter-dependent and bring about social cohesion. If this is a political requirement of the government, it should be backed by some government aided political programme or its success is doubtful.

Disadvantages

- It is a very expensive system because of the long length of underground pipe lines needed and of the requirement that the tube well should discharge 150 USGPM into the system.

- Because of the distance between the tube well and the over-head tank, a considerable amount of expenditure has been incurred. The expense of operating the tube well has also increased as result of this distance.

- Due to the distance between the pump-house and the overhead water tank, the operator, in any kind of emergency such an overflow from the tank, or any other breakage in the system, will not be able to take action immediately. This may cause further damage to the system.

- The operating cost will be very high. The pump and motor which has been installed is of 40 horse-power, 1470 RMP. The discharge from the well is 150 USGPM. The pump and motor are almost twice as large in capacity and horse-power than what is required. The amount of power consumed as such will be much higher.

- In choosing the concept no relation between the technical solution and the sociology of the rural areas has been established.

b) Design Details

Pipe material (PVC): PVC pipe material had been ordered by UNICEF staff before the schemes had been designed. These pipes are rigid type conduits, class 'c' and manufactured to withstand and water head pressure of 9 bars.

The could have been push on joint class 'b' pipes, manufactured to withstand a water head pressure of 6 bars. This would have resulted in considerable savings. The push on joint type pipes would also have been much easier to join and less likely to leak due to bad workmanship.

Pumps and Controls: The pumps and motors should have been ordered after the yield of the well, depth of the well and the height of the tank had been fixed. The pumps should have been obtained locally (the ones installed are imported) and been as simple as possible. The controls used are also unnecessarily sophisticated. Both these factors will create maintenance problems later.

Frost Line: The frost line factor should have been taken into consideration. At present the specified depth of the pipe is 2'-6" only. In an extreme winter water will freeze at this depth.

Single Riser: A single riser system for the overhead water tank should have been adopted. This would have reduced pipe length and resulted in easier maintenance.

Water Wastage: Wastage of water in this system will occur through leaking valves and leaking house connections. It was observed in one village that due to bad plumbing water from all the taps was leaking.

Large Diameter of Pipe: If the population had been taken at 3 percent growth, the maximum flow ratio and the supply pressure would have been reduced accordingly. Taking this into consideration would have decreased the flow in the pipes, and as such, the size of the pipe. This again would have reduced costs.

Pump-House: From the construction point of view the civil work is of good quality and the contractors and the consultant need to be congratulated for it. However, for a cluster of villages in the rural areas, such an elaborate structure with projections and complex architectural details is not justified. The structure should have been economical to construct and as maintenance free as possible.

The pump-house has been provided with a grider to lift the motor. This girder will not serve any purpose as the motor can be easily lifted out with the help of 2 to 3 persons.

Some kind of drainage should have been provided inside the pump-house to drain water from any leaks which might develop.

The number of external lights provided on the pump-house are far too many.

A room for the pump-house operator was not necessary.

The rain water pipe to drain water from the roof of the pump-house to ground level is not needed. A simple spout from the roof would have served the purpose. In addition, the problem of snow accumulating on the pump-house roof has not been taken into account.

Pump Installation: The pump selected is of a much larger horse-power than required. The pump and motor are of the vertical type. However, in this case the motor is mounted on the side of the pump. The drive shaft of the motor is on the top and the pump is driven with the help of belts and pully mounted on the drive shaft of the pump and motor. This has been done to reduce the RMP of the motor whereas really the pump and motor should have been of matching rpm. The installation of the motor has been done in such a manner that it is creating a lot of vibrations which in due course will harm the motor and its bearings. The motor has already been replaced once, and if the present defects are not removed will have to be replaced again soon.

On the panel board two extra fuse load break switches have been provided. These switches have probably

been provided as spare ones. However, because of the manner in which connections have been made, these spare switches will never be utilised.

An extra valve has been installed on the discharge side of the pump to drain the system. This was not necessary. This valve is leaking badly, and if not taken care of may become inoperative.

Pipes passing through the walls should have done so through a sleeve in the wall so that the vibrations of the machinery do not effect the structure. This would have also made it easier to make replacements if and when necessary.

Electrical Panel Board: The electrical wiring work is of a substandard nature.

The controls of the pumps are very sophisticated and have been imported. They could have been very simple and of local make.

Two sets of A-meters and V-meters have been provided. One set would certainly have been sufficient.

Overhead Water Tank: From the construction point of view the work is of good quality but with some problems. On visual inspection, some water leak marks on the side and base of tank are visible. These defects have been pointed out to both Mr. Peacock and Mr. Ahad who accompanied us to the scheme, and need immediate attention.

The system which has been adopted to service the tank is as follows:

- One pipe to fill the tank.

- One pipe to discharge into the distribution system.

- One pipe acts as overflow and for emptying the tank.

As such the number of valves utilised on the system are four. This system could have been designed on the single riser system by utilising a single pipe which will fill the tank, discharge into the system and drain the tank. The overflow could have been a spout from the tank. This would have been more economical and easier to maintain. The number of valves needed on the system proposed would have been only two.

The elaborate staircase which has been constructed to the tank roof was not needed. A simple steel monkey ladder on the side of the tank would have been enough.

A study of the climate of the Quetta region has indicated that the insulation on the tank with thermopole and then brick on the outside was not necessary at all.

There are 2 six inches vents provided on the roof of the tank. One would have been enough.

The water level indicator on the tank was not necessary at all. The operator at the tube well pump-house will not be able to see the indicator except through a telescope, as the distance is far too great.

Distribution Lines: No indication has been given regarding the frost line depth on the drawing nor mentioned in the specification.

The house connection detail shown on the drawing indicates that the connection to be made is from the top of the pipe. The drawing does not indicate the type of clamp nor the rubber lining to be used. This position of connection will create more head-loss and the number of joints will increase.

The proper connection is at 22-1/2o from the horizontal. The clamps should be of cast iron and of proper rubber lining which will not deteriorate. In this position the number of connections will decrease and so will the headloss.

The clamps and rubber lining being used by the population are not of good quality. This information was given to us by Mr. Ahnfors of UNICEF.

The pipe material selected for the distribution system could have been selected at a much lower pressure rating. Explanation is already given above.

Encasement of PVC pipes in cement was not necessary. Other and cheaper methods could have been adopted depending on the problem.

c) Operation and Maintenance

The operation and maintenance problems which we foresee are as follows.

- The motor is likely to burn out and will need to be replaced completely or its bearing will have to be changed. This might stop the functioning of the system for days on end, if a proper maintenance organisation with pumps and spare parts in stock is not developed.

- The carbon contacts of the motor control panel will burn out after sometime due to the presence of dust as the front of the panel is kept open by the operators. In order to replace the carbon contacts they will have to take the breaker out and to purchase the new switch or carbons from the local market.

- Some of the valves are already leaking. If they keep on leaking in this manner water will be wasted, and if they are not properly maintained, in due course, they will become inoperatable.

- The water meter is made in China. The track record of these meters is not very good. As there is no arrangement for bye-passing the meter it cannot be removed without stopping the system till it is replaced. This may cause operational delays.

- Leakage of water from the point of penetration of pipes into the tank is already taking place. In the long run it will damage the reinforcements of the concrete.

- As the condition of clamps and rubber lining deteriorates, the water leaks from house connections will pose a health hazard. The contaminated water will enter back into the system from the leaking portion during the period when the water supply is stopped and the pipes are empty.

- Overall the system is too sophisticated for village communities to operate and maintain. As said earlier, urban local authorities with all their technical expertise and finances have problems running similar systems. It is necessary that proper technical support is given to the cluster committee to manage this scheme.

- With kilometers of underground water lines, the functioning of the water supply system can be easily sabotaged.

Possible Health Hazards

- Contamination of water from house connections, due to the substandard material being used in making the house connections, can occur.

- The air gap between the filler pipe and the water level in the surface tanks which the people have made in their houses, can create health hazards, by the bacterias travelling from the filler pipe into the distribution system.

d) Tender Rates

The rates of the contractor for most items are a good 100 percent higher than rates for similar construction work in Balochistan.

2.2 Pre-BIAD/UNICEF Scheme Situation

The Pir Alizai Water Scheme has been operating for the past 3 months. In the village of Batezai we had a detailed discussion with Ajan Nuruddin who lives in the village but owns a shop in Karachi. He informed us

that the village consisted of 21 houses. All the inhabitants were the decendants of 4 brothers who were of his grand-fathers' generation. He is about 65 years of age.

Before piped water came to Batezai, the entire village collected its water from the village community well by means of a pully and bucket. The well had been in operation ever since Ajan Nuruddin can remember and had never run dry. Nor had the village ever experienced any shortage of water even when rainfall had been meagre. However, the depth of the well had to be increased because the water level had fallen due to tube wells being used in the neighbourhood by farmers. This well has now been filled and the only evidence of its ever having been there is its pully bi-pod sticking out of the ground.

According to Ajan Nuruddin, most villages in the neighbourhood have community wells. The more well-to-do families have their own wells and often they allow villagers to collect water from them. Shahzada Sheharyar Khan of Kalat and Malik Noor Ahmad Yousefzai of Taringabad have also confirmed Ajan Nuruddin's statement. To a question as to whether he would have preferred an independent water supply for his village from the well, Ajan Nuruddin replied in the affirmative.

In the village of Malik Aga we saw 2 large diameter wells with pumps on them. These are used mainly for agricultural purposes but people also collect water from them. Investigations revealed that the excavation of these wells upto a depth of 100 feet costs between Rs 30,000 to Rs 50,000.

2.3 Impact of the Programme

Ajan Nurudin is satisfied with the working of the scheme. Originally he had fears that the *Khans* of the area would misuse it or control if for their use only. This fear resulted in the unwillingness of the people to excavate trenches for the pipes. However, that has not been the case. He also feels that people will pay for the maintenance of the project. He does not know exactly what maintenance entails in technical or operational terms, but is optimistic.

According to a group of persons sitting in the mosque in Batezai, water is supplied regularly every morning and evening. The hours of supply vary. The tap in the mosque was being used to fill up a nearby pond. This pond is used for watering and washing animals. Since the scheme became operative the animals do not have to be taken out of the village for watering and washing.

In the school at Malik Age trees have recently been planted. These trees are being watered by the water tap installed in the school as a result of the scheme. No trees had been planted before because of the problems of carting water.

2.4 Possible Options for Similar Schemes

Instead of a centralised water scheme complete with kilometers of water lines, overhead water tanks and pump houses, a decentralised system should be aimed at.

This could be done by making the village the unit for a scheme. To this end various options are available. Any one of the options given below could be adopted depending on the situation.

Water source:

- An existing community well could be taken over and improved.
- An existing well, the property of a family could be purchased.
- A new large diameter well could be dug.
- A large diameter well with a tube well at the base, to reduce cost could be installed.

In all cases above, the well will not need to supply more than 20 USGPM as opposed to the 150 USGPM being supplied by the tube well for Pir Alizai cluster. This would reduce costs of electrification and pumps, and require a small depth for well excavation.

Well lining and covering:

The well should be lined to about 8 feet below ground level in normal cases. Depth of lining however will be determined by soil conditions. The lining should project above the ground in the shape of a wall to protect

the well from ground water contamination.

The well should be completely covered. This covering could be of any of the materials listed below.

- A mud brick dome. Speaking to Mr. Richard Johnson of UNICEF, we were informed that the Afghan refugees have brought with them the art of laying mud brick vaults and domes without shuttering. This is the cheapest way of roofing in the world. Given the climate of Balochistan it is also durable.

- Galvanized iron sheets and girders. The only disadvantage of this form of covering is that the materials will have to be imported from the cities. In addition, a complete sealing off of the well may not be possible.

- Reinforced concrete slab.

Access will have to be provided to the well for cleaning purposes.

Pumping:

Water will be pumped from the well by a locally made positive displacement pump, also known as a donkey pump, into a water supply line which in no case will need to be of over 2" in dia-meter. The line will be connected back to the well. From this line distribution lines will feed the houses or community stand-posts. No tanks are required at all. If pressure builds up when the taps are closed, the water will flow back into the well (see Figure 1). Due to the mini nature of the scheme the electrical fixtures will be single phase, very simple, and any local electrician will be able to deal with them.

Pump-house:

The pump house need not be any more than a simple shed of local materials. The pump however should be properly mounted on a raised platform.

Sterilization equipment:

If tests show that sterilization of water is required, then a small chlorination chamber could be provided. This would drop chlorine, through suction created by the flow of water, when the pump would be operative. However, proper training would have to be imparted to the operator of the pump regarding the quantity of chlorine to be placed in the chamber. Easy availability of chlorine may also be another problem (see Figure 1).

Community tanks:

If the need of community tanks is felt, then they could be of earth or mud brick lined with PVC or galvanised iron sheets. Mr. Ahnfors of UNICEF is experimenting with such tanks but with rubber lining. Rubber is an expensive item in Pakistan. The roof of the tanks again could be of galvanised iron sheets or of mud vaults. This would result in a considerable saving in cost (see Figure 2).

Cost of the proposed scheme:

The cost of the proposed scheme will be as under:

-	Digging of well (maximum cost)	:	Rs	50,000
-	Part lining and covering of well	:	Rs	40,000
-	Small shed over pump	:	Rs	2,500
-	Providing and laying of distribution line of not more than 2"			

	and of maximum of 5,000 running feet at Rs 14 per RF. (This would not be required at all for small communities such as at Kondul or Batezai	:	Rs	70,000
-	Positive displacement pump with electrical connections	:	Rs	5,000
-	Sterilization equipment (if required)	:	Rs	6,000
	Total about	:	Rs	180,000

Figure - 1

Figure - 2

The above cost would be considerably reduced if existing community wells can be utilised. If this proposal, or something similar had been followed, then the total cost for the Pir Alizai cluster would have worked out to a maximum of Rs 180,000 x 5 villages = Rs 900,000, as opposed to Rs 2,400,000 for the implemented scheme. If existing community wells could have been utilised, then the cost would probably not work out to more than Rs 140,000 per village, or Rs 700,00 for the villages that form the cluster.

Pre-caution:

The sanitation programme will contaminate the sub-soil water. This contamination can be removed by sterilisation. However, to be on the safe side no latrine should be made within 60 feet of the well. If this is not possible then the well should be placed some distance from habitation.

Solar panels:

Where electricity is not available solar panels can be installed to generate electricity at a fairly low cost.

Advantage of our proposal:

- Being a small scheme it will be easier to operate and maintain.
- As it belongs to a village, problems of co-ordination for operating and maintaining will be simplified.
- It will strengthen the village unit instead of aiming at creating a cluster organisation.
- In the same investment it will benefit 266 percent more people.

3. NASEERABAD DISTRICT: GOTH GOHAR KHAN AND ALLA DINO RIND CLUSTER

3.1 An Evaluation of the Scheme

a) Concept

These two schemes serve a number of villages along perennial canals. The size of the villages varies from populations of 20 to 1500 persons. They are being connected together through a centralised piped water supply system. As the distance between the villages is large, 26 kilometers of line is being laid for organising this central system. The source of water is the canals. In these 2 schemes the concept which has been adopted is as follows.

- Source of water is a nearby irrigation canal.
- Water is pumped from the canal into 2 sedimentation tanks, which have a holding capacity of 40 days. This is because the canals are closed for this period of time for yearly cleaning.
- From the sedimentation tank the water will flow by gravity to the filteration units.
- From the filteration units water will flow into a clear well by the help of a pump.
- From clear well water will be pumped to into overhead reservoir.
- From overhead reservoir water will flow into the distribution system.

b) Design Details

Design criteria:

The scheme would have been much more cost effective if the following factors had been considered:

- The sedimentation tanks should have been fed by gravity which would have eliminated a pump room and a pump. This would have made the tanks shallower and as such easier to clean.

- Size of the tank could have been reduced and the flows to domestic consumers curtailed during the cleaning period of the canals.

- The 2 sedimentation tanks in this scheme are of rectangular shape and the retention time is 40 days. They will also act as a storage tank. This has been done because of the closure of canals for 40 days once a year. Their large size is bound to lead to maintenance problems which will be discussed later.

This concept has been utilised for the removal by gravitational settling of suspended particles heavier than water. It was observed in the field that the turbid water stored by the villagers for 24 hours did the same. Only colloidal particles remained in suspension. The villages are presently using alum effectively to clear water of colloidal matter.

Filter units:

Two filteration units of hopper shape have been proposed. The depth of filter media with gravel is about one meter and the water depth is also of one meter. They are designed as slow and filters with the idea of straining absorption and biological flocculation. In this case the water will become slightly clear but the biological population will not be completely eliminated without some kind of chlorination. In the absence of complete analysis of water from the canal, true observations cannot be made. The design of the filters makes them difficult to maintain.

One pump house:

The pump of the clear water well and overhead tank could have been housed right under the water tank after relocating the tank near the wet well. This would have eliminated the necessity of two pump houses. The proximity of the pumps to each other would have aided the operator.

Overhead tank:

On the overhead tank the outside brick work can be eliminated and the concrete stairs to the tank simplified. These comments have already been made for the Pir Alizai cluster.

Single riser:

If a single riser system had been adopted to service the tank savings could have been made.

Butyl lining:

Butyl lining has been proposed for lining the tanks so that ground water does not enter the sedimentation basin. Butyl lining could have been avoided by either raising the sides of the tank or by making it shallower. Some kind of soil stabilisation could have been done to make the soil impervious. The butyl lining will also created maintenance problems. This is discussed later.

Pump house:

The comments for the pump house are the same as the ones we have made to the Pir Alizai scheme.

Pipe sizing:

The comments for the distribution lines are the same as the ones we have made for the Pir Alizai scheme

Relation to sociology:

Again the design is not related to the sociology of the area or to the organisational potential of the population. This is really and urban water supply scheme for a high density area, which should be run by a local government department.

c) Operation and Maintenance

The operation and maintenance problem which can be foreseen in the proposed system are as follows.

- Maintenance of a number of pumps which are at a distance from each other but which have to function and stop some-times at the same time will 2 operators.

- Accumulation of mud will take place at the bottom of the sedimentation tank where butyl lining is being done. This mud after sometime will turn black and will emit a foul odour and give a bad taste to the water due to anaerobic condition. This will bot be the case where no lining or concreting is being done.

- Cleaning of the sedimentation tanks will be a great problem. Removal of water and mud from their base is by-beyond the organisational potential of the villagers. This is because: 1) the tanks are far too large and of a depth of 14 feet, and 2) maintenance will have to be done by the coordination of many villages who are far removed from each other in some cases.

- The construction of a fish pond at Alla Dino Rind at a small distance from the sedimentation tank will raise the water table. This can create problems for the butyl lining.

- The surface of the filter bed will have to be raked after about every 2 weeks to clear it. In between the 2 weeks it will have to be re-raked to break the surface accumulation. At the end of every month the filter media will have to be removed and transported out of the filters for washing. It will then be returned to the bed. The maintenance of these filter beds will become a problem for the villagers. The maintenance is further complicated by the design of the filter pits. The concrete walls are very steep and filters very dep down. One wonders how an operator will go down, remove the media, have it washed and replaced.

d) Rates of the Contractor

The rates of the contractor for most items are a good 100 percent higher than rates for similar construction in Balochistan. The reasons for this is primarily the BIAD image.

In the case of the Naseerabad schemes aggregate costs are also very high as aggregate comes all the way from Mach and costs Rs 1,500 per truck. Brick also costs over Rs 900 per thousand. Schemes should have aimed at reducing dependence on these very expensive items. The introduction of appropriate construction technology would also have benefited the local population.

3.2 The Existing Situation

The schemes are scheduled to be completed this year in June. In both the clusters we had meetings with the landlords and in one case with the users.

a) Goth Gohar Khan cluster: village Abdul Karim

At Goth Gohar Khan we had detailed discussions with Abdul Fateh of Goth Abdul Karim. We visited the village and examined their present water supply system.

Abdul Fateh is from the landlord family of the village. He is the owner of 150 acres of land. Apart from his extended family, all the remaining people in the village are his serfs. He has given land for the treatment plant and the tanks which are being constructed for the scheme. He claims that the community still owes him over Rs 50,000 for this land. He is certain that this payment will not be made, and hinted that due to his contribution he had a bigger claim on the system compared to the others.

The village, like all the other villages in the cluster, is situated on the Mohammad Pir Tributary of the Pat Feeder Canal. The land-owners have taken G.I. pipes from the canal and installed hand pumps on them. Some of these pumps are located in the village square from the villagers can also draw water. Many of the villagers also use *phitkari* or alum in their water jars which clears water of all sedimentation. If water is allowed to stand in the jar for 24 hours it also becomes as clear as the water in jars containing alum. This water is almost of the same quality as the scheme will supply to the inhabitants of this cluster.

In certain villages away from the canals, people have installed hand pumps to tap subsoil water. The water according to Abdul Fateh and his brother is at a depth of 35 to 40 feet. This water, it is worth noting, could be of a quality superior to what the scheme will supply.

The village has 2 large ponds. These serve the village during the 40 days period the canals are closed for cleaning. One of these ponds is for the use of animals and the other of the village population. They meet the demands of the village adequately. Hand pumps have also been connected to these ponds but are used only when the canal is closed.

Nobody in the village is more than a couple of 100 yards away from a water source. The carrying and storage of water does not seem to pose any problems whatsoever.

b) Alla Dino Rind cluster: Goth Alla Dino Rind

At the Alla Dino Rind village we met the local landlord, Alla Dino Rind. He is the owner of about 1,000 acres. He is the owner of about 1,000 acres. This village, like the other villages in the neighbourhood, are mostly along canals and water courses, from where they get their water.

The village consists of the landlords family and his serfs. Most of the villagers go to the canal to fetch water as the landlord has not had any hand pump installed for their use. Alum is also not use by most of the households, but water is allowed to settle before it is used for drinking purposes.

For his own use the landlord has installed an overhead water tank on his house. He pumps up water from the canal by a positive displacement pump placed near the water-course.

During the yearly closure of the canal the landlord pumps up water to his tank from a pond meant for his exclusive use. His serfs however, dig shallow wells near the canal from which they draw water during this period. After the canals re-open these wells are refilled.

Alla Dino Rind has constructed a house with attached bathrooms and showers. This can be attributed to the scheme. However, the rest of the village seems to be uneffected. One village woman accosted Yunus Shaikh saying that all this work was being done for the rich to further their exploitation of the poor.

Alla Dino Rind has donated land for the scheme free of cost. This is an important factor and given relationships in rural areas, will have an effect on the functioning of the scheme for the future.

The above information gives some indication of the sociology of the village and the type of "community" participation possible.

3.3 Impact of and Reactions to the Programme

Abdul Fateh of village Abdul Karim is not impressed by the scheme. His main concern right now is the recovery of Rs 50,000 (which he is sure he will not recover) from the cluster community for the land which he has given to the cluster. He understands the importance of the use of alum for removing sediment from water and is aware that the stagnation of water is the pond and vegetation in it is harmful to health. He asked if the cleaning of the existing village ponds and shaping them like the ones which were being constructed for the scheme was not feasible. He would definitely have preferred a decentralised system of water supply for his village. Regarding the maintenance and operation of the system, Abdul Fateh is hopeful but does not know what is really involved. He will however be able to collect money from his serfs to pay the cluster committee. If not, he will bear the expenses for his village himself.

Alla Dino Rind is satisfied with the scheme because his overhead water tank will be filled with better quality.

The scheme has also brought the local landlords together as they will be sharing water. Asked about the relationship of his peasants to the scheme he replied that they were very poor and ignorant and had to be guided by him. He was quite sure that they will not pay the subscription of Rs 10 per month required for maintenance of the scheme to the cluster committee and nor did he really expect it of them. He would in all likelihood contribute on their behalf. This he felt would be a burden on him but he would have to bear it. Given conditions in the rural areas of Sindh, this sum of money paid by the landlord for water, would figure in the relationship of Alla Dino Rind and his serfs when the division of the harvested crops takes place. Alla Dino also said that even if the *haris* did pay they could only pay him. An outsider could not be allowed to come and collect money from his village.

Another point raised by the feudal lord was the matter of having the trenches dug by his serfs, as participation. He felt that this in financial terms was a very small part of the scheme and as such it should be paid for by BIAD. He felt that the peasants would not have enough time to do this work in the near future. Here it must be noted that landlords can have almost any form of labour intensive work carried out by their *haris* without any difficulty.

The above comments are a pointer to the problems the scheme will face in its operational and maintenance period and to the solutions that will surface to those problems.

3.4 Possible Options for Similar Schemes

a) Hand Pumps

The most obvious and simple solution is the tapping of subsoil water through a hand pump. The water thus acquired will be of a better quality than the present BIAD scheme will give to the population. The cost of a hand pump, inclusive of boring to a depth of 40 feet and pipe of that length would be not more than of Rs 15,000.

Cost of the scheme

If one pump is installed for every 5 houses then the total cost for these 2 schemes would be as under.

- Alla Dino Rind cluster:

• Population	:	3,800
• Number of houses at 10 persons per household	:	380
• Number of hand pumps at 5 houses per pump	:	76
• Cost of scheme at Rs 15,000 per pump	: Rs	1,140,000
• Cost of under construction BIAD scheme	: Rs	5,200,000

- Goth Gohar Khan cluster:

• Population	:	4,270
• Number of houses at 10 persons per household	:	427
• Number of hand pumps at 5 houses per pump	:	85.4
• Cost of scheme at Rs 15,000 per pump	: Rs	1,281,000
• Cost of under construction BIAD scheme which does not serve all the villages in the cluster	: Rs	7,500,000

Advantages of the proposal

- Our proposals will cost less than one-fifth of the schemes being constructed by BIAD. As such 500 percent more villages will benefit from this scheme.

- Unless subsoil water is brackish, better quality of water will be supplied to the inhabitants than what the BIAD scheme is going to supply.

- As no major civil works are involved the scheme requires no contractors. The time period of

execution will also be very little.

- No maintenance or operational problems will occur which the people cannot overcome on their own, without involving their feudal lords.

- Storage tanks to cater for the 40 days canal closing will not be required.

3.5 Direct from the Canal

Water can also be pumped direct from the canal into a distribution system (see figure 3). A positive displacement could be used for this purpose. The water can be made to pass through a pressure filter and a small chlorination chamber from where the flow of water will suck in chlorine through the suction created. If taps are not operating the water will flow back into the canal. If community tanks are considered essential then earth ones as discussed in 2.4 of this chapter could be considered.

A pond made near the canal could be made or an existing pond, if suitably located, cleaned. During the canal closure period the same pump could be used for supplying water to the village from the pond. As the pond will not be used throughout the year, it can be emptied, cleaned, lime washed and refilled just before the canal closure period without any difficulty.

In case electricity is not available then the same system could be made to work through the installation of solar panels.

In case subsoil water is abundant, then instead of using canal water a pump could supply subsoil water through the same system. The tube wells in this area would be cheaper as the water level is not very low, the soil is clay and at an average not more than 30 UG gallons of water per minute would be required from the well for the populations in the villages of the Alla Dino Rind and Gohar Khan clusters.

Cost of the scheme for one village

-	Tank: execution and preparing: in case of existing tanks, cleaning, compacting and lime washing		: Rs 20,000
-	Positive displacement pump		: Rs 5,000
-	Pressure filter: can be back washed with the same pump	: Rs 15,000	
-	Sterilization chamber and equipment		: Rs 6,000
-	Distribution network of PVC line of never more than 2" dia		: Rs 50,000
-	Fence around the pond		: Rs 10,000
-	Total cost		: Rs 106,000
-	For the 12 villages in the Goth Gohar Khan area		: Rs 1,270,000
-	Cost of present Goth Gohar Khan scheme		: Rs 7,500,000

Figure - 3

In the case of a tube well the cost of the tank would be reduced and the cost of the tube well added.

Advantages

- The size of the storage tank at an average will be 20,000 gallons at the most. As this is for the village only, it can be done by the villagers themselves. It is interesting to note that the villagers are required to carry out 203,688 cubic feet of excavation for the Goth Gohar Khan scheme pipe lines alone. This works out to a storage capacity of 1,523,586 gallons!

- Maintenance of the pond will be much easier because of its small size and because it is the property of one village only.

- As no major or sophisticated civil and mechanical works are involved, the schemes can be conceived, designed and implemented quickly.

- 500 to 600 percent more villages will be able to benefit from this scheme at the same cost as compared with the under construction BIAD one.

4. CHIP KALMATI CLUSTER

4.1 Proposed Scheme: An Evaluation

The cluster consists of 8 villages. The population of the total cluster is 688. Some villages are as small as 7 houses. The largest consists of 37 houses with a population of 137 persons. Distances between the villages are so large that 31 kilometers of main line pipe is required to serve these villages. The water source is the Akra Kaur Dam.

The cost of the scheme it seems will be about Rs 10,000,000 or Rs 14,500 per head of population.

Again, an urban water supply design concept meant for areas of heavy density has been applied to this cluster (if it can even be called that) of villages. This is bound to create immense problems of operation and maintenance in one of the most under-developed areas of Pakistan. The technical solution has not been related to the sociological reality or to the organisational potential of the villages for operation and maintenance.

Unfortunately we were unable to visit the scheme and our comments are made from our studies of the scheme on paper.

a) Concept

- From the Akra Kaur Dam the water passes through a filter into a clear well.

- From the clear well the water is pumped to an overhead water tank.

- From this tank it travels 44 kilometers in underground water lines.

- Because of the long lengths the system has to be boosted by booster stations.

- Power is supplied to the booster pumps through diesel operated generators.

b) Design Details

In the above concept if certain factors had been considered costs could have been reduced. These factors are listed below. However even then the scheme is unworkable through community participation.

- Instead of placing the filteration units and overhead tank near the source of water the following could have been done:

    - Filteration units and overhead tank should have been located at a position nearer to all the

villages instead of near the source of water.

- From the source the water could have been transported by means of pumping.
- This pump and distribution line should have been sized to the filteration rate. In this case saving would have been made on the size of the pipe.
- This would have eliminated the 2 booster stations and diesel generating sets and as such the operation and maintenance cost would have been reduced.

- Overhead tank could have been serviced by a single riser system which would utilise single pipe for filling, discharging and emptying of the tank.

c) Operation and Maintenance

- The operation and maintenance cost will be very high due to number of pumps and diesel generating sets.

- The number of operators required on this scheme will be a minimum of 4. One operator will be required at the filter unit, 2 will be required at the 2 booster stations, and 1 for maintaining the distribution system. Due to the long distances between the system, the operators will not be able to communicate with each other. For correct maintenance this is essential as the pumps have to be operated simultaneously. The problem could be overcome by providing the operators with *walki-talkis* or relating the pumps through some electronic device. The later would be an expensive option.

- The maintenance cost of the system will be high due to replacement of parts of pumps, valves and controls.

- To operate each diesel generating set one operator and a mechanic will be required.

- Since there is no automation on the system, breakdown at one of the pumps will be a problem and may result in the complete breakdown of the system.

- Procurement of diesel regularly will be a problem. According to the PSO representatives in Karachi, the supply of diesel to the Makran Coast is erratic.

- Comments made in regard to design of pump house, water tank staircases, filters, pipe sizing, etc. for the Pir Alizai and Naseerabad schemes also hold good for the Chip Kalmati scheme.

d) Tender Rates

Tender rates are excessively high. Perhaps this is also due to the isolated position of the Chip Kalmati cluster villages.

4.2 The Existing Conditions

The scheme is supposed to be completed in June 1985. However, we know very little regarding the scheme first hand, as we could not visit it. From conversations with UNICEF staff and Mr. Sheharyar Khan, it seems that the area is devoid of sweet subsoil water except in the dry river beds. Many villages in the cluster, we have been told, have to travel many miles to get potable water. Some villages do have wells and their brackish water is used for washing and cooking. There are also hand pumps which supply brackish water.

The present source of water is the Akra Kaur Dam about 10 kilometers away. Piped water systems generally destroy the "water conservation culture" that has developed in arid areas. The quantity of water in the dam must be preserved as far as possible, for we might discover, that one season of drought makes the Chip Kalmati water scheme unfunctionable.

4.3 Impact of and Reaction to the Proposal

The impact or reactions of the people could not be noted as we did not visit the area.

4.4 Possible Options for Similar Scheme

This scheme cannot be justified in any manner because of its high cost (Rs 15,000 per person). At this cost the larger villages in the cluster could have dug their wells and built their own central passive solar desalinization units to treat available brackish water for the whole village.

a) Hand Pumps and Desalinization Units

One proposal could be the installation of hand pumps at one pump per 5 houses. The brackish water from these pumps could be used for washing and cooking, as is done on the Island of Manora in Karachi. Each house could be supplied with a small solar desalinization plant for distilling water for drinking purposes. A small plant, costing Rs 2,000, can give about 3 to 4 gallons of drinking water every 24 houses.

Cost of the scheme:

-	Number of households in cluster	:	158
-	Number of pumps required at 5 households per pump	:	32
-	Cost of pumps at Rs 20,000 per pump	: Rs	640,000
-	Cost of 158 desalinization units at Rs 2,500 each	: Rs	395,000
-	Cartage of units at Rs 500 each	: Rs	79,000
	Total	: Rs	1,114,000
-	Cost of UNICEF/BIAD scheme	: Rs	10,000,000

Advantages

- At the same cost a 900 percent larger population could have been catered to.
- The scheme would be easy to build as no complex mechanical and civil works would be involved.
- There would be no operational or maintenance problems which the people cannot tackle themselves.

Disadvantages:

- No piped potable water would be available. The question of course is whether it is a disadvantage.

b) Water Tankers

Water could also be provided by water tankers to surface water tanks in the villages, provided the roads are serviceable.

Cost of the scheme:

-	Cost of tanker at Rs 450,000 each	:	Rs 900,000
-	Cost of each water tank in 8 villages: Rs 30,000 x 8 =	:	Rs 240,000
-	Cost of taps	:	Rs 4,000
	Total	:	Rs 1,148,000

Disadvantages:

- Tankers would be difficult to run and to maintain.

- This would be a centralised system n an area where habitation is far apart and the villages are of unequal size and affluence.

Chapter Three

PHASE 1-B AND PHASE - 2 SCHEMES

1. PHASE 1-B SCHEMES

1.1 Proposals of the Consultants

The Phase 1-B schemes are being designed by the consultants appointed by BIAD. Preliminary work has already been done on most of these schemes. Some are in the stage of design detailing. In the case of a two water sources have so far not been identified.

Preliminary work on 2 of these schemes was reviewed by us. The schemes are similar to the Phase 1-A schemes in as much as they are designed round the cluster concept and water storage and operations is centralised. However, in the case of the tube well scheme at Hajizai Cluster, the overhead tank has been replaced by a surface reservoir and community tanks and/or stand posts have been provided in the villages instead of house to house connections.

The surface water scheme at the Abdul Rashid Cluster is again similar to the Phase 1-A surface water schemes. However, a treatment plant for sterilization has also been proposed as a part of this scheme.

The planning of these schemes and their future operation and maintenance again has not been related to any sociological findings or research. No study of existing water supply systems has been made and water from existing or proposed sources has not been tested chemically.

Given the above situation an appropriate design for a rural water supply system cannot be arrived at.

1.2 Recommendations

- The work done by the consultants so far should be scrapped and payments made to them for this work written off. This loss is a small one compared to the emergence of inappropriate systems.

- The consultants should be asked to look into decentralised options for water supply schemes which village communities can manage easily, economically, with the minimum of dependence on outside agencies, and with as little social friction as possible.

- The schemes should be low cost so that the maximum number of people should be able to benefit from the available finances.

- It is possible that the consultants may not be able to carry out the research work required for relalting technology to sociology and to the concept of genuine community participation. For this purpose the UNICEF may have to organise its own research cell.

2. PHASE - 2 SCHEMES

For the design of Phase - 2 schemes, the UNICEF should set up a proper research and design cell which must aim at making the schemes appropriate, in the widest sense of the word, in keeping with the criteria developed by us in paragraph 5 of Chapter 1 of this text.

We strongly feel that rural water supply schemes should be rural in nature, and that participation, maintenance and operation can only work effectively if the village is made the unit of the scheme. For achieving this result both research and innovation is required.

The cell should consist of

1. a person experienced in development and its many facets;
2. an environmental engineer;
3. a hydro-geologist;
4. a civil (design) engineer; and
5. a sociologist.

In addition, site engineers will be required to supervise the schemes. However, as the schemes would not be large sophisticated ones, even *mistris* with experience could act as site supervisors. As the village will be the unit of the scheme, the people and the notables will be deeply involved in it. As such, may be only visiting supervisors will be necessary.

It is essential for the development of the proposed cell that it communicates with the outside world. For this purpose, visiting consultants could be appointed to discuss and review the cell's findings, its design proposals and implementation procedures. These consultants could be appointed on a monthly retainership basis or on a per visit basis. Some manner of involving the government departments in the programme should be aimed at.

It must be understood that decentralisation will change the very nature of the BIAD programme. Apart from the factors already discussed in the report, design consultants will not be needed; smaller local contractors with much cheaper rates will come forward to implement the work; community participation will not only become easier to achieve but can be considerably increased; defects or shortcomings in the system will only effect small communities at a time; and most important of all, the programme will be able to serve a large part of the province with the resources and time available, as compared to the 10-15 percent it seeks to serve at present.

However, there is a stumbling block. How will the notables and landlords of the area where the new schemes are to be implemented react to these low key solutions when high tech schemes have been provided to their neighbours?

Chapter Four

THE SANITATION PROGRAMME

1. THE PRESENT SITUATION

1.1 Cultural Factors

In the areas visited by us a large number of latrines have been made. The vast majority of these latrines have been constructed in the open and next to each other. It seems that in many cases the people have decided to continue to excrete in the open as before, but in pans.

1.2 Peoples Complaints

Most of the latrines examined have now been clogged up and people excrete around them rather than in them. Detailed discussions were held with the people regarding the failure of these latrines.

The main complaint of the people concerns the design of the pan. They feel that it is too small and too shallow, resulting in splashing and discomfort while squatting. The other complaint is the difficulty in flushing it with a small quantity of water and as a result they clog up.

2. EVALUATION OF THE UNICEF DESIGN

UNICEF designs for the latrine and the pan were studied by us in detail and our comments are given below.

a) Pan

The depth of the pan is very shallow, with a slope of about eight degrees only. The pan has a semi-circular shape from the inside with no lips on the top edge to stop the water or urine from splashing.

The outlet diameter of the pan is far too small for easy flushing. This is especially a problem because the diet of the people of Balochistan is meat and wheat. Due to this diet the consistency of the faces is sticky and hard. As a result the outlet trap gets choked and so does the chamber created to connect the trap of the pan with the digesters.

In addition to the above problems the trap of the pan is designed in such a way that no pipe can be connected to it. It is a U-trap with the outlet facing upwards. Thus the connection point with the outlet becomes the clogging point in the system. The people have realised this and in many cases they break the trap to make the connection with the pipe thus doing away with the water seal.

b) Soak pits and Digesters

The soak pits and digesters in the design consume a lot of space and utilise fairly long lengths of pipe. The chamber which connects the pan to the digesters is also quite unnecessary. We feel that all these sophistications can be done away with and that they contribute to the failure of the programme.

c) Building Materials

Burnt brick, wiremesh, cement concrete elements and pipes which are used in the UNICEF design, should be used only if very necessary, and if possible be done away with completely. Designs can be made which utilise only local materials, thus lowering costs and dependence on supplies from the urban areas.

The PVC pipes which UNICEF has supplied for the sanitation programme are inappropriate to the needs of the designed system. They are of an unnecessarily thick section and as such require 2-3 people to lift them.

3. RECOMMENDATIONS

3.1 The Design of the Pan

Pans of appropriate designs which fulfill the cultural requirements of the people of Pakistan are manufactured locally. These pans are available in cement concrete, in terrazzo and in ceramic ware. Their cost varies from Rs 15 to Rs 400.

The depth of these pans is about 8-1/2" to 10" at the back end. Most of them have lips on the top edges, are U shaped from the inside and much large in width and length than the UNICEF design. These factors prevent splashing of water and urine.

The outlet of the pans is 3" in diameter. The trap is either of S or P shape. This aids in the making of connections. Due to these factors comparatively less water is needed to flush them. The pan design should aim at providing effective flushing with the one litre of water that people carry with them to wash themselves with. It is too much to accept that people will carry extra water with them for slushing purposes. To this end design research can be undertaken by the UNICEF technical staff.

The use of the UNICEF design pan must be stopped and the pans in store written off if the programme is to succeed. Similarly the concrete pipes stacked by the project should also be written off.

b) The System

As far as possible the pan should be placed directly on the latrine. This does away with the necessity of using pipes, make flushing easier and clogging more difficult. It also reduces costs and economizes on space. As the age of a latrine has been worked out to 11 years, only one pit is required. If pipes have to be used then PVC non-pressure pipes will be much more convenient.

c) Materials of Construction

The lining of the pit need not be in burnt brick. If stone is available locally it can be used for this purpose. Alternatively sun dried brick could be used. The roof of the pit could also be a dome made out of sun dried brick. Alternatively it could be a precast concrete slab. The later would be simplier to construct.

c) UNICEF Revised Designs

The designs prepared by Mr. Ahnfors of UNICEF are a great improvement on the old designs. Especially the design appended to his letter to Mr. Abdul Ahad Khan dated 23rd November 1983. However, as Mr. Ahnfors pointed out to us, the only draw back of the design is that children would be scared to use it because of the fear of falling into the gapping hole in the ground. This defect could be overcome by incorporating a pan in the system.

d) Location of Latrines

The people in most cases have not understood the proper use or the full benefits of latrines. Due to this reason they insist in building them out in the open, sometimes far away from their source of water.

To rectify this defect, the policy of supplying materials and directions to anyone who digs a pit should be discontinued. The person who wishes to install a latrine should apply to the cluster or village sanitarian. The choice of the location for the latrine should be made jointly with the user keeping in view the source of water, distance from his house, privacy and technical problems related to the designs.

The development of latrines is rural Balochistan will result in a major cultural change. The people must be made aware of this if the programme is to succeed.

For example, in a school in the Pir Alizai Cluster, 2 latrines have been constructed. Both have clogged up due to a lack of water for flushing. We feel that it a tap could be installed in these latrines and the school children instructed in their use, these latrines would start functioning again.

However, one can end this chapter on an optimistic note. In the village of Batezai, Ajan Nuruddin has constructed a latrine as per the UNICEF designs. Not satisfied with the pan and flushing required to make it function, he has constructed a new latrine. In place of the pan, he has made a cement concrete chamber. The size, depth and length of this chamber is similar to the locally manufactured pan and Ajan Nuruddin feels that with his design he has overcome the problems inherent in the UNICEF pan. He has also understood the benefits of having the toilet near a water source and the importance of privacy. From him this understanding is bound to spread to the rest of village.

/Israr Rana

April, 1985

REPORT ON A JOINT ASSESSMENT OF SINDH RURAL WATER SUPPLY PROJECT

(March 10 - 24, 1986)

Mazhar Hussain/PHED
Han Heijnen/SDC
Arif Hasan/UNICEF Consultant

Karachi, March 1986

Contents

Annexures

1. Sari Singh: Alternative Design
2. Some Examples of Possible Promotion Slogan/Approaches
3. Appropriate Technology
4. Terms of Reference for Assessment/Review of UNICEF Pakistan Water Programme

INTRODUCTION

It should be mentioned that 3 important developments are going to take place in Pakistan and Sindh in the near future and should be considered complementary to the present assessment mission.

1. An assessment/review of the UNICEF Pakistan Water Programme will be carried out in April 1986 with participants from UNICEF New York, HQ, Nairobi, and New Delhi. It will assess and review on-going programmes with special focus on UNICEF's policy/position regarding future assistance, work out guidelines for appropriate low cost technologies to be supported by UNICEF, evaluate the government's capacity and capability to plan and implement a water programme and collect information from other UN agencies for better coordination. More details are given in Annexure - IV which includes the Terms of Reference.

2. The government of Sindh, concious of the fact that no long term development plan exists for rural water supply in the province intend to go through the preparation of a comprehensive master plan which will require intensive research and analysis and probably re-organisation of these departments and re-thinking of present concept. They have requested the participation of UNICEF who has build up some experience in the last 6 years and who could feed some additional expertise within its limited resources and mandate.

3. The Arid Zone in Sindh comprises about 60 percent of the geographical area of the province. The government of Sindh created the Sindh Arid Zone Development Authority (SAZDA) by an act of the Provincial Assembly passed in June 1985. This creation followed an interest in extending the development effort to the arid areas of the province and the need to find ways and means to exploit systematically the resource potential of the region. The preparation of a comprehensive planning study which requires technical assistance is being analysed presently by the UN agencies in Pakistan and although it is premature at this stage to foresee the outcome, it nevertheless demonstrate that the political will is there.

It can not be said that the Swiss Phase - I was entirely successful (which this report expresses in frank terms) but it did have a beneficial impact on government planners to accord more interest and resources to the deprived areas. It is not only by coincidence that the government of Sindh frequently consults UNICEF in this regard.

It is hoped that this Joint Assessment Report will be beneficial for the 3 proposed activities related to water supply development in Pakistan mentioned above.

SWISS PHASE - I AND PHED SCHEMES

1. BACKGROUND

Consultations between the government of Sindh and UNICEF in 1978 led to the preparation of a plan entitled "Piped Rural Water Supply Plan for Rural Communities in Sindh".

The plan proposed construction of 306 piped schemes for towns and villages located predominantly in the Indus River Plain, having an aggregated population of 13.7 lakh.

This plan was considered by the 2 parties, and UNICEF suggested to give priorities to the least developed areas of Tharparkar and Kohistan. Finally, Tharparkar was selected by the government, and a new proposal titled "Piped Water Supply Plan for Desert Area of Tharparkar District, Province of Sindh" was prepared by PHED of Hyderabad and submitted to the UNICEF office, Islamabad in February 1979.

The plan proposed to provide water supply facilities for 48 towns and villages having an aggregated population of 103,550.

Since the plan did not clearly define water sources to be used for the proposed scheme, it was mutually agreed to start with a ground water survey and then to decide which type of scheme is most appropriate for particular town or village.

2. THE ROLE OF UNICEF

The first phase of the Swiss assisted rural water supply project in Sindh finally contained 4 areas in which UNICEF would provide support to PHED.

2.1 Hydrological Survey of the Desert Area of Tharparkar

In the summer and autumn of 1979 a team led by Stefan Radojicic, the UNICEF hydrogeologist based in lalsmabad, and including a PHED geologist, Jafar Ali Arain, did a ground water survey in Tharparkar. Based on this survey the most appropriate source for a particular site was going to be decided.

The report covers pre and post-monsoon measurements of open wells. However, the investigations were inadequate in that they did not reveal much information about the quality and quantity of ground water available in deeper aquifers.

To obtain additional information the drilling of deep wells was proposed. However, at this juncture we touch a major difference in perception as to what the direction of the project as viewed by the various partners should be.
PHED had originally requested UNICEF's assistance to improve the drinking water conditions in the Tharparkar area and this was also the basis for SDC to agree to finance the project. However, UNICEF/WESS focused for over 2 years on exploration. Only after the negative results and long delays at Chachro and Khokhrapar did UNICEF under combined pressure from PHED and SDC change tack. From the end of 1981 therefore the driller went for fresh water at usually a lower depth of 150 - 250 feet. It is clear that this decision considerably speeded up the drilling operation since then. Neither has it led to a lesser water quality in the wells drilled.

With regard to the ground water exploration in Tharparkar - which by the way is a task of a specialised agency and hardly within UNICEF's mandate - it can be observed that electrical resistivity measurements to select the most promising well sites would have brought about a considerable improvement in well selection at lower cost and with less delays than through the drilling of test boreholes.

2.2 Drilling of Wells in 8 Selected Villages

The drilling operation had a slow start. Obviously the initiation of every activity in such a difficult area takes time but in this particular project there were many consequential delays some of which could have been avoided.

Equipment:

- The first rig supplied was borrowed from Balochistan. It was old, cumbersome and heavily under equipped (e.g. no water tanker).

- The second rig remained in port awaiting clearance for over a year (Schott-Dubon). Necessary trucks and support vehicles were also cleared with great delays.

- The third rig remained in Customs for 8 months and was subsequently in PHED store for a year because of "lack of work".

Support:

- Poor communication between the drilling operation and UNICEF/WESS/Islamabad has caused many delays in the drilling.

- Stoppages of the drilling due to (administrative) delays in the provision of spare parts, fuel, money (PHED - responsibility).

Other delays are inhereny to operating in a new and difficult area.

Training:

Although initially 2 local drillers came with the rig, a big training effort was needed to get the required number of capable staff. Although quite a number of staff have left in view of insecure position and the low pay, the Master Driller still managed to set up 2 drilling crews each with a driller, 2 assistant drillers, a welder and a number of helpers.

Logistics:

The very difficult conditions of the desert slow down all transport and communication. Breakdowns of vehicles will continue to cause delays. Supplies of any kind as well as spare parts have to be brought in from outside.

Evenso an every increasing number of wells have been successfully drilled since 1983. By all means a good achievement under the harsh desert conditions.

Out of 8 towns where drilling has been completed or is planned for, 7 sites have been visited by the team. A description of the present status of these projects is given in item 3.

2.3 Construction of 5 Simple Schemes in Nagarparkar Zone of the Tharparkar District

In order to provide direct relief to the inhabitants of Nagarparkar zone, 5 shallow schemes were proposed for construction by PHED through UNICEF assistance. It was envisaged that appropriate technologies would be applied tailored to the situation, however, only large diameter, shallow wells were constructed. Results of this part of the project are poor, both technically and socially. All but one of the sites was inspected by the team, a resume of which is given in item 3.

2.4 Construction of Warehouse/Workshop at Mirpurkhas

To back-up the drilling operation the construction of a workshop-cum-warehouse was foreseen. The rather large compound and building have been completed only recently. Large quantities of PVC pipe both for well construction as well as for distribution systems are stored here. Old casing pipes and spare bits for the percussion rigs were seen during the visit of the team. Other pipes and materials lying about in various PHED-compounds in Mirpurkhas will also be put up here.

The tools required for the workshop have partially been received, whereas other machinery to set up a simple workshop is shortly going to be ordered. This workshop will support PHED-activities in Lower Sindh. In Phase - II a similar workshop-cum-store will be set up in Sukkur to take care of repair for PHED's projects in Upper Sindh.

3. MARCH 12-15, 1986 JOINT ASSESSMENT TEAM

From March 12 to March 15, 1986 the Joint Assessment Team visited the Phase - I project areas in Tharparkar district. The findings ae listed below. In an attempt to provide a complete picture of each project complinentary references have been used from 2 recent tour reports (Heynen, July 1985; Akhter, November 1985). Projects are listed in chronological order of starting date.

3.1 Borehole Scheme

Chachro:

After completion of the geo-hydrological survey the first well of the project was drilled here in the vicinity of 2 sweet wells.

For the drilling a percussion rig was employed. Though a percussion rig is considerably slower in drilling that rotary drilling it is much more suitable for drilling in desert conditions with saline ground water for the following reasons.

- The mechanical engineering of a percussion rig is straight-forward and sturdy. Repairs are easy and can often be done in the field.

- Caving and loss of circulation of drilling fluids which can be a very ennoying problem with rotary drilling in coarse sands, is of hardly any importance.

- A simple bailing test can provide on-site determination of the water quality. Rotary does usually not allow for this facility.

- Especially in Sindh with its increase in salinity with depth this water testing is extremely useful to determine when to stop drilling.

- The investment cost for a rotary rig are much higher than for a percussion rig.

As the rig ordered for the project had not arrived yet, an old ig from Balochistan was used on loan. Problems with maintenance of the rig the absence of tools, material, water tank, and especially the fact that the well casing supplied had no threading and had to be welded slowed down the drilling.

To further the knowledge of the geo-hydrological situation the well was to be drilled to 1,000 feet. The geologist from PHED regularly collected samples which were examined by the irrigation laboratory in Karachi. Following the examination of the samples UNICEF/Islamabad would issue new instruction upon which the drilling could continue. The unavoidable delays caused by this feedback procedure led to a lot of time losses and frustration in the field.

A fresh water lens was found between 116 and 124 feet. Drilling continued upto 700 feet, the water becoming increasingly more saline (over 12,000 rpm). When coal was struck at 700 feet after one year, drilling was abandoned and the well sealed.

Although the population requested for the well to be developed if only to provide for animal watering, PHED decided against this request for policy reasons.

The town which makes a fairly desolate impression due to extensive damage caused to it in the 1971 war, has an overhead tank and distribution system which was constructed in 1969. There is till now, however, no water source for this system. A hand pump installed as relief aid by UNICEF in 1973 has been partially dismantled and the well is not any more in use.

As before the population gets its water by camel transport at Rs 3-5 per day.

Khokhrapar:

Two wells were drilled in Khokhrapar village, one to a depth of 680 feet, the other to 692 feet. Water quality was found to be highly brackish, with the salinity reaching 22,000 ppm. For the same reasons as described above for Chachro, these 2 wells were not developed.

Gadro:

Two wells have been drilled with a water quality of 4,500 ppm. Though the WHO advises in the original water quality standards that the salinity should not exceed 1,500 ppm, in this project salinities upto 5,000 ppm have been condoned because these salt levels were acceptable to the consumer. The wells supplied water to a resident population of 1,500 and a migrating population of 15,000 excluding cattle (source: Union Council). The water is pumped by diesel engine-driven Monopumps into two 5,000 gallon reservoirs from which the water is delivered through around 10 taps protruding directly from the tank wall.

The system has functioned well until about 4 months ago. However, at the time of visit it was out of order because one pump had fallen into the well, whereas the diesel engine driving the pump of the second well could not be used as it overheated.

The system has been completed since 4 years and though it has delivered water it has also had quite some problems.

- Pumps have falled often into the well. Fishing the pumps out of the well is very difficult. Presently already 4 mono pumps have been supplied as replacements to Gadro. One well is now equipped with a submersible pump.

- Through the Union Council a generator with 4 times the capacity of the old one was purchased for Rs 100,000. The size of this generator has caused serious over-pumping of the aquifer. To avoid this occurring in the future the Chief Engineer has ordered to limit the discharge of each well to 1,000 gallons per hour.

- Though some revenue was raised - Rs 2 per satchel and Rs 5 per animal (the later monthly) - the funds were not use for (preventive) maintenance of the scheme. In fact the system has mainly worked through the good offices (diesel/mechanic) of the Rangers stationed nearby.

Every year 30 percent of the population leave to go for harvesting in the barrage lands. As there is severe drought this year nearly all the people have left the area with their cattle. Until there is a functioning revenue collection and repair and maintenance system this scheme will continue to have problems. Also the Rangers are losing their interest in having to look after the scheme.

If at all possible the repair of the scheme by PHED should be made subject to certain improvements in the reliability of the scheme by the Union Council. If the prospects remain gloomy, even the takeover by PHED of the operation and maintenance could be considered in this case as the potential revenue seems adequate to cover the cost of staffing and OHM (semi-private basis).

Mithi:

Six wells were drilled here to a depth ranging from 150 - 200 feet. The salinity rangers from 3,500 to 4,000 ppm.

The pump-houses and reservoir were completed in September 1985. The electricity connection to the pumps was only provided a few days before the visit, even though Mithi itself already enjoys electricity since 4 months.

Two wells had been equipped with submersible pumps supplied by UNICEF. These pumps will be operated for about 12 hours per day at a discharge rate of 1,000 gallons per hour. It has been decided by PHED to run these 2 wells for one year, evaluate the situation and only then decide whether to put pumps in the other wells. These pumps will be supplied by PHED.

Apart from the two 150 m3 storage provided near the wells, 15 smaller tanks of 20 m3 (5,000 gallons) each are to be provided for distribution of the water. The water is delivered in the same way as in Gadro with delivery pipes protruding from the tank. Presently 2 tanks have been constructed, others will follow when funds will become available next fiscal year.

The population according to the 1981 census was around 12,000. The town council, however, maintains that the present population is around 20,000. Mithi certainly will expand quickly now that there is a tarmac road connecting it with Naukot. Facilities like electricity and a water supply scheme will further attract new settlers. It is likely that the population will reach 20 to 25,000 within the next few years. Taking a conservative population estimate of 20,000 it means that with the present 2 wells around 1.5 gallon per person per day can be delivered rising to 4 gallons with 6 wells operating. However, with increasing population the scheme rapidly becomes inadequate.

From the foregoing it is clear that the existing open wells will continue to be needed to augment the water supplied by the wells.

However, due to the pumping some of the existing open wells are likely to dry up. Especially when also the nearby tarai is dry this will cause hardship on the people and the cattle.

The present system of delivering water to the people is quite a business. A camel satchel of water sells at Rs 30 per month for the poorest quality to Rs 100 per month for the best quality. For that price the water is delivered to the house.

There are about 100 - 120 wells selling various qualities and quantities of water, one well even installed with a electrical pump.

Assuming that there are about 1,500 households of which half have the water delivered at an average expense of Rs 50 - the other households will go and collect the water straight from the well often at no cost - then there is a monthly turnover of over Rs 35,000. Depending of the time of the year, monthly profits for the well operator may range from Rs 500 to Rs 1,250 (data based on interview with one well operator).

From the above rough calculation it is clear that there is a good potential for revenue collection. However, many households having the water delivered to their door-step now will have to go and collect it from public taps later. The town committee proposes to raise revenue by imposing a flat water rate of Rs 15. It can be argued whether this rate is: a) recoverable from those who prefer to use the well or from those who used to get the water free at the well before; b) is adequate to cover the cost of operation and maintenance (and possibly extension/upgrading of the scheme), taking into account that part of the population does not pay.

As far as the health impact of the new supply is concerned it can be started that it will be negligible for at least 2 reasons.

- Bacteriological contamination of the water will take place between the community tank and the house because of dirty containers; in case of damage to the mains contamination may furthermore take place between the pumping station and the tank due to intermittent supply.

- The water quantity delivered is grossly inadequate to have any effect on health. As a matter of fact the we supply only marginally improves the existing system,.

Following the visit to Mithi is worth mentioning that the following issues need to be resolved to make the project successful over a longer period.

- A system should urgently be developed by the town committee to ensure proper operation and maintenance. Tariffs for water should be put high enough so as to compensate for operation and maintenance, salaries and for improvements and extensions of the system. PHED should support this effort by advising the town committee about the implications of the management of a water supply scheme.

- An investigation should be made into the options for increased supply to cover the increasing population e.g. mixture of boreholes and open wells or mixture of boreholes separately for drinking water only and for domestic and animal use, etc. An increased supply and a higher level of service (through house connections) will be a pre-condition for an ultimate improvement in health.

Measures should be taken to enhance a positive effect of the provision of safe water on health; e.g. sanitation education, promotion of latrines, etc.

Kantio:

The 2 wells drilled here were completed in June 1985. One well is capped and at the site of the other a simple delivery system has been made consisting of a Lister engine and a mono pump, a water collection basin and a cattle watering trough. This is a temporary arrangement which the drilling crew made at the insistence of the villagers.

At the time of visit it was revealed by the operator that the pump was only sometimes used, most often when there were marriage parties which need much water. To start the pump the operator ordered a boy to bring water to prime the mono pump. The boy went off and returned after about 10 minutes with a donkey carrying 2 clay pots with water from the nearest open well. Awkwardly the boy and another villager primed the pump through the delivery pipe.

The Lister started directly and the whole machinery was in good condition. The water delivered was the most saline of the waters that we had tested but it was still drinkable. Probably it would improve after continued pumping.

Like in Gadro the mono pump seems to be less appropriate for desert conditions because it does not have a check valve and in practice needs to be primed. And also the water for priming is far away and contaminated in the Thar!

Presently a reinforced brick masonry underground reservoir of 15 m3 is under construction.

Islamkot:

Drilling started in Islamkot in July 1985. Initially only 2 wells were going to be drilled but in order to ensure an adequate future water supply for this town of more than 7,000 inhabitants it was decided to drill an additional 3 wells. The third well was completed in the first week of March.

The chairman of the town council, a venerable energetic man of 73 years old, discussed the need to know the design and the layout of the scheme. He argued that he would need time to prepare and convince the town's people that they had to pay for the new supply. Especially because there would be only a distribution scheme through community tanks and no house connection as every body wanted. His appeal to be consulted and informed about the proposed scheme only received a lukewarm response from the responsible PHED engineer.

In addition to the 6 towns mentioned drilling is further planned in Jesro-Jo-Par and Diplo. Originally Satidero was selected but as there was an adequate supply of good water through open dug wells, it was decided to make boreholes in Jesro-Jo-Par instead.

This village consists of 500 houses and over 20,000 animals. The tarai is about 1-1/2 miles away. In the par near the village are over 200 wells. The people dig upto 70 - 100 feet, whereas perennial water is available at 250 - 350 feet. The wells become dry in summer and in case of drought the wells in the tarai also fail. The people move out of the area when this happens. At present 90 percent of the animals and two-third of the population have moved out of the area. The village social structure has also disintegrated

with the influential persons having gone into commerce. This village supplies about 3,000 animals to Karachi every year.

The team visited Jesro-Jo-Par and had a meeting with the teacher and some 10 to 15 villagers in one of the huts. In a discussion of about an hour a variety of issues were raised including expectations of the villagers, what they could/should contribute towards the construction of the scheme and the problems associated with operation and maintenance. However. the villagers have no idea as to how this will be maintained or what operation or maintenance entails. They feel that the Tehsil Council should pay the Union Council to maintain and operate the proposed scheme.

Table - 1

List of Boreholes Drilled To-date

Name	No. of wells	Depth in feet	Supply	Year of drilling	Remarks
Chachro	1	695	No	1980/81	Saline
Khokhrapar	2	592,603	No	1982	Saline
Gadro	2	387,402	Yes	1983	Community tanks next to well
Mithi	6	152,180,170	Yes	1984	2 wells used
Kantio	2	238,148	Temporary	1985	
Islamkot	3	213,194,240	No	1985/86	

All together 16 wells with a total length of 4,765 feet have been bored. Twelve of these wells are of good quality, 3 are saline and one is of doubtful quality. The cost of drilling these wells amounted to around US$ 65-70 per foot (lifetime of Schott-Dubon assumed to be 20 years), excluding salaries and TA/DA. An average well as drilled in the last 3 years thus represents a value of (176' * 70) US$ 12,300 or Rs 195,000. Including salaries, TA/DA, feul etc., but excluding UNICEF staff costs, one well will cost around Rs 2.75 lakh. A considerable investment which thus has to be put to good use!

Achievement of the drilling operations:

- Physical output:
- Drilling of 13 viable boreholes.
- Delivery of (presently insufficient) water in Gadro, Mithi and Kantio.
- Training of 2 drilling teams, including a.o. 2 drillers, 4 assistant drillers and helpers.
- Strengthening of the PHED-laboratory which is now capable to also do sieve analysis in addition to chemical water analysis.

- Open spin offs:

Interest and increasing expertise on the part of PHED to tackle projects in the arid zones of Sindh.

Issues still to be resolved:

- Integration of the drilling operation in PHED. Presently the 2 drilling teams are not well represented in the organi-gram of PHED, are not headed or directly supported by permanent PHED staff and so might find it hard to communicate their problems with PHED.

- Usually there is quite sometime between the completion of the borehole and the construction of some kind of distribution system.

Ways should be found to reduce this time gap.

3.2 Five Small Schemes in Nagarparkar Zone

In addition to the 8 projects for the drilling operation UNICEF also agreed to bear the cost of the construction of 5 small schemes in Nagarparkar zone. Apart from Kuwara these schemes were visited by the team.

Virawah:

A 16 feet diameter shallow well was constructed near a tarai. The well, according to the villagers, provides only water during 9 months of the year. In the remaining months of the dry season they have to resort to the tarai in which they construct seasonal open wells.

The community takes care of the scheme and raises Rs 5 or Rs 10 monthly per household for operation and maintenance. The rangers from the nearby camp pay Rs 300 a month and sometimes sent a mechanic to help out.

Nearby the pump-house an old well with a UNICEF supplied (1973) fly-wheel hand pump was also giving fresh water. The pump was in disrepair since one year but the well cover was now removed and the water raised by bucket. The waste water of this well irrigated a small field in which onions, peas and some leafy vegetables were grown.

The villagers of Virawah were disappointed with the yield of their scheme and said to prefer a rehabilitation of their tarai so that this would contain water all year round.

Wadhrai:

A similar well as in Virawah was tried here. However, due to hard rock the construction of the well was not possible. Some efforts were made to convert it in a rain water tank collecting run-off from the rocky hills to the north. Due to lack of rain and the small catchment area the tank had never really functioned. Even if it would have collected water, it would have been fairly contaminated since the catchment area is very close to the village.

Horizontally displaced hand pumps near the large tarai at a few hundred meters from the village are likely to be a better solution for the water problems of this area.

Nagarparkar:

A large diameter shallow well was constructed here to augment the old system which was constructed by PHED in the early 70's.

Presently only the newly constructed well was operated because one of the two diesel engines had been sent to Mirpurkhas for repairs. The system was functioning satisfactorily.

Kasbo:

The scheme was operative but had been closed down due to social disputes. Against the advice of the people the well was made on the eastern side of the dry river bed passing near the village. The villagers claim that the water from the system is more saline than the water from their own wells.

We returned to the village to find out and sat down in a small shop of Sunji, a Hindu trader. At first he was reserved but when he was convinced about out sincerity he invited us to come and see his land. After a few minutes drive we stopped near a Vishnu temple and he preceeded us to a secluded garden. In the garden were a number of wells with sweet water irrigating about 150 acres of land. Wheat, onion, carrot, green vegetable and a variety of fruit trees were seen. His was not the only garden because nearby there were more of these wadis. One man was observed lifting water with 2 oxen at the rate of some 5 gallons per minute.

Water was plenty.

Kuwara:

As the system was claimed to be a failure (Akhter, November 1985) and the team was short of time, Kuwara was not visited.

Achievements:

- Nagarparkar scheme functions and in Virawah water, due to persistent drought, is not sufficient. Kasbo scheme could be operative but is closed down due to social problems.

- Operation and maintenance functioned reasonably well in the schemes visited.

Issues:

- In these difficult conditions more attention should probably have been paid to the advice of the inhabitants. Together with the people's solutions appropriate to the situation could have been found.

- Did the project decide that these people needed water or did they come themselves and request assistance?

3.3 Phase - II

a) Introduction

The second phase of the Sindh Rural Water Supply Project was originally due to commence in January 1984. Because of a delay in receipt of funds, and further delays in the preparation of PC-1 forms by the government, the programme's start was rescheduled for January 1985. Elections in Pakistan then intervened to cause additional problems in getting PC-1 forms written and approved, which was only done in August 1985. However, a number of activities have already begun.

In Phase-II there has been a shift in emphasis away from the delivery of water supply only towards the delivery of a package of measures aimed at improving the health of the rural population using water as an entry point for sustained development.

It is for that reason that next to PHED also the Rural Development Department features prominently as one of the partners in the second phase of the project.

In the following section we will only deal with the PHED-involvement in Phase-II. The RDD part is described in part 2 of this report.

b) Piped water scheme:

The first PHED implemented component is the construction of 6 piped water schemes in 3 districts, Larkana, Jacobabad and Dadu. All schemes are based on providing 10 gallons/person/day, and will use storage tanks in 2 to 3 locations in each village fed by pipes from wells. The table below gives an overview of plans.

Table - 2

Phase - II Piped Schemes

District/ Village	Type	Population	Cost in million Rs.	Estimated per capita cost
Larkana:				
- Khandu	Deep tube well	5,700	0.959	168
- Gaibi Dero	-do-	10,800	9.425	873
Dadu:				
- Sri Singh	-do-	4,200	1.216	289
- Bajara	-do-	5,144	1.940	377
Jacobabad:				
- Liaqat Ali Domki	Shallow Tube well	3,630	0.551	152

The cost component is being met, proportionately, 47 percent by UNICEF and 53 percent by the government.

Since mid 1985 an additional percussion rig, Dando 800, has been in use in Thano Bula Khan. This rig is lighter than the Schott-Dubon and can only drill upto 500 feet in a sandy formation. Deeper is not possible as it cannot lift the casing anymore.

Unfortunately this rig has also taken more than 18 months before it was commissioned, initially because it was not cleared from customs and later because there was "no work". The rig is simple to handle and can easily be towed behind a truck. It is a rig which will do very well in these circumstances.

Five boreholes have been made with this rig till now.

Table - 3

Listing of Boreholes Drilled in Kohistan

Name	No. of wells	Depth in feet	Supply	Year of drilling
Thano Bula Khan	2	220 320	No	1985
Sari Singh	2	100 72	No	1985
Gaibi Dero	1	192	No	1986

The team visited Thano Bula Khan and noted that the 2 new bore-holes have not yet been incorporated in the existing scheme. The town is now supplied through 5 diesel engine driven pumps in large diameter wells in a dry river bed to the north of the township.

One of the schemes proposed in the Phase-II was technically reviewed based on the data provided in the PC-1. It was felt that the scheme was over-designed in terms of storage and diameter of trunk and distribution mains required. Considering the lack of funds for initial construction as well as the need to reduce cost of operation and maintenance and at the same time increase the reliability of supply a more

daring and innovative design would lead to more value for money. Another issue that is worth attention is for instance the attraction of an incremental approach whereby a project can be cut up in sections that in themselves can already supply water. Depending upon the avail-ability of funds in a particular fiscal year the project can then be constructed in phases with increasing levels of supply in the course of the construction of the scheme.

To demonstrate this approach an example has been worked out based on the date available on Sari Singh. For the sake of the argument the steps leading upto completion have been shown below.

From an economic point of view this approach also has the advantage that revenue on the investment will be received from an earlier stage.

The observations made on the design of Sari Singh to apply to some degree to all the schemes proposed in the PC-1.

Presently the TAG project of the Transportation and Energy Department of the World Bank are promoting optimisation of designs for brached and looped water supply system as well as for traditional and small bore sewerage systems. To this end the TAG has published a manual including diskettes which allows for computer aided design of schemes. TAG is also prepared to provide technical assistance to government agencies in the sector to learn using these techniques.

In the context of the Water Master Plan for Sindh this method of optimisation of schemes is well worth considering.

c) Dadu water resource survey

To assess the chances of drilling a successful well a thorough study of the available water resources in Dadu district has been undertaken. The study covers information on existing wells and deep boreholes as well as other information relevant to a successful sitting of wells. The survey has in the last 14 months covered 4 out of 7 talukas of Dadu district.

Though the effort is laudable it might be more appropriate if the survey exercise is scaled down and is concentrated on those places where boreholes are planned. A brief survey of existing wells and boreholes augmented by a electrical resistivity survey (as executed on behalf of UNICEF by the geology department of the University of Sindh; January 1986) would usually yield sufficient information to decide upon the well location.

d) Water resources and drilling unit

Over the last 6 years UNICEF has assisted PHED with the drilling of boreholes. To that end UNICEF provided rigs, transport and the services of an expatriate driller. PHED contributed salaries of geologist and drilling crew.

Now that the drilling operation has consolidated itself the time has come for UNICEF to gradually withdraw its support. However, this is only possible when adequate support from within PHED for the drilling operation is ensured.

This representation of the drilling interest in PHED would probably be most effective if a water resource and drilling unit would be set up within PHED.

Right from the start of the project PHED has already taken steps in that direction through the creation of 2 posts for geologists. Recently permanent posts have also been created for 1 drillers, 2 assistant drillers, and 1 mechanic. Due to the low salaries that the government can pay these posts are still vacant.

As such a unit is considered essential for the continued functioning of the drilling operation, it is felt that its establishment should be a pre-condition for support by UNICEF as detailed in the PPA. For instance, it is of no use to supply transport to an operation that is going to fold because of lack of support from within PHED.

However, when this unit is indeed established it is recommended that UNICEF though not directly involved anymore, will occasionally cast a 'motherly' glance at the progress of the drilling and the state of repair and

vehicles. In that context UNICEF could also favourably consider to assist PHED at their request to remove bottlenecks hampering the drilling through, for instance, the provision of essential spare parts and replacements not available in Pakistan or through consultancies.

4. PROBLEM AREAS

4.1 Management

As has been mentioned before there have been a number of consequential delays in the execution of the project. These delays are not only as is sometimes easily assumed caused by PHED but many of these can be allocated to UNICEF.

a) PHED

The delays of any government department are caused by the functioning of the bureaucracy and are so often beyond the control of concerned department. Preparation of PC-1, follow-up tendering etc. are all time consuming exercise. To avoid unnecessary delays in the future there are probably only 2 areas where PHED should give more attention.

- As soon as a design of a proposed schemes has been finalised forward a list of necessary materials including specifications to UNICEF requesting them to order the necessary materials. Relevant background material and maps are per PHED procedures also to be provided.

- Support the drilling exercise by timely supplying them with fuel, spares, gravel, etc. In doing so the drilling can be speeded up even more.

b) UNICEF

Whereas UNICEF should have been the driving force behind the project, it has in the past been the cause of many delays. The delays caused by the exploratory drilling of the first 2 years have already been described in some detail. In addition to that there have been very serious delays in clearance of rigs and vehicles from Karachi port in the starting years of the project. Problems associated with material are continuing to the present day (e.g. local procurement, queries about pumps and pipes etc).

For the good of the project WESS/Islamabad should take a more active interest in the work going on. This also includes for instance using its expertise to advise on the designs of the proposed schemes. When due to time constraints WESS/Islamabad cannot make this support available it should put its trust in the judgement of PHED and UNICEF/Karachi so as not to hamper the progress of the project due to delayed procurement.

4.2 Technology

a) Criteria

Realistic design criteria, for design period, quantity and quality, convenience, cost per capita are essential. Especially in the difficult circumstances of the arid zones of Sindh a review of design criteria would be worthwhile in view of the high cost involved. Some suggestions are given in table 4.

Table - 4

Design period	20 years for mains, wells 10 years for overhead reservoirs and distribution system expansion only after 10 years if so required.
Quantity	5 gallons/day/head or less if there is an abundant supply of saline water.
Quantity/Quality	Water supply of saline water and provision of drinking water only from one central borehole (existing situation in Diplo) (situation compatable to water supplies in towns in developing countries, or for instance in France where people buy bottled water for drinking).

For a public health engineer 2 criteria are over-riding in any of his considerations:

- cost, as an engineer it is his duty to find the maximum benefit/least cost option;
- health, the water supply scheme should untimately lead to improved health of the beneficiaries.

Using more advanced calculation methods (programmable calculator, PC) would allow for a better design because more possibilities can be checked and the least cost option can be chosen. The manual methods presently in use take so much time that it is hardly feasible to calculate 2 or 3 options. Next to the application of calculators or PC's a review of the design criteria can lead to a considerable saving in initial and recurrent cost. A revised design for Sari Singh is provided as an example of this approach.

For water to have an impact on health quantity, reliability of supply and convenience are of more direct importance that the quality of the water. It is therefore, essential to supply an adequate quantity (assume clean water, less than 50 E. Coli/100 ml) of water near the house. To fulfill this requirement one can consider two approaches:

- adequate supply of fresh water: 5 gallon per person per day or if available. If an abundant supply of water for other domestic chores is available (barrage land/tarai after the rains), a provision of 2 gallons a day could also be acceptable;
- in case the quality of the supplied water cannot be guaranteed (no chlorination, leakage, intermittent supply) people have to resort to other water sources for drinking and cooking. Rather than spending a lot of money on the delivery of safe water for all types of daily use, one can also consider to supply clean water through the system and provide safe wate from a central point. For instance, it seems that in Diplo an old scheme is existing which every time has been turning out increasingly saline water. The population is presently getting this water in their compound. It can well be imagined that the construction of one central well is a cheap solution that still is acceptable from a health point of view. Like in Europe or in Arabia people will go and collect/purchase their water from a central water point.

b) Appropriate technology

One of the original goals of the project has been the development of appropriate technologies. This aspect has not been very successful probably because it was often only an afterthought. May be it was also not within the mandate of PHED to do very much in this field.

Whatever may have been the case the need for appropriate technology to support life and health in the desert is as topical as before especially for the smaller communities.

Suggestions and illustrated examples of possible technologies have been provided in Annex-III. Most of these ideas could be applied in that part of Swiss Phase-II that is to be implemented by the PHED.

During the visit it was noted that the community tanks constructed by PHED have a delivery pipe faucet protruding directly from the tank wall. These tanks are filled from the ground storage reservoirs and will then directly provide water to the community. Thus relatively large pumping mains are necessary to provide the required quantity of water during the period of supply - usually 2 hours in the morning and 2 hours in the evening.

A design by which the water supply from the community tank is controlled through a control valve, would on the other hand have advantages. The tank can be filled any time of the day through pumps or overhead reservoir (less problems with load shedding, smaller diameter mains), and the distribution of water can be controlled more easily (selling of water/rationing in case of breakdown).

4.3 Maintenance

Maintenance is representing a problem in the schemes put by the PHED. After completion of a project PHED transfers the responsibility for operation and maintenance to the Union Council. However, the UC is often not in the position to take up this O & M and then the project may be falling into disuse.

The problems associated with this lack of maintenance are undoubtedly manifold. Still 2 main factors are suggested to be of major importance.

- There is hardly any communication and consultation between PHED engineers and UC representatives or the consumers on the layout, level of service etc. of the scheme.

- The community and the UC are inadequately informed about the implications of the O & M of the scheme.

In fact it all boils down to a lack of communication between PHED and the benefiting community consequently causing a lack of understanding and motivation to manage and pay for operation and maintenance.

Next to a better communication and management aspects of the present maintenance concept could possibly be changed so as to improve the viability of the schemes. Some suggestions are given below.

- A pre-condition for a community could be the deposit of an amount of sar Rs 50,000 or Rs 100,000 in a fixed savings account. The income from this account can be used to augment the revenue raised and be used to pay for O & M and salaries. It will also be a security fund against lack of revenues or an occasional larger expense.

Such an account could be operated between the UN chairman and the executive engineer PHED.

The operation of such an account allows for an initial subsidy of water rates which could then be gradually raised to cover actual recurrent cost (Borujwada near Nagpur/Mala-rasthra State/India).

- One could also consider to run the water supply scheme as a small corporation. The corporation would be jointly managed by PHED and the UC. Two or three staff members will be employed and trained in their respective duties by PHED.

Revenues should be set at around 150 percent of the recurrent cost so as to provide a profit. The revenues could be split as follows:

- 100 percent O & M/salaries

- 20-30 percent PHED for saving against future ivestment

- 20-30 percent UC for specific development projects

Systems that worked in this way have generated quite some positive spin-offs in the communities in which they were tried (construction of school in Alta de Los Idolos/Colombia Community ricewill in Ban Banglox/Thailand).

5. RECOMMENDATIONS

5.1 From the foregoing it is clear that PHED is now gradually capable of managing its own drilling operation. Direct UNICEF support in terms of technical assistance through the provision of a master driller, topping up of salaries etc. should be phased out.

Assistance towards the supply of spare parts and replacement from abroad for the drilling operation could for some time to come still be supplied by UNICEF upon request. This would include support for the workshop in Mirpurkhas and the one planned in Sukkur.

5.2 Designs could be tailored more closely to the means and needs. Innovative design, clever sitting of (overhead) reservoirs and an incremental approach towards construction would reduce initial investment, increase reliability, reduce maintenance cost and in an early stage start raising revenue. All this without a degradation of service in terms of quantity and quality. In the context of the Sindh Water Master Plan PHED may wish to contact TAG/World Bank to explore the possibilities of assistance and collaboration in this matter.

5.3 Maintenance remains an issue that needs close attention of PHED if schemes are to function according to design and investment.

A more active stand should be taken by PHED and PHED staff right from the start of any project to ensure undertanding and participation of the maintenance concept by the users.
Various concepts of maintenance systems preferably based on independent local responsibilities should be tried out in places like Islamkot, Diplo, Ghaibi Dero, Sari Singh etc. This process should be started well in advance of the construction.

It should be remembered that when the implications and modalities of maintenance are being considered before a project is being conceived then only will there be a chance that maintenance will become an integral part of a lasting water supply scheme.

In the context of the on-going project a pilot activity geared towards the development of a viable operation and maintenance system through community participation and finance should be undertaken. Its components would include:

- interactive communication with the community on the design features of the project;
- information about the technical, managerial and financial requirements for operation and maintenance;
- development of a system to raise revenue compatible with the administrative and social environment.

To assist this activity the resource person in UNICEF for community education and participation should be made available.

5.4 The government should support a promotional drive based on commercial advertising techniques to emphasize relations between one's living environment and health. Some examples of possible promotions are given in Annex-II.

This type of support will in an indirect way support PHED's efforts to ensure lasting maintenance and will also satisfy the public health requirement of its work.

SWISS PHASE - 2 SCHEME AND THE RDD INVOLVEMENT

1. PHASE - 2 SCHEME WITH RDD INVOLVEMENT

A water supply programme with a major software component has been proposed for 500 villages in 6 districts of Sindh as part of the Swiss Phase - 2 of the Sindh Rural Supply Project. This is an addition to the piped water schemes that are to be put up by the PHED.

The hardware component consists of the installation of 4,000 hand pumps in 3 years in the rural areas of Sindh. Over 60 percent of these pumps are to be installed in the barrage areas. The RDD will be the implementation agency for this project and the UNICEF will provide the pumps along with all necessary accessories. The pumps being developed by the UNICEF are over-coming many discrepancies found in the locally manufactured ones. In addition, the RDD will ensure that these schemes are properly maintained through community participation and/or government involvement and that platforms and soakaways are constructed. In this connection we have been informed that the government has approved a budget of Rs 200 per year per hand pump for maintenance purposes.

As water supply by itself does not meet the objectives of the UNICEF, which are primarily connected with health, programmes for demonstration latrines, sanitation, PHED services etc. are also envisaged. To make these programmes possible and to help identify villages for hand pump installation, O & M, the programme also plans to aid the RDD as so to develop its research, extension, training and technical potential. The Rural Development Academy is seen as an important component of this assistance. The UNICEF has already assisted the Academy with finances, instructors and course materials for arranging a course for Master Trainers in February this year.

The 'Project Plan of Action' documents have been developed by the PHED/RDD/UNICEF.

However, these documents are conceptual in nature and the exact nature of assistance and the possible directions it will take for sociologically and/or geographically different areas have not been specified. Perhaps this can only be done after some research into these aspects has taken place. The assistance given so far by UNICEF has been on an ad-hoc arrangement.

On the basis of observations made during the field trip, and conversations with the rural population, the team feels that it is imperative that a clear distinction is made between the barrage and arid areas of Sindh (a distinction that is well understood in the Contingency Plan), when thinking about the appropriateness of hand pumps for rural water supply. The sociological, ecological and economic factors which should form the basis for technical and organisational decisions need to be studied.

2. THE SITUATION IN SINDH WITH REGARD TO RWS

2.1 Tharparkar

During the field visit to Tharparkar the team spoke to the residents of the villages of Kabul Khanna Goth, Chappar Din Shah and Khisar, regarding the present position of water supply and their feelings with regard to the installation of water pumps. The gist of these conversations are recorded in the paragraphs below. The villages visited by the team are not in the list of villages selected by the RDD for its programme, but are typical of the villages in the desert.

Kabul Khanna Goth:

Kabul Khanna Got consists of about 100 houses and over 1,000 animals. The village clusters are built on the hillocks and 2 wells in a depression, about 2 furlongs from the clusters, serve the population. There is a tarai about one mile from the village.

In summer, the water disappears from the wells and has to be extracted in small quantities from the wet sand that remains. Alternatively, people dig wells in the tarai. These well are of a temporary nature and sometimes become inoperative in the later summer months, in which case the villagers are forced to

migrate with their animals to the barrage lands.

The people are aware of the advantages of a hand pump at their wells. However, they feel that the fly-wheel type hand pumps which were installed in the neighbourhood in 1973 are difficult to operate. They also informed us that the fly-wheel type hand pumps were abandoned because they failed to provide water in the drought seasons and not because of maintenance problems. Hand pumps are welcome, but there must be a guarantee that they provide water they year round, otherwise the people do not want them. The villagers are more interested in developing their tarais than installing hand pumps at the wells. They feel that if the tarai can be cleaned out and some protective construction can be made against its silting, then its water retention can be improved and as such the wells near it or in it can perhaps become perennial. Before the tarai used to be regularly cleaned out by the villagers as the owner of the village, Kabul Khanna, was interested in agriculture and cattle. He used to organise the people and get them to work. If investment was required (it seldom was) he made it, and recovered it from the people. Now he has gone into commerce and trade. The villagers have no tradition of communal work except through the zamindars initiative and authority.

The people use donkeys to extract and cart water. The same donkeys plough the land after the first rains. Almost every family owns at least one pair of donkeys.

Chappar Din Shah:

Chappar Din Shah is a large village consisting of 400 houses and about 13,000 animals. The depression or par near the village is full of wells. Almost every extended family owns one. A well costs Rs 4,000 to construct and is about 24 inch in diameter. The koaras or well makers, live in the village and the profession is hereditary. There are 3 families of koaras in the village.

In the summer months the wells dry up and it takes a whole day of waiting to obtain 2 jars of water. The tarai, a few miles from the village, also dries out at the same time, and the katcha wells in it a month or so later. The villagers then go to the Khisar wells, 8 miles away, to get water and also move their cattle out to the tarai at Khisar, where water lasts somewhat longer. If conditions are exceptionally bad, then the people move to the barrage lands.

The villagers are skeptical about the success of hand pumps because they are sure that they will fail to supply water in the drought season. They are sure that the hand pumps installed by the UNICEF earlier, have been abandoned for this reason. Here again the preference is for increasing the water retention in the tarai than for installing hand pumps. Ali Bajir, a resident of the village explained that the tarai also serves animals which a hand pump may not be able to do, and animals he feels are are important, if not more so, than human beings. A feeling which UNICEF cannot possible share.

People spend Rs 200 per month on feeding their donkeys and upto Rs 800 per month on maintaining a camel. Ali Bajir argues that even if pumps are installed they will still have to keep their animals for carting water and for ploughing the land, and in addition, they will have to pay for the maintenance of pumps.

Khisar:

Khisar consists of 500 houses and the population owns about 25,000 animals. There are wells in the depression near the village. The wells become almost dry in summer and so the major part of the population is forced to migrate. About 15 kilometers away there are wells which never go dry, but do become brackish, and animals are usually shifted there in late summer. Every year a large number of animals (about 5,000) are sold at Umerkot for the Karachi market from this village.

Here again the villagers prefer development of the tarai to installation of hand pumps. Again the disintegration of the village social structure has made it impossible to maintain the tarai properly. Three years ago the tarai was cleaned by some government agency through the UC with the help of a tractor. The silt was pushed to the edges of the tarai instead of being removed, and it came back with the rains. To a question as to why the people did not point out this shortcoming while the work was going on, Arbab Ali, a Khisar shopkeeper, replied that they are all poor people, and as such cannot interfere in government matters.

2.2 The Barrage Lands

In the barrage lands there is no shortage of water. In most cases people gather water from the canals and smaller water courses. In the majority of villages there is a pond which is used by the animals and by the village population, for drinking purposes, when the canals are closed for about 6 weeks for yearly cleaning.

The social structure in the village is related to the system of land tenure. In some villages there is peasant proprietorship, which may be collective clan ownership, or individual ownership, and in other villages there may be a feudal landlord. At the village of Basram Bangla near Mirpurkhas, both these social structures are present. This village has been chosen by the RDD for a hand pump scheme.

Basram Bangla consists of 20-25 houses. The community is ethnically homogeneous. They are all Rajputs from Rohtak in India. They own the land they till and the size of proprietorship varies between 12 to 32 acres.

At present, the community collects its water from 2 shallow wells. One of the wells has a horizontally displaced hand pump on it. This pump was installed about 5 years ago by the community. Mohammad Iqbal, a local of the village, installed the pump without any assistance from a mistri. The pump has worked prefectly for the past 5 years and has only needed to have its washers replaced every 3-4 months. This was done by Mohammad Iqbal without any difficulties. After a few repairs Mohammad Iqbal started to keep spare washers in stock so as to save him visits to Mirpurkhas.

Recently the pump stopped supplying water. On investigation it was discovered that the horizontal underground pipe had rusted. The villagers have got together to replace this and the pump is functioning again, but less efficiency than before.

The village is very affluent and almost every family can easily bear the cost of installing a hand pump for their exclusive use. In addition, they can afford to maintain these pumps as well. The only problem is that hand pumps are not in their list of priorities. There is also little understanding of the connection between water and disease. Children in the village normally have severe stomach problems and 2 died last year of dehydration.

There are 2 tractors in the village belonging to the larger proprietors. They were purchased 10 years ago and are immaculately maintained. Recently they have been overhauled at a cost of Rs 10,000 each in Mirpurkhas. Other peasants hire these tractors from their owners at Rs 60 per hour. All minor repair to these tractors is done by the self trained mistri of the village, Mohammad Iqbal.

The villagers are looking forward to the installation of hand pumps in their villages but feel that as the government is putting up the pumps it should also finance its maintenance. If they were to put them up themselves then only the responsibility of maintenance would be theirs.

The RDD has already motivated the people and formed a Village Development Committee (VDC). However, the committee members understanding of the programme is very different from that of the RDD's or UNICEF's. The relationship between health and water is absolutely unknown to the community.

Near the peasants village are the houses of their labourers. Five families live there. These haris are not allowed to use the village wells and must go to the water course to collect water. They are not part of the village committee and will not benefit in anyway through the RDD/UNICEF programme. Even if a separate pump is installed for them, they feel that they will not be allowed to use it and if they are then they will not be allowed to maintain it, and as a result it will fall into disuse. These haris are the poorest of the poor, as they are bonded labour and owe the village community over Rs 20,000. Given the meagre sum they receive from their masters, this sum never decreases.

3. HAND PUMPS IN SINDH

3.1 Privately Installed

All over Sindh there are hand pumps in the rural areas which have been installed by village communities or individuals. Hand pump technology for installation, operation and maintenance is well known and understood. In every small town these services are available. The cost of hand pump and its installation is sufficiently cheap (Rs 600) to make it possible for most communities to afford them. These pumps installed through individual or community initiative, are normally well maintained.

The maximum number of these pumps exist in areas where clan or peasant ownership of land is common, or where landlords are enlightened and interested in the welfare and health of their haris. Elsewhere, an oppressive social system and ignorance with regard to the relationship between health and water, make hand pump installation difficult, and its maintenance and operation even more problematic.

3.2 Government Installed

We have been informed that over the years the government has paid for the installation of over 100,000 hand pumps. Yet not even 10 percent of these are functioning. A host of social, political and economic seasons are given for the failure of these schemes. However, it is felt by RDD that the new software component developed by it will lead to the development of a maintenance system through the Village Development Organisation (VDO) and the UC. The VDO will be established by the Master Trainers trained at the RDA by UNICEF assistance.

The RDD's concept of the VDO is sound. However, its success depends entirely on a massive extension and education effort compatible with the social and cultural environment. For this appropriate research has yet to be initiated.

3.3 Hand Pump Industry

In all the small towns of Sindh there are hand pump dealers and installers. Spare parts are always in stock with them. These hand pumps are assembled in small workshops along with all necessary accessories. Better quality brass screens are imported from China and are also available all over the province. In Mirpurkhas alone there about 8-10 such dealers.

Mohammad Yousef is one such dealer in Mirpurkhas. He installs at an average about 15 pumps a month and sells an additional 40. The cost of a pump with 30' GI pipe of 2-2/1" dia is Rs 575. Drilling upto 30' depth costs Rs 2 per running foot.

According to Mohammad Yousef, GI pipe in saline soil seldom lasts more than 5 years. Gauze screens also wear out a year or so later. This is the only major problem with the hand pumps and one that entails a cost equivalent to installing a new pump. Washers also wear out every 4 to 5 months, but their replacement is neither expensive nor difficult. Mohammad Yousef is sure that if PVC can replace GI pipe and metal gauze and such PVC is made available in the market, he and other dealers will use it in a big way. A number of pumps developed by the UNICEF and other agencies over the last few years have overcome the defect of erosion by replacing metal pipes and gauze by PVC.

4. RDD AND ITS INVOLVEMENT IN SWISS PHASE - 2

4.1 RDD's Role in Swiss Phase - 2 And Its Present Limitations

The RDD will be the implementing agency for the installation of hand pumps and will be responsible for motivating and organising the communities through the local government for the software programme in Phase - 2.

This is a new role for the RDD as it has so far been mainly the designer and supervisor of engineering schemes identified by the UCs and finally approved by the P&D Department. The RDD's organisation at present is geared to cater to this role only.

However, there is a Rural Development Academy at Tando Jam which has been giving courses to local government officials and to the elected representatives of the people, in rural administration, revenue raising, law etc. The Academy has no research facilities nor the organisation for developing extension and

monitoring services. As such the social and economic research necessary to make such training appropriate is not available nor in its absence is it possible to modify technology to make it compatible with the sociology and economics of the rural areas. In the absence of monitoring facilities, feedback from the field is also not possible, and based on it relevant modifications in the programme cannot be made.

At a meeting at the Academy the Director of the Academy felt that in view of his limited resources, the UNICEF will have to initiate supportive action if it wanted the Academy to play a positive role in the proposed programmes.

For the present programme the RDA has carried out a course for the motivation of master trainers. UNICEF involvement in this training programme has already been mentioned in paragraph 1. These persons were chosen from the villages where the hand pump programme is to be carried out and were then sent to the Academy. These master trainers are required to form VDCs in their areas. These VDCs will provide a caretaker for every pump. This care-taker will be trained by the Academy. The government will provide funds for the maintenance of these hand pumps. A master trainer has been trained for the village of Basram Bangla which the team visited. However, the RDA, because of its limited administrative set up has no direct link with the project activities at the village level.

4.2 Future Plans for the RDD and the Academy

Keeping in view the limitations of the Academy, the RDD has drawn up elaborate plans for its development and applied for finances for the carrying out of these plans during the next financial year.

These plans include:

- More instructors for RDD and of a higher than grade 17 rank.
- Development of a research wing.
- Development of an extension programme.
- Development of training programme for people's representatives; local body officials, artisans and technicians (such as masons for making of platforms and soak aways) at as low as the taluka level.
- The commencing of pilot projects and their monitoring.

These are ambitious plans, and even if the government approves the finances required for this project, an enormous input and time will be required before this project can take off and become viable.

5. CONCLUSIONS

5.1 Tharparkar

a) Hand pumps, cartage of water and the effect on health

The Thar area is very different from the barrage lands in social and ecological terms. As the villages are built on high land and water is available only in the par, people will always have to carry water over considerable distance, even if hand pumps are installed. This cartage of water will always take place by animals as during the drought seasons there is no other work for the animals. The water carrying utensils will also remain the same. It is doubtful therefore, if the hand pump scheme will have any positive effect on health.

b) Hand pump installation

Drilling for water for hand pumps in the desert is not an easy exercise nor an economical one. For this reason the RDD hopes to install hand pumps on existing open dug wells. The people do not wish to have pumps installed on their wells as after installation they will not be able to draw water manually from them.

They feel that there is a real possibility that the pumps will fail due to a lack of water and the people will go back to their original manner of water collection.

In this context the case of the Virawah well should be mentioned. Here the well has failed to cater to the needs of the village population. Because of the persistent drought the people have already started to use the old wells in the tarai, and Nabi Bux, a UC member, feels that unless the well can be made perennial it will fall into disuse.

c) Peoples preference for tarais

It is obvious from the contents of paragraph 2 that the people are very much in favour of developing their tarais and increasing their water retention time. The tarai serves the animals as well as human beings, and the greater the retention of water the more the subsoil water will be replenished. However, water direct from the tarai will be even more unhygenic than from hand pumps in the par. This can be overcome through technological research and innovation. Various methods are available for increasing the retention of water and are discussed in Annex III.

d) Maintenance of tarais

From conversations with the people it is obvious that the tarais used to be regularly maintained at one time. This is not longer the case as the village social structure that made this maintenance possible has, or is, disintegrating.

It is necessary to create new rural institutions, keeping in view the present social and political conditions, so that the tarai can be looked after. Government funding and maintenance for the tarais is not wished for nor feasible in the opinion of the team, as it will put a large burden on the government and make the people dependent.

e) Ecological concerns

Almost every year a shortage of water forces a large percentage of the desert population to the barrage lands. This movement is extremely beneficial to the desert and all who live in it. Certain subsoil water, which cannot be tapped due to the technological limitations of the desert people, is preserved. In addition, the grazing grounds are saved from overgrazing and as such can cater to the desert livestock.

It is feared that with efficient tapping of water resources for the rural areas, we might deplete the water resources of the desert and after some years make it very difficult for life to continue in Tharparkar. In addition, the presence of sufficient water will make movement of livestock to the barrage areas unnecessary. This will lead to the overgrazing of the pasture lands and it is very possible that after some years they may not be able to support animal life. Of course, if water could be found or stored in sufficient quantities to guarantee agriculture and fodder production, the ecological concerns being expressed could be set aside.

In view of the ecological concerns which have been expressed, the development of efficient water management methods through rehabilitation of tarais, measures to reduce evaporation and uncontrolled run-off, will lead to the availability of a considerably larger quantity of water. Water conserving agriculture will stretch there resources even further. These ecological concerns could form a part of the research necessary for the formulation of the proposed Water Master Plan.

5.2 The Barrage Lands

a) Affordability of hand pumps

Hand pumps can be afforded by the majority of the communities in the barrage areas. If they are not installed it is because of a lack of motivation which due to not relating disease with water quality. If a motivation programme, backed by technical advice and tailored to suit the social organisation existing in the villages is developed, it is quite likely that people will install hand pumps on their own. The motivation approach as such will have to be different in different areas and will need constant modification based on the monitoring results.

b) Maintenance

Maintenance allocation to the UC at Rs 200 per hand pump per year is an enormous sum of money for the government to spend. The UC could utilise this finance for development purposes. If people install hand pumps themselves they will also maintain them and the government will then not have to bear this burden which will increase with every passing year. Government agencies do recognise this problem and it would deserve consideration in the upcoming master plan.

c) Aid for the poorest

If hand pumps are to be installed at all, it is imperative they should be installed for the destitute and the poorest of the poor. This class in Sindh has very little political power or say, and it is more than possible that they will not be on the priority list of the UCs for development. RDD and especially UNICEF, through their pressure in relevant places can bring about a change in this state of affairs.

5.3 Rural Development Academy

The RDA is essential to the appropriate development of water resources in Sindh and to their maintenance and operation through peoples participation and finance.

The water programme can succeed, along with other software components, only if the people are made aware of the changes that this programme is going to into their lives and are associated the subsequent decision making. This can only take place by

- relating motivation and organisation process to existing social, political and economic conditions;
- being able to develop necessary communication aids, suitable for an illiterate population;
- monitoring results of the communication and organisation process, analysing them, and modifying the approach if necessary.

For appropriate technology it is again necessary to modify standard engineering technology, implementation procedures and administrative processes and to make them compatible with social, political and economic conditions.

For the success of the project it is essential that the RDA play the research and education role necessary for the achievements of the above goals. For this it will need an enormous amount of assistance. The UNICEF, it is felt, is the right organisation to promote and help develop the Academy's potential.

In conclusion it has to be pointed out that sophisticated fertilizer, pesticide, seeds and other related agricultural research has been taken to almost every village in Pakistan by commercial organisations through a massive extension and demonstration effort. In the field of water and health a lesson can be drawn from these organisations.

6. RECOMMENDATIONS

6.1 In the Tharparkar desert area an investigation for the possibility of developing the old tarais and the creation of new ones through construction of small check dams should be undertaken. This investigation should cover both the technical aspect so as to determine the physical dimension of the problem, and the social aspects so that a motivation programme in the implementation of a maintenance component through community finance and participation can be developed. Various methods for preventing evaporation and increasing the retention capacity of the tarai are available and should be collected and studied for their suitability to the economic, social and climatic conditions in Tharparkar. The possibility of using hand pumps (horizontal displacement) from the tarai for drinking purposes should also be studied along with the various options available for making this water supply safe for drinking purposes.

To tackle the issue mentioned above a small pilot study should be contracted out. The study would consist of the following main components:

- literature study to short list low cost technologies appropriate to Tharparkar;
- social action research in 2 or 3 environmentally suitable sites;
- implementation and monitoring of the selected technologies.

6.2 The hand pumps developed by the UNICEF are superior to the ones being marketed in Sindh today as they will have a much longer life. The details of these designs should be made available, along with relevant literature explaining their advantages to the hand pump manufacturers and dealers. This effort will definitely lead to the popularization of better design and benefit the situation in Sindh much more than the installation programme. In addition, spares will then be available at all the dealers and no dependence on the RDD for their supply will be necessary.

6.3 A programme in the rural areas for motivating the people and/or landlords to install and maintain hand pumps at their own cost should be undertaken. This programme should explain both the health and economic advantages that a hand pump brings. To be effective the programme should have a aggressive advertising component and should also educate the people in modifying water collection, cartage and storage so as to help make water safe for drinking. A close link with the Health Department for this programme should be considered. The motivation/extension component will have to differ in sociologically different areas.

6.4 A criteria for choosing a community for hand pump installation should be developed so that pumps are installed free of cost only for the poorest, even if this is possible only in theory for the time being. The UNICEF should use its political clout to make the implementation of this criteria possible.

6.5 The UNICEF should give all possible aid to the RDA for setting up research, education and extension facilities

- for research purposes the UNICEF should aim at bringing the Academy into contact with similar research and development in other parts of the world. It should arrange for a regular supply of journals and publications for the library of the Academy. It may, at the request of the Academy, even provide research personnel to the Academy in the initial period;
- for education purposes the UNICEF should help arrange selected instruction courses at its expense, help develop instruction literature and depute its expert staff to the education effort of the Academy on a temporary basis;
- for extension purposes the UNICEF can help in preparing films and other audio-visual aids (suitable for an illiterate population) for the RDD programmes. For this purpose the UNICEF should help to establish a audio-visual unit at the Academy. In addition, the UNICEF should continue to help develop the mobility of the RDA and RDD for extension purposes. Without suitable transport the programme cannot possibly succeed.
- the director of the Academy feels that a pilot project with all the components of the proposed programme should be developed in a village near Tando Jam by the Academy. This village could then serve as a demonstration area for other villages. UNICEF should consider to assist by providing

technical assistance and necessary hardware to compliment the Academy's effort.

UNICEF WATER ASSESSMENT FOR PAKISTAN

April 1986

Contents

I. SUMMARY OF FIELD TRIP REPORT FOR NWFP

1. GOVERNMENT INSTITUTIONS

P and D:

In future UNICEF can be associated with the department at the planning stage so as to be an advocate and promoter of appropriate technologies. So far the UNICEF has been a supplier of materials for the line department project.

PHED:

PHED is an organisation of physical engineering only. The result is that communities have remained passive inspite of massive water schemes. In addition, the PHED schemes have created problems of maintenance and operation and in some cases ecological problems. If these are to be resolved and the water programme is to be used for mobilisation and organisation of people. the PHED programme will have to be made compatible with the concept of community participation and as such compatible with the sociology and economics of the specific rural area it is meant for. For this, coordination with other line departments is a must. Has UNICEF a role in bringing about such a change - and how?

LG & RDD:

This organisation is tied to the political structure at district and village levels. Concept of community participation, self help, social research, monitoring are a part of the organisational structure. The later two are dormant, and inappropriate approach to the former two, in most cases, makes them unworkable. Revitalisation of social research and monitoring, initially related to specific projects in selected and socially different areas, can help develop models of participation. Where appropriate models do exist (Mansehra district), detailed documentation and analysis is essential so that the area can serve as a demonstration area for other similar projects. How can UNICEF assist in this programme?

Health Department:

The health department has no extension services. Even those which have been planned do not function. A host of sociological reasons related to the segregation of women, attitudes, beliefs and faith in the super-natural, make it difficult for the people to react to modern medical science and also make it impossible for the health department to get female medical staff. The department's emphasis is on curative medicine as opposed to preventive. The later has almost been given up in despair. The need is to develop extension services for preventive medicine that take into consideration the various social, economic and administrative constraints of both the provincial government and the specific communities we are working with. These extension services will have to be related to development work which mobilises communities. Initially as a test case it can be developed in a small area. What can UNICEF's role be in the effort?

District Plans:

The district plan structure offers an opportunity for all the above suggestions to be implemented. What is required is a study to see how this can be made possible and the role UNICEF can play in it. Small scale projects as test cases, seem the most likely area of UNICEF intervention.

2. COMMUNITIES

Three types of socio-economic areas were visited in NWFP.

a) Irrigated Areas (Karak)

- Land tenure: mixed feudal and peasant proprietorship.
- Comparative affluence. Break-up of feudal structure in progress. Society in transformation.
- Tractors, banks, fertilizer and pesticide agencies, schools with girls attending, exist in this area.
- Maintenance skills available.
- Extension of urban economy into the area has created a new class of independent farmers, commersants and traders.
- Signs are that they are an alternative leadership to the feudal - mullah alliance.

Need to understand and tap it.

b) Barani Lands of Erratic Rainfall (D.I. Khan)

- Land tenure: large feudal holdings. Also peasant proprietorship.
- Extreme poverty. Income levels as low as Rs 500 per year.
- Population may be migratory where water is insufficient.
- The feudal system is linked to the clan and to political representation. That means that the large feudal will also be the head of the clan, and the elected representative at the national, provincial and union council levels.
- Women completely segregated and girls normally not sent to school.
- Mullas and religious heads are the supporters of the system and so are the small traders and merchants who operate here.
- People have faith in holymen, shrines and mullas. They are approached when people fall ill and they cure through charms, prayers etc.
- System retrogressive and suppressive.

Need to build awareness through involving people in local level development.

c) Barani Lands of Regular Rainfall (Mansehra)

- Small land holdings. Independent peasant proprietorship.
- Earnings from land are small but as the communities are free from feudal control they seek work in urban centres, Middle East and even in the UK. This has been happening since 4 decades.
- People from here are motor mechanics, electricians, lathe machine operators etc., all over Pakistan.
- Village structure is democratic in nature and although religious leaders may be respected they do not, in the absence of feudal support, control the thinking of the communities.
- Possibility of women workers reaching the women and organising them is there.

- Because of the village structure, the system of local government, and its political arm, is viable and strong. People influence it even if they do not fully control it as yet.

Need to expedite peoples absolute control of the UCs - through appropriate projects? Extension?

3. RELATION BETWEEN WATER AND HEALTH

In the minds of the people the relationship between water and health does not exist. But piped water has effected the quality of life, for example:

- People bathe more often.
- Wash their utencils.
- Wear cleaner clothes.
- Can water their animals so they do they have to migrate to the river.
- Can use their original water source for agriculture.
- Can sell their animals which used to cart water and thus save on their maintenance.

There are also problem areas where water has been supplied.

- Drainage: larger stagnant pools around community tanks are a source of disease and guinea worms.
- House connections lead to the flooding of streets with waste water.
- Women do not like the piped water schemes as they restrict their movements.
- Systems fail at times and people have to go back to the original source of water.

4. SOCIAL ATTITUDES AND THEIR RELATIONSHIP TO HEALTH

- Water and/or the state of the physical environment is not seen as related to disease or to health.
- Animals and humans drink from the same water source in many cases.
- Piped water may not be considered 'sweet' and in which case it may only be used for animals, washing and cooking. The original contaminated source will be used for drinking.
- When people fall ill they go to a mulla, a holyman or an exorcist rather than to a doctor.
- People have their own traditional cures, for many diseases, which are based on superstition.

Possibility:

Three small projects in 3 sociologically different areas:

Social Research:

- Motivation/Monitoring/Modification/Education
- Development/Participation/Monitoring/Modification

II. FIELD TRIP REPORT FOR NWFP

1. GOVERNMENT INSTITUTIONS: Capacity and Capability

Various government agencies are involved in the planning and implementation of rural development in the NWFP. The offices of the relevant agencies were visited at the provincial and district levels by the team and talks were held with the officials incharge. Visits to the villages where these schemes had been or were to be implemented, were also made, and the reactions of the community and the operators, to these schemes were obtained. A precise of these discussions, with the opinions of the team, are given below.

1.1 The Planning and Development (P and D) Department

The P & D department is the overall planning agency for the province. Allocation of funds for various development schemes are made by the department from its budget under the relevant heads, against PC-Is submitted by line departments. The schemes for which these PC-Is are submitted were identified by the District Coordination Committee (DCC) of which the chairman district council was the chairman and district heads of the line department were among the members. However, this function has now been taken over by the District Development Advisory Committee (DDAC) which consists of local MPAs and MNAs as members.

Discussions were held with Mr. M.I. Baig, chief of health and education, and Mr. Jalil Mougal, chief of water. A number of important points emerged as a result of these discussions. The provincial government spends 7 to 9 percent of its total budget on developing water supply. A total coverage of 41 percent has been achieved so far. However, the development schemes have made use of most of the known subsoil water resources available for the type of sophisticated piped water schemes promoted by the PHED. If these schemes are to be expanded to the deprived areas, then the cost per capita for this development will be extremely high and the maintenance and operation aspects will be problematic, to say the least. It is essential therefore that alternative sources of water be discovered and technologically appropriate systems of tapping and delivering them be utilised. For this UNICEF's assistance can be most helpful in the planning stage. This nature of assistance has not been provided by the UNICEF to this department todate. UNICEF's future role in this context is seen as an advocate and promoter for appropriate technology as opposed to a supplier of materials for the PHED schemes.

Given the rapid growth of water coverage, the P & D's emphasis on water is also declining, and there will certainly be cuts in the water budget from next year. Emphasis will be more on sanitation and health.

1.2 PHED

The PHED is an organisation of professional engineers. The organisation plans and supervises the implementation of piped water schemes. It also operates and maintains these schemes for which it receives funds from the provincial government.

The PHED is concerned only with physical engineering and since it operates and maintains these schemes as well, it favours centrally controlled and operated systems. Its monitoring system, which is efficient, is also only concerned with physical issues, although the collected data can also be analysed in social terms. It has a research wing, headed by a senior research officer. This deals with identifying water sources from hydro-geological surveys carried out by WAPDA and the Irrigation department, and in testing the quality of water and geological strate during drilling operations. For this purpose the PHED has a PH engineering laboratory in Peshawar. The fact that the nature of survey required for irrigation schemes is very different from that required for small village water supply schemes has not been taken into account in the PHED planning.

The result of the PHED approach has been that:

- The community has not been involved in anyway in the selection planning and implementation of the scheme. Nor is it involved now with its operation and maintenance. As such the raising of awareness or the creation of an organisation around the water programme is non-existent. All that has happened is that the water source has shifted from a well or a pond to a community tank or a house connection, and may be the quality of water has improved. Water has not served as an entry point for any other programme.

- One tube well or water source developed by PHED now serves a number of villages. Many miles of the pipelines carry water to the tanks or houses in these villages. In many places, Latambar village for instance, where sufficient water was available from springs for the use of the village, the original source of water has fallen into disuse and goes to waste. The village is now served, along with other villages in the Karak district, from tube wells. The PHED carried out no study of the original water source of these villages to determine their suitability for a decentralised water supply scheme. It is worth noting here that one village, Mitha Khel, where almost every house has a well, has not requested for the water supply from the PHED system, although the water line passes a few hundred yards away from the village. The village has electricity and the people have mounted small pumps on their wells. Karak is in the salt range and the tapping of the rain water aquifer since 1973 for the PHED schemes, has also resulted in making many ancient irrigation wells in the district saline.

- The maintenance and operation of the PHED schemes pose enormous problems for the PHED. The only revenue generated for maintaining these schemes is by taxing the persons who have house connections. They pay Rs 20 per month. However, a large number of these houses do not pay their dues and the PHED is forced to take action against them. In addition, a large number of illegal connections have been taken from the pipelines thus denying water to the outer ends of the system. The PHED has initiated police cases against these illegal connections. It seems that a very large organisation will be needed to deal with these complex problems. Already the PHED spends Rs ___ per year, or Rs ___ per capita of population served, for maintenance purpose. Given the nature of the problems mentioned above, this expenditure will keep increasing.

In certain districts the PHED has already reached a coverage of 75 percent. Yet there are districts where coverage is as low as 21 to 23 percent. A different approach which can overcome the problems mentioned above, and prepare the communities to react positively to health and education programmes can be adopted for these districts. For this the PHED will have to integrate human engineering in its physical engineering programme.

The PHED's professional competence is impressive and there is no doubt that given finances it can take water to almost every corner of the province. 98 percent of all public water supply schemes in the province are carried out by it. However, the PHED engineers with whom we held discussions in Peshawar, Bannu, Karak and D.I. Khan, were all adamant that their approach was correct and it was the only way to guarantee a water supply system that works. The question is whether UNICEF can through advocacy bring about a change in PHED's thinking, and if so, how?

1.3 Local Government and Rural Development Department (LG & RDD)

In the structure of the LG & RDD the political structure and the government administrative structure interact at district and village level. This relationship makes it possible, in theory, to involve the people at village level in decision making, planning and implementation. The water schemes implemented by the department are also maintained by the UCs through community participation.

a) Local government

The district council is an independent organisation. It raises revenues through various taxes levied in the district. In D.I. Khan, the council generated Rs 7,300,000 last yea of which Rs 400,000 were spent on development. Of this Rs 880,000 were spent on water schemes. This sum was divided among 40 UCs. Each UC received Rs 48,500. The water schemes carried out by the UCs were mainly extensions to the existing PHED schemes. For these schemes PHED permission has been sought in some instances. The PHED engineers think that these extensions are destroying their systems and must be stopped.

In addition to these extensions, the UCs have constructed katcha ponds for rainwater collection. The chief

officer of the D.I. Khan district council is confident that the UCs can also run a handpump programme and maintain it through community finance and involvement.

The works carried out by the UCs are identified by the councils themselves, designed by the engineering wing of the local government at district level, and supervised by the sub-engineer at tehsil level.

Until recently the chairman district council was also the chairman of the DCC. The committee members included the heads of the district line departments. Schemes which the line departments were to carry out for the financial year were identified by this committee. This arrangement gave the district council the power of coordinating all development work in the district. This coordination, however, has never taken place in the districts visited by the team.

The district council's and administration's link with the projects carried out is of a supervisory nature only. Facilities for monitoring of projects, social analysis, and based on these, modifications in the procedure, or in future planning are non-existent. However, a planning officer has now been added to the district council structure. The relationship between the district council, the UC, the voluntary village organisations and the people is shown in Chart - 1. The nature of this relationship is not conducive to developing community involvement and awareness.

Chart - 2 shows a possible relationship which would make a change in the attitudes of the rural population possible and make them receptive to health and education programmes.

To achieve the results of Chart - 2, the UNICEF has promoted the district plans for Mansehra, D.I. Khan and Chitral. These are discussed later in the paper.

The district councils input into water is negligible as compared with that of the PHED. In D.I. Khan is 12 percent of the total district investment in water during the fiscal year 1985-86.

b) Rural Development Department (RDD)

The RDD implements the Rural Works Programme (RWP) which is funded by the provincial government. This development should, in theory, have a 15 to 20 percent self help component in it. This component is not here as the RDD has no motivational or community development programme. However, both these components are within the charter of the RDD. The only involvement RDD has with water is through the grant-in-aid given to the UCs through the assistant director LG & RDD at district level. This grant-in-aid is 18 percent of the RWP and of this 15 percent is spent on water schemes through the UCs.

		(Rs. in million)
-	Total RWP in province (1985-86)	: 58.919
-	Total grant-in-aid to UCs (1985-86)	: 38.847
-	15 percent of grant-in-aid (1985-86) spent on water supply	: 5.827

The RDD has a research, monitoring and evaluation wing under a director at the provincial level and its programmes can be linked for research, formulation and implementation with PARD as they used to be before, when the RDD was the village aid programme organisation, and even later when it was the IRDP.

At present the RDD is nothing more that an engineering organisation, like the PHED, which plans and executes small development projects. Yet in its structure it has the potential of taking on the role for which it was created - that is, to be an organisation of action oriented research, motivation, community and physical development. The organisational chart of the LG & RDD shows that is has considerable technical staff at the district and tehsil level. With this manpower, and the RDDs research and extension potential, the scope and nature of activities of this department can be developed considerably.

c) The District Plans

District plans with UNICEF's assistance and promotion, have been formulated for the districts of Chitral, D.I.

Khan and Mansehra. These plans were developed on a massive survey of the districts where the entire population, represented by its household heads gave its priority for development. Based on the figures of this 'felt need', elaborate plans for district development were drawn up. The team discussed the plans and the progress achieved so far with the concerned officials at the district level in D.I. Khan and Mansehra.

The district plans are very ambitious. The seek to establish among other things, community based services for children and women; womens development groups; training for out of school boys and womens community centres. These activities are to be initiated by the VDCs and the citizens committees, both voluntary bodies. Training for management and monitoring to the village project committees, to primary school teachers, TBAs, community health workers, form part of the plan. This training component for the Mansehra district has been completed fully, and for the D.I. Khan district is in progress.

However, none of the activities envisaged by the plan in D.I. Khan have so far taken off, though the plan period began in July 1985. In Mansehra, the plan which began in July 1982, has also failed completely in target terms, except for the water component. The 26 community health workers for instance, have disappeared without a trace and so have the trainers for women.

The reason for the failure of the plans is that the community was not ready to react positively to the programme as it is not compatible with its social and economic conditions. Nor is it compatible with the administrative structure of the district council, which is mainly administrative and supervisory. Although the survey did seek to motivate the population, it is doubtful if many understood fully the nature of the programmes being promoted. It is significant that the water programme in both cases is the only component on which the communities have been able to mobilize themselves, and in the case of Mansehra this mobilization has not necessarily taken place through the citizen's committees or the VDCs, but through village elders and activists.

In D.I. Khan, the communities in 3 cases have dug their tanks for rainwater collection and are waiting for UNICEF assistance which has been delayed considerably. In Mansehra, however, the communities have carried out 2,123 water projects as opposed to the 1,545 which were proposed by the plan. The reason is that each village can have an independent water source from a spring and the people have developed the skills of pipe jointing and laying. The demonstration effect has now taken over and villages are collecting money and installing the system without UC assistance. The same result to some extent can be achieved in D.I. Khan if some way of acquiring cheap water at the village level could be developed for this arid area. May be this can be an area of UNICEF's intervention.

The line departments have not followed the district plans while preparing their ADP, though these departments have participated and agreed to the plans.

To determine the nature of UNICEF's role in the future it it necessary to monitor the district plans and find out the real causes for this failures. Based on these results necessary modifications can be proposed to make the plans compatible with the sociology and economy of the communities on the one hand, and to lay the foundations of some changes in the structures and functioning of the LG & RDD on the other.

1.4 Health Department

The role of the department is mainly curative and from the figures of the D.I. Khan district budget, it seems that 78 percent of the budget is spent on salaries, rural health centres, hospitals and dispensaries.

From talks with the provincial and D.I. Khan district officials, a dismal picture emerges. This is further supported by interviews with the rural population at Latambar, Shabbirabad, Katta Khel, Wanda Yarik, Kari Shamozai, Bohar and Mansehra.

Basic Health Units (BHUs) in the province are supposed to have a female and male medical technician in their staff. However, only 20 percent of the posts for female medical technicians are occupied. It is the duty of the medical technicians at the BHU to train one male and one female CHW for every 1,000 persons. However, such training takes place on paper only and there is no monitoring system to find out if, when, and with what result this training has been done. Whenever an investigation has been carried out the trained CHW have been untraceable. Similarly the number of LHVs are well below the requirements set by the depart-ment and there is one LHV to every 15,000 persons in D.I. Khan district. This includes the urban population.

The Rural Health Centre (RHC), which is supposed to look after 4 BHUs is similarly understaffed. In 8 cases out of 10, a lady doctor is not available at the centre.

Both the BHU and the RHC are passive institutions. They sit and wait for people to come to them. The team visited villages like Bohar and Wanda Yarik in D.I. Khan where no EPI team had ever come for implementing its programme. In Kari Shamozai, an affluent village of 10,000 persons, with a supposed outreach of 30,000, only 5 persons visited the RHC per day and only 30 to 40 ORS packets were used per month.

It is argued by the department that even if the BHU and RHC were to have an extension programme the problem of logistics would have to be overcome and it would also necessitate the setting up of a proper monitoring organisation. Right now there is not even a centralised system for data collection and the BHU staff does not even have bicycle to make movement possible.

In addition to the Basic Health Services Programme, the department also has programmes for the control of communicable diseases, Malaria eradication, sanitary inspectors and sanitary patrols. All these are parallel organisations and do not interact with each other, although the more successful programmes such as the EPI can be used to promote the other components. There is no monitoring of data regarding any of the above mentioned programmes and it is not known as to whether they even function or not.

There is also no connection between the health department and the programmes of the other line departments. The only connection is with the education department and this is limited to supplying the high schools with literature regarding hygiene and health which no one there reads.

It is necessary that an evaluation of the health system is made keeping in view the level of development of the communities, the problem of the segregation of women, the relationship between the various departments of the health department, and especially the nature and modalities for the training of the para-medical staff. Only then can a more realistic structure, and may be a much less ambitious one, emerge.

1.5 Coordination Between Health, RDD, Education, PHED

There is no coordination between any of the line departments in the province. The PHED, the district councils, the RDD, carry out parallel programmes. The health and education departments have no relationship to these programmes whatsoever. The system of monitoring for these programmes, where it does exist, does not take into consideration sociological conditions or the change that occur in the communities as a result of these schemes. Very often, as in the case of the PHED, they do not even build on what exists, but destroy it. The district development plans in spite of their failures and shortcomings, do propose a structure within which such coordination can be promoted. For this to be successful, monitoring of the programmes, and modifications based on the monitoring results are essential. Only they can the relationship between health and water be promoted successfully at the village level.

The team feels that physical development, such as the building of an appropriate water supply system, that is socially acceptable and sustainable, can bring about changes which may prepare the community to receive and react to inputs from other line departments. The Mansehra district school building programme which has been taken over by the village community, is an example of change being initiated by an appropriate water supply system. That this take over would happen was not foreseen by the plan.

2. COMMUNITY CAPACITY AND CAPABILITY

2.1 Nature of Communities

The team visited the districts of Karak, D.I. Khan and Mansehra during its field visit to the NWFP. Three types of communities were identified during these visits. The type is related to the system of land tenure,

which in turn is related to the geography of the area and the availability of water for agriculture.

a) In the irrigated lands

The only irrigated lands visited by the team were in the Karak district. Irrigation here is from open wells mounted with pumps. Agriculture received a big boost after electricity came to the area 20 years ago as electric pumps could then be used for lifting water where previously the Persian wheel was used.

There are large land holdings in the area of upto 1,000 acres. However, the majority of the area is peasant priprietorship of holdings of below 3 acres. The large land holders have traditionally been the representatives of the people and have been looked upon to settle disputes and mobilise people for any development work. The small holdings of the peasants and low incomes have made a number of people leave for the cities and also to the Middle East. Many of these returned and purchased more land. They have also built new pucca houses away from the traditional village. These isolated houses are visible between Karak and Shabbirabad. This new class does not accept the traditional leadership of the area, and due to its new found affluence is playing an increasing role in the affairs of the village.

Other changes have also taken place. In the village structure, the blacksmith, the barber, the carpenter, the tanner, the potter and the dom (minstral), were not part of the clan system. They could not own land of even a house. For the services they rendered to the community they were looked after by the village. Now these artisans do own their own houses and many have purchased land.

This society is in a state of transformation from a feudal to a pre-industrial one, and the agents of change and development can only come from the new affluent classes. The development of agriculture has also brought in the fertilizer and pesticide agencies; tractors are visible everywhere and as such workshops and mechanics for their maintenance must also exist. There is evidence to show that these tractors are let out to peasant by the "tractor lords". Water for irrigation purposes can also be purchased from "water lords". Since the PHED system became operative the people have converted their drinking wells into irrigation ones.

At Shabbirabad, a town of 4,500, there are 3 banks, and according to the village population almost all children, girls and boys, go to school. However, preventive health services are almost non-existent in the area. In Latambar village there is even a shop belonging to a qualified chemist.

Keeping in view the picture painted above, the community seems to be ready to receive education and health inputs with a minimum of preparation for them. Involvement of women in programmes, and reaching some of them may also be possible. A more detailed study is necessary.

b) Barani lands: areas of erratic rainfall

In these areas there are large land holdings with tenant farmers working on them. Small peasant holdings also exist but as agriculture is on erratic rainfall only, the peasant population is extremely poor. Earnings can be as little as Rs 500 per year per family.

Power is vested in the bid landlords of the area and the influence of the religious leaders is considerable. As agriculture is dependent entirely on rains, people raise livestock, mainly goat and sheep. Bohar, a village of 4,000 in D.I. Khan, has an animal population of 20,000 which moves to the river in the drought period. It has no health facilities, preventive or curative, and only 50 male students attend school. However, there are at least 3 mosques. Clan organisations are strong and are linked in many cases to the village settlement pattern. For example, Bohar is a village of Jaats, and the head of the Jaat clan panchayat is also the main zamindar of the area. He is also a member of the UC. The artisanals classes in the village do not own land or houses.

The construction of the rainwater tank in the village was arranged by the zamindar and its yearly maintenance and cleaning is also organised by him. This tank caters to the needs of the village population and to their animals. Not more than 3 matkas are allowed per house per day from this pond. After the monsoon it dries up in 4 to 5 months. If there are no winter rains the population move in January. Otherwise, movement invariably takes place in April and the population returns in July after the first monsoon shower. There is no doubt that most of the villages in the barani area of erractic rainfall have similar social structures.

Kari Shamozai, a large village of 10,000 persons, also in D.I. Khan district, has a different economic set-up from Bohar. Although the area has large land holdings of upto 10,000 acres, the size of the village, the presence of government institutions for health and education, banks and a WAPDA lines man, have given some independence to the village population from the feudal system. The village has a number of merchants who do business with the towns, selling animals and buying cloth and other industrial goods for sale in the villages. However, such villages are few and far between, and it is doubtful whether their social attitudes are any different from those of the other villages in the area. It is important to note here that one of the main reasons for Shamozai's development is that the chief of the Istarana tribe lives here. He is important politically, is educated, and has taken an interest in the affairs of the village.

The traditional leadership of the landlord and the Imam, paternalistic in nature, is deeply entrenched. Women are segregated completely and there is no doubt that at this stage they cannot be involved in any programmes and cannot even be reached effectively. In these circumstances can the traditional leadership be an agent for change and that too of a change which will eat away at its power? A lady doctor working for the D.I. Khan district health department discreetly expressed her doubts about it.

c) Barani land: regular rainfall

The Mansehra district is a barani area where rainfall is regular. Apart from a few feudal holdings, the system of land tenure is peasant proprietorship. The land holdings are small and incomes from them low, but since the population is free from feudal controls they seek employment in urban centres in Pakistan, in the Middle East and in Europe. A large number of them join the army. This process has been continuing for the past 4 decades and has resulted in further consolidating an already democratic society at village level. In various parts of Pakistan motor mechanics, welders, lathe machine operators, electricians and plumbers come from this part of the country. Contact with the rest of the world, the fact that the areas is politically important and has received attention, and given its social structure which is free from the control of centralised retrogressive leadership, have all created an awareness which has made the local government system workable and viable. The positive reaction of the village communities to the water programme and the school building programme, are proofs of this awareness and organisational potential.

In these areas the local government and the political institutions themselves can be agents of change. As a matter of fact the change has already taken place in the minds of the community and needs only to be tapped and directed appropriately.

2.2 Relationship Between Water and Health

In the minds of the people of the area we visited, there is no relationship between water and health. Among the community leaders and the officials of the line departments (including the health department), if such as relationship does exist, it is of minor importance. The only exception to this was the chairman of the Mansehra district council, who was not only very clear on the subject, but also had plans for promoting this understanding in the villages. He fully appreciated the role of women in creating awareness of this relationship. However, regular water has made a difference to the quality of life in the villages (hence to the possibility of effecting health positively) and some of these differences are listed below.

a) People bathe more often and wash utencils

This was borne out by interviews at the Badaber refugee camp at Shabbirabad, at Samozai, at Kata Khel and at Mansehra. In all cases the population spoken to said that bathing and the regular washing of utencils was a low priority before the water system became operative. An Mansehra the district officer, Mr. Bahadur Shah explained to us that bazaar in the small town and large villages used to be called Kala (black) Bazaars, because the people were dirty themselves and wore dirty clothes. They bathed only once in winter, and once in 2 weeks in summer. Women bathed even less. This has now changed.

b) Livestock, water and other services

Since the PHED water schemes became operative in Mehrabi and Kari Samozai, people do not take their animals to the river during the yearly drought period. The original water sources, augmented by the PHED schemes are enough for their requirements. Since they have now become settled populations, they can think in terms of education for their children and of developing commerce and trade. It is doubtful if there

would have been operative schools, health centres with EPI programmes, and a business class in Samozai, if the population had remained migratory.

c) Agriculture

After the installation of water schemes, in certain cases, the old water source has been utilised for developing agriculture. This is especially true of the Karak district. The result has been an increase for some areas in income levels.

d) Transportation of water

To cart water from long distances people used animals, mainly donkeys and camels. The camel was also used for ploughing purposes whereas the donkey was entirely a "beast of burden". Since the water schemes came into being, many people have sold their animals if the community tank is not too far away from their homes. They thus save on the maintenance cost of these animals. Others who used to pay professional carriers for transportation of water, also make a saving. People find it cheaper to hire a tractor for ploughing their land (interview Shabbirabad) than maintaining a camel. As such a camel who does not carry water can be considered redundant. Maintenance of a donkey is about Rs 60 to Rs 80 per month, and that of a camel about Rs 250.

2.3 Problems That Water Creates

However, there are problems associated with the water supply schemes. These are listed below.

a) Drainage

The water supply schemes, especially where community tanks with taps have been installed, generate a lot of waste water. In many cases this forms a large pool near the community tank. In Mehrabi, the population stands in this stagnant water, which is used by animals for drinking, and fills their utencils. In such cases the guinea warm problem must certainly exist. Similarly waste water from house connections collect in the lanes. To over-come this problem the PHED has taken to providing underground tanks from which water is drawn out with a rope and bucket. This system, however, leads to the contamination of the water in the tank by the insertion of unclean utencils.

In Mansehra, the district council, to tackle the waste water problem has initiated a scheme of paving the streets and making open surface drains on either side of them. These will in the long run create the following problems.

- All waste water will flow into the mountain streams and river lets, which are also a source of drinking water for other villages.

- It will not be possible to stop people from connecting their flush toilets in the future to these drains.

b) Womens complaint

The women are against the water supply schemes, especially the ones where house connections are given. All the people, leaders and officials are of this view, and it is a source of great amusement to them. Whereas before women went out to fetch water from long distances, now their activities are restricted to the neighbourhood, and in many cases to the home. Movement, social interaction with others, and a visual contact with the environment have all been curtailed. It is important to ask as to what effect these restrictions have on the health of women and on their immediate environment, their homes and their children?

c) Failures of PHED system

At the village of Katta Khel the PHED has installed a water supply system. However, the people have maintained their old rainwater tanks for the use of their animals. Every summer, the PHED fails to supply sufficient water and the people have to go to Mehrabi, 8 hours away on camel back to fetch water. They also use water from their old water tanks. However, the do not migrate anymore as they used to with their animals.

2.4 Attitudes and Their Relation to Health

- Water or the state of the physical environment is not seen by the communities as related to disease or health. There-fore, water collection is done in dirty contaminated utencils and carried by animals whose excreta litters the areas around the PHED water tanks. Large pools of stagnant water, from which animals drink, surround many PHED storage tanks.

- In areas where rainwater collection pools have been constructed, the catchment areas are often littered with animal excreta as they are grazing grounds for the animals. The pools are fairly deep, and if covered, no sunlight reaches them. They end up by being animal infested tanks. Very often animals also drink from them.

- In some cases people are used to drinking rainwater, which they consider to be "sweet". Subsoil water may not be considered "sweet". Therefore, in Kari Samozai, where there is a PHED water supply scheme with over 600 house connections, drinking water is still obtained from the rain-water pond and carried to the houses by the women. The PHED water is used only for washing and cooking and for animal consumption. This is inspsite of the fact that the pool is contaminated with animal excreta and is filthy. Of the 14 boys gathered at the pool 3 had guinea worms.

The village population says that the PHED water causes diarrhea and so they do not wish to use it. Dr. Abdul Rauf of the RHC at Samozai says that he also had the same complaint when he began his service in the village. After 2 months he got used to the water and now drinks it without any side effects.

Mr. Aziz, PHED executive engineer in D.I. Khan, says that the water at Samozai being bad for health is a myth fabricated by women so that they can continue to get water from the pond. Mr. Aziz is very serious when he says this.

- When people fall ill they usually go to the village mulla for treatment. He prescribes charms, special prayers, and at times even pennance. In certain cases he may feel that the patient has been taken over by a "Jinn", in which case he acts as an exorcist. Visits to the shrines of holymen and offerings to them are common. It is only after all these have failed that the patient is brought to a health centre. If the parient is a woman, it is unlikely that she will be brought at all, and a male member might consult with the doctor explaining the symptoms and receiving directions for her cure. The above holds less true for areas like Mansehra where peasant proprietorship coupled with strong urban influences exist.

- There are many traditional treatments and taboos for various diseases. For example, during measles no bathing is permitted and an injection is strongly forbidden. The patient must not be exposed to light either. These attitudes conflict with medical treatment, and doctors like Abdul Rauf at Samozai are incapable of convincing the people that their centuries old beliefs are incorrect.

- The EPI programme is the most successful extension programme of the health department. Although villagers do get their children to take the first shot they seldom come for the second, if as a result of the vaccination the child catches fever or has a reaction. An understanding of the reasons for the reaction are not known and are not communicated to the people.

- The segregation of women in most areas of the NWFP is very severe. The only way of reaching a woman is through her male family members through proxy. Even urban women cannot reach them easily as they are considered a bad influence on their rural sisters. This nature of the segregation makes it difficult for the existing health services to function. Women in rural areas do not come forward to be trained as LHVs or CHWs. They find it difficult to attend MT courses away from home. As doctors they do not wish to be posted at the RHCs. They are not willing to be school teachers in rural areas.

- The hold of tradition is so strong that in Kari Samozai the team members were required to cover their heads in deference to a local tradition. Per Engebeck did not oblige and so Mohammad Zareef Khan, a local dacoit, seriously considered kidnapping him, feeling that Per's failure to comply with the tradition was justification enough to kidnap him.

2.5 Conclusions

a) In the barani lands of erratic rainfall: D.I. Khan district

- The people are extremely poor and in many villages cannot afford to pay even Rs 20 per month for house connections to the PHED.
- They are completely under the influence of their landlords, mullas and chiefs.
- The new class of merchants and traders instead of offering an alternative leadership to the old, are supporters of the existing system.
- Women are completely segregated and no possibility of reaching them seems available.
- Change can only brought about by involving people in development. This development has to be the result of action oriented social research on a small scale, which can be expanded upon later.

b) In the barani areas of regular rainfall: Mansehra district

- People are aware and have higher income levels than D.I. Khan. Artisanal skills are available.
- Communities are independent and although deference is given to the religious leadership, they do not govern the lives of the people.
- There is a possibility of establishing contact with women through women workers.
- Conditions for change are already there and need to be assessed and promoted. The communities can also participate in financing development. What is needed is motivation, technical assistance, supply of tools and monitoring of results. Motivation too many become unnecessary once the demonstration effect takes over.

c) The irrigated lands: Karak district

The area is in a state of change. Further study is required to develop a proper understanding of the situation.

/Israr Rana/

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