5002

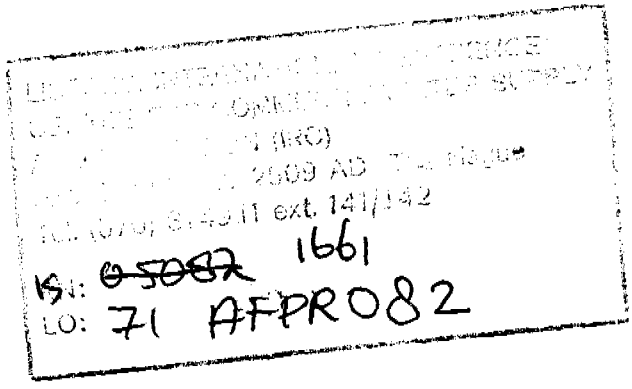
# Drilling Agencies in Voluntary Sector

**AFPRO**

5082

# Meeting of the Drilling Agencies in the Voluntary Sector

## Relevance of Voluntary Agencies in Water Resources Development




Aurangabad

3rd to 5th August 1982

# CONTENTS

## A Summary of the Proceedings

INTRODUCTION

The Meeting of the Drilling Agencies in the Voluntary Sector held in Hyderabad, during July 22-23, 1981, had concluded with the general agreement that the next meeting would be held during 3-5 August, 1982, at Poona, and AFARM Poona had agreed to host this meeting. In keeping with this, AFARM and AFPRO New Delhi jointly hosted the meeting in August 1982, at Aurangabad. To broaden the specturm of Water Resources Development Agencies, it was also decided to include such voluntary agencies as those are active in the field of Water Resources Development apart from conventional drilling agencies who originally initiated this forrum.

Inaugural Session :

In his welcome address, Dr.S.T.Gujar, Chairman, AFARM, raised some of the basic issues needing debate - the question of survival of voluntary agencies involved in drilling in the present-day context, the efficient use of equipment, and the need to share experiences.

Mr. J.B.Singh, Executive Director, AFPRO, in his Keynote Address, expressed his concern about the extent of awareness among voluntary agencies to the larger social issues that affect the implementation, costs and effects of a drilling programme in the overall context of Water Resources Development programme. He particularly stressed upon the need to give a second thought to the nature of equipment presently in use, its capability and utility vis-a-vis its age, condition and the financial capacity of a common Indian farmer to utilise the service.

Review of the Proceedings of the Last Meeting :

Mr. D.K.Fouzdar (AFPRO New Delhi) in his presentation at this session, briefly reported on the action taken on the salient issues of the last meeting, namely, creation of an Association of Voluntary Agencies in Water Well Drilling, Driller's Journal, Drillers' Training School, and Slow Drilling Rigs.

The last point, slow drilling rigs, generated a lot of discussion. Though a number of divergent points of view were stated, it was generally agreed that slow drilling rigs did have their place in tube well drilling, so long as their limitations were recognised

Relevance of Voluntary Agencies in Water Resources Development :

The topic of this session was not new, but nonetheless, it had always been of interest, whenever it had come up in the past. It was true for this meeting also.

Col. Verma opened the topic with his paper "Relevance of Voluntary Agencies in Water Resources Development". It documented the history of involvement and contribution of the voluntary agencies in the field of water resources development. The clousre of a number of projects in voluntary sector had made the question of relevance even more acute.

However, if voluntary agencies were not willing to accept that their role was far greater than merely drilling a hole in the ground, then there was no question about the need for voluntary agencies in this field. The voluntary agencies should therefore free themselves from this technological fix and concentrate on Water Resources Development rather than on drilling. Col. Verma went on to outline some of the possible steps that a voluntary agency might take if it were still to remain "relevant" and even become pioneers, as in the late 60s.

Mr. Kathuria's presentation in this session, "Future of Drilling Agencies in the Voluntary Sector' tackled the question of relevance more directly. He outlined the major differences between the voluntary agency and the private rig owner, and so arrived at points of basic policy which would give the voluntary agencies an advantage in this field, and yet be in complete harmony with its fundamental aims.

Mr. Fouzdar's paper, "Water Well Technology - a Cycle Shop Concept for the Drinking Water & Sanitation Decade", pointed out an aspect of drilling that voluntary agencies have tended to ignore - Slow Drilling Devices. Rather than operate sophisticated rigs, with their inherent technical and managerial problems, Mr. Fouzdar proposed a decentralised, low-cost and low-technology approach to supply of drinking water to rural areas by tube well drilling.

In the discussions that followed these three presentations, it was agreed that the voluntary agencies still had a vital role to play in tube well drilling, especially if supply of water was to be understood in all its facets. This would imply a broadening of the activities of the voluntary agencies, so as to be able to offer all the aspects of work - investigation and exploration; drilling; development; yield testing, quality testing; advice, installation and maintenance of lifting devices, distribution & utilization and most importantly water conservation and management of both ground water and surface water.

Mr. Fouzdar's paper could not obtain a consensus of the participants. One view point was that slow drilling devices were more appropriate to our needs in terms

of costs and technology, while this was opposed with the feeling that slow drilling devices have serious limitations, and were not really cheaper in terms of drilling charges.

Organisational set-up in the Voluntary Section for Water Resources Development :

As a follow-up of the last meeting at Hyderabad, this topic was discussed again at Aurangabad.

Mr. Joshi's paper outlined the need and function of an Association.

A special session, convened later, followed up on this paper, where concrete steps were drawn to bring about the formation of the National Association for Water Resources Development. A Steering Committee was chosen, and given the authority to take steps to bring about the legal creation of the Association.

The two other papers presented in this session were :

" New Role of AFPRO - GITS in the Field of Integrated Rural Development" by Mr. K.M.Namboodiri, and " Selection of a Water Well Site" by Mr.Moitra.

Mr. Namboodiri's paper proposed that AFPRO - GITs, who have so far only been investigative and consultancy teams, become functional in tube well drilling, by operating drilling rigs. This proposal was based on two shortcomings felt by Mr. Namboodiri. Firstly, some GITs were located in areas where there are no voluntary agencies involved in drilling, and so the end point of an investigation was not seen. Secondly GITs were not getting regular feed back of field results, where there were voluntary agencies. By becoming operational, GITs would also have the advantage of becoming more comprehensive in their services.

Mr. M.K.Moitra s paper emphasised the need for scientific well siting, and the need for coordination between all the agencies involved in the production of ground water.

The discussion on these two papers generally revolved around the pros and cons of GITs operation. There was no disagreement on the need for coordination between the agencies in all the phases of ground water exploitation.

Economics of Water Well Drilling :

This session considered two papers, one entitled " Economics of Drilling" by Mr. Kathuria, and the second, " An Overview - Hydrofracturing Technique & its effectiveness in Indian Conditions" .

Mr. Kathuria's paper initially dealt with the parameters to be taken into consideration and the basic principle of calculating cost of operation of a drilling rig. His

His thesis was that the final costs of drilling should be calculated on the basis of unit depth rather than unit time. With quantative data, he was able to show that the cost of drilling did not vary very much, when calculated on a footage basis, but showed substantial variation when calculated on the basis of time. This paper created substantial interest among the participants and the discussions covered topics like idle time, quality of staff, operating with staff, incentives as against, over working the machine and quality of work.

As the name suggests, Mr. Changan's presentation was an over view of a new technique of salvaging failed wells. The reclaimation method employs water at high pressure injected into a packed well so as to create fractures which hopefully will bring water into the unsuccessful well from near by water bearing areas. The document on which Mr. Changan's paper was prepared indicated a fair degree of success where this technique has been tried. Unfortunately, no information on hydro-fractures in the hard rock condition in India are known. This paper evoked interest especially since number of participants had attempted using explosives to increase yields of poor tube wells and had come up with inconsistent results.

Social Engineering

In this session Col. Verma, Mrs. Nalini Singh, and Mr.A.P.Fernandez were the speakers. Col. Verma s point of view was that technical solutions to problems of development needed to take social parameters into its consideration in the design of the development project.

If this was not done then it was very likely that the benefits of the developmental efforts would not accrue to the beneficiary for whom it was intended.

Mrs. Singh endorsed the above point of view and went on to say that even in highly technical programmes like drinking water supply by tube well drilling, the community, and especially the women needed to be consulted prior to drilling of the tube well.

Mr. Fernandez applied this question to the nature of aid agencies where some agencies were satisfied by making a donation, others wanted an accounting of physical achievements and the third type of an agency who also asked for an assessment on the social changes that their aid had brought about.

There was a general agreement that voluntary agencies could not afford to ignore the social implications of their work. The 2nd point of view was that though social responsibility could not be ignored it was often difficult for voluntary agencies to involve themselves deeply into such questions because such involvement had implication much deeper than the successful solution of a technical problem.

Concluding Session :

On behalf of AFARM Dr. Gujar called a conclusion to the meeting with a brief summary of the major issues discussed and raised questions which would need further deliberations at a later date. Col. Verma on behalf of AFPRO felt that the voluntary agencies were much stronger now especially with the decision to form the National Association for Water Development Agencies.

The body took the decision to reconvene for its next meeting on 3rd to 5th Aug. 83 at Bangalore. Mr. J. N. Kathuria invited the next meeting at Bangalore on behalf of the voluntary agencies of Karnataka.

## WELCOME ADDRESS

(By Dr. S.T.Gujar, Secretary, Maharashtra Arogya Mandal, Chairman, AFARM, Poona)

In the capacity of Chairman of AFARM, Dr.S.T.Gujar welcomed all the participants to the meeting. He felt that where as voluntary agencies had played a pioneering role in the initiation of water resources development through tube well drilling, today, a large number of voluntary organizations in this field were defunct, or finding it extremely difficult to maintain their organizations. A lack of consistancy in overall water resources planning was resulting in inefficient utilization of equipment, because of which a plan of deployment and maintenance of equipment was becoming difficult to formulate.

However, the use of rigs was a vital issue, since they are here to stay, and since the use of voluntary organisations is not only in droughts, but for long term development objectives also. The quality of managerial capabilities in voluntary organisations was also a factor contributing to the problems faced by voluntary organisations.

The sharing of experiences with one another was important reason for coming to such meetings, since this broadened the common knowledge and information base in the voluntary sector.

## Keynote Address

J.B. SINGH, EXECUTIVE DIRECTOR, AFPRO, NEW DELHI

Friends,

1. Last year in July we met at Hyderabad after a lapse of seven years. This time we are meeting after a year. In fact, at Hyderabad itself, we had decided to meet in Maharashtra and Dr. S.T.Gujar had very kindly agreed to organise this meeting. We are, therefore, grateful to him and to his colleagues to have provided us the opportunity to come together and to discuss the matters of common interest. These meetings once a year, have a special purpose for AFPRO and for you as well. By this get together, we are able to review our approaches, methodologies and to exchange experiences. As we all know, approaches, methodologies, experiences are never static. Changes do occur from time to time. Similarly, changes do take place in our attitudes and behaviour. Thus, such meetings give us a chance to look back at what we have been doing individually and to decide as to what is to be done in future.

2. The composition of participants in last year's meeting was rather limited. We had AFPRO Senior Specialists on the first day, AFPRO related drilling agencies and the representatives of selected manufacturers of drilling rigs and components joined us on second and third day respectively. This time, we belonging to various fields are meeting from the first day; from the very start.

3. Friends, as you all know, Indian agriculture continues to be a gamble with monsoon, despite impressive expansion of irrigation facilities. Only a few days back we feared of large scale drought because of late onset of monsoon. The situation has since improved somewhat, but we cannot deny that the rains have so far been sporadic and in many areas scarce and scanty. May be in a day or two, while we are in session here, the Indian Parliament will be discussing the damages caused due to scanty rainfall in the country.

What I have said is just to stress the need and importance of drilling agencies because of our <u>almost</u> total dependence on Rain God.

4. The pendulum of prestige, need and demand for, the services of drilling agencies swing very fast forward and backward. With failure of monsoon, there is a lot of hue and cry and a spurt in drilling work. With onset of good monsoon the pendulum swings back and demand diminishes. In one case it becomes relief work of an expanded nature, in the second case it is a long term development work. This forward and backward swing of drilling work is not only in terms of

time alone . It is so in terms of areas as well. This means that drilling work may be needed badly in one area whereas the same kind of need may not be felt in another area. These occasional swings in drilling work raises two major problems for agencies engaged in drilling work. These are :

i) The resources in terms of manpower, equipment and funds being limited, how can the sudden demand for large scale drilling work be met on an urgent basis when such needs arise.

ii) The resources in terms of manpower, equipments and funds created over a time, being almost fixed, how can the reduction in drilling work be made when urgency is not felt and slackness in demand occurs.

5. The problems of fluctuating demands of work, I have mentioned are basically management problems and problems connected with business adjustments with time and demand . Here, I would like to raise a few questions :

Can we solve these problems? If yes, what ways and means have to be used? Can we think of diversification of our activities in such a manner that business adjustments required of us could be made expeditiously and efficiently?

In this connection we have to consider whether solutions can be found out by working singly or jointly. If working together is imperative, then what procedure should be followed for coordinated action?

6. Most of drilling agencies attempt to work on 'No profit no-loss basis". We have to consider this principle rather seriously. If we adhere to "No profit no loss principle", we have to examine whether or not we can compete with Government owned drilling outfits, which are heavily subsidised or with private drillers who have tremendous flexibility to balance losses in one situation with gains from others.

7. Many times it is said that drilling charges collected by the voluntary agencies are almost the same as charged by the Government Departments or private drillers. Then what is special about drilling agencies in voluntary sector? My answers to critics of drilling agencies in voluntary sector have been as under :

a) Voluntary drilling agencies work in areas where there is no money because, the motive is not to make money but to serve the people.

b) Voluntary drilling agencies, because of their orientation and perhaps

ideology, tend to lay more emphasis on social responsibility rather than business gains.

c) Voluntary drilling agencies give premium to works benefitting the community more than helping an individual to gain economic power.

d) Most of the agencies do provide, follow up services after construction and installation of pumps.

e) The drilling agencies in voluntary sector help to maintain drilling charges at reasonable level and do better quality jobs.

8. I would like you to consider these points and do some kind of self-evaluation and heart-searching. The questions I would like to raise here are :

i) Do we have enough data to show that we are alive to our social responsibilities and are not commercially oriented as might be the case with private drillers.

ii) Can we say for sure that drilling work we do benefits the poor or we do drilling for those who can pay better.

iii) Do we really take care of the wells and pumps in terms of their maintenance and repair after the drilling job has been done.

iv) Do we make deliberate attempts to organise and train community for maintenance and repair of wells/pumps or we leave it to Government functionaries to manage the drilling works completed.

9. Finally, I would turn to the drilling rigs, supporting equipments and tools we have been working with so far. Some of the machines and equipments were imported long time back. For quite sometime spare part support had been provided. The fact, however, remains, that the machinary is wearing out and sooner or later they will be obsolete. We have to think together as to what should be done to maintain the machinary in working order for a longer period and what should be done to dispose off those which are already worn out and no longer required? Can we not think of replacing worn out parts in the imported machines with parts available or specially made locally? Can the indigeous manufacturers of drilling rigs think of examining the worn out machinery and suggest their commercial reconditioning?

10. Friends, some of the questions that I have raised are stray thoughts. I look forward to your free and frank discussions and suggestions for possible future action by all of us - Scientists, Technologists, Social Workers and those having deep concern for poor and in their development.

## Review of Proceedings of the Last Meeting at Hyderabad-July 1981

| | |
|---|---|
| Chairman | Mr.T.Radhakrishnan, WDS, Hyderabad. |
| Speaker | Mr.D.K.Fouzdar, AFPRO, New Delhi. |
| Rapporteur | Mr.V.G.Joshi, ELC WDP, Betul. |

Mr. D.K.Fouzdar presented a general report and a resume of the proceedings of the meeting of Drilling Agencies in the Voluntary Sector held at Hyderabad during 22nd & 23rd July 1981. During the presentation, the main subjects of discussions, the conclusion and recommendations of the last meeting were highlighted. A report on the follow-up action taken by the AFPRO to promote the recommendations of the last meeting, was as follows :

1) Association of Voluntary Agencies involved in Water Well Drilling :

No steps had been taken to form the Association.

2) Drillers Journal : The publication of such a journal was supported mainly by AFPRO. However, due to various problems like, status of the journal, funds for publication, responsibility of editing and officiating such a publication, the publication of the journal could not be started.

3) Formation of Drillers Training School : It was reported that the efforts were being made to start such a training programme with the help of Skill for Progress (SKIP), Bangalore.

4) Slow Drilling Rigs : AFPRO was trying to motivate local fabricators to manufacture such a rig.

Discussion :-

Although many subjects were put forward for discussion by the speaker, the delegates mainly discussed the topics of slow drilling rigs.

- One major point of view was in favour of slow drilling rigs, specifically Calyx drills. The advantages of this machine were pointed out to be its simple operation and maintenance, low drilling cost (Rs.20.00 to Rs.30.00 per ft.), and applicability for shallow holes in not-so-hard rock formation, and collapsing formations. The slower drilling speed of the Calyx drills could be off-set by increasing their number , and the cost factor was a major consideration for clients. These points were put forth by Dr.B.B.Choudhry (Indore), Mr.R.N.Rakshit (Bombay), Dr. V.K.Dixit (Varanasi), Mr.K.M.Namboodiri (Coimbatore).

- A different point of view, put forth by Mr.D.Ray Choudhry (Calcutta) and Dr.S.T.Gujar (Poona), was that the complex operation, maintenance and

non availability of spares makes the Calyx preferable to the D T H machine, and that the use of a Calyx was justified from a socio-economic point of view considering its comparatively low capital & operating costs.

The position in favour of D T H rigs, stated by Mr. Abraham (Betul), was that D T H rigs have definite advantages over that of Calyx machines. Usually the lack of trained personnel affect a D T H rigs performance, much more than the rigs inherent drawbacks. Also, the Calyx operators work at drilling fees equal to that of D T H rigs, and have been known to charge more than D T H rigs rates for working in areas inaccessible to D T H machines.

Mr. J.B.Singh (Delhi), Col. B.L.Verma (Delhi), Mr.T.K.Mathew (Delhi) & Mr.T.Radhakrishnan (Hyderabad) were of the opinion that both Calyx and D T H machines had their own place in water well drilling. Firstly, the client seeking a tube well needs access to information so that his work is done by the right kind of machine. Secondly, the voluntary agencies obtained their machines when time was of utmost importance, i.e. during droughts and scarcities. Lastly, it might be worthwhile, in the present context, for the voluntary agencies to consider operating both fast & slow drilling rigs to meet their clients' requirements, and support such activities with facilities of well developing, yield testing and other technical guidance.

Rapporteur's Comments :-

Although many subjects were brought up by Mr. Fouzdar for discussion, the Calyx drilling carried the day. The participants contributed richly on the subject. The main points that were put forward were :

1) Calyx drill offers cheaper alternative to costly D T H rigs.
2) Trained hands are not required to operate this rig.
3) The rig can reach remote villages.
4) The rig can handle difficult drilling condition.
5) If put into operation in large numbers, Calyx rigs can produce equally large number of bore holes.

Let us now consider these statements in the light of present conditions : India is one of the signatories of the International Drinking Water & Sanitation Decade. We are committed to solve this problem during the 1990s. We have been on this programme for over a decade. What is the net result of over a decade's work?

The number of problem villages has not gone down but has increased during the last decade.

Time may not be of importance to us since we already have access to our requirement of clean water. But why should others keep waiting for their share of "Gangajal" till doom's day. Those forwarding the cause of the slow drilling rig for socio-economic reasons, are probably aware that thousands of people in this country die every year because they are not provided with their share of clean water and will keep dying till they are not provided with clean water. What kind of social justice is this?

As regards difficult drilling conditions like thick overburden, with little modification of drilling techniques, the same D T H rigs can overcome such problems. On the otherhand, the Calyx drill contractor will be unwilling to undertake such jobs at nominal rates, when drilling conditions are as bad as that.

It is not true that truck mounted rigs can not go in remote areas. The small truck mounted D T H rigs can reach any where, where the bullock carts can go, provided the desire is there to help people in distress.

No drill can handle each and every drilling problem. Every rig is made with specific job requirements in mind. Every rig has its own advantages and disadvantages. What one has to do, is to select a proper rig to suit particular drilling condition. The drilling of a bore is much more than a hole in the ground. It is the process of constructing a hydraulic structure, to which water must flow in with least resistance.

So friends, let us not discuss this subject of slow and fast rigs. Let us put to end this subject of the most super rig and discuss something more serious, more important than this, which will help us to solve the real problems. If a Calyx rig can solve the problem then use it. If something more sophisticated is needed to solve the water problem then get it and use it to solve the problem, instead of getting involved in appropriate technology. The appropriate technology is mostly a theory. In practice, it is miles away from the goals we want to reach.

## REPORT ON THE FIRST WORKING SESSION :

## 'Relevance of Voluntary Agencies in Water Resources Development'

| | | |
|---|---|---|
| Chairman | : | Fr. A.L.Fonseca, MPSM, Nasik. |
| Speakers | : | Col. B.L.Verma, AFPRO, New Delhi |
| | | Mr. J.N.Kathuria, Omaga/Swissteco, Hubli. |
| | | Mr. D.K.Fouzdar, AFPRO, New Delhi. |
| Rapporteurs | : | Mr. V.K.Sardana, AFPRO, New Delhi. |
| | | Mr. T.Radhakrishnan, WDS, Hyderabad. |

## Rapporteurs Note

The session dealt with the following three papers :

1) Relevance of Voluntary Agencies in Water Resources Development by Col. B.L.Verma (Retd.), AFPRO.

2) Future of Drilling Agencies in the Voluntary Sector - by Mr.J.N.Kathuria, Omega/Swissteco Drilling, Hubli.

3) Waterwell Technology in India - A Cycle Shop Concept for the Drinking Water and Sanitation Decade, by Mr.Dilip Fouzdar, AFPRO.

The first two papers directly dealt with the question of the relevance of voluntary agencies in water resources development, by posing the question, whether 'To be or Not To be'

Relevance of Drilling Agencies in the Voluntary Sector, by Col. B.L.Verma :

- Col.Verma, in his presentation, first sketched the history of drilling agencies where he outlined the pioneering and catalytic role played by the drilling agencies in the voluntary sector during 1966/1967, with an emphasis on 'social engineering' aspects, by fulfilling the felt needs of the target groups through provision of drinking water by drilling with fast rigs and installation of deep well hand pumps.

He pointed out that the voluntary agencies started asking themselves the question of revevance, right from 1969 onwards. However, the answer to this had been side tracked in each and every meeting and he appealed to the participants that now we had to face this question rather seriously and try to find an honest answer, particularly since some of the drilling agencies in the voluntary sector had already closed down and others were finding it difficult to survive due to the growing competition being faced from private drilling agencies. He further said that we should not feel shy in answering this question, since voluntary agencies in other fields such as health, education etc. were also addressing themselves to this question of relevance.

Tracing the causes for closing down of some of the drilling agencies, Col.Verma mentioned that many agencies were forgetting their role of being pioneers, catalysts and service agencies, but trying to find an answer for survival in the

business of drilling. He said that, in his opinion, voluntary agencies have relevance in water resources development today and will always have this, since water is a 'driver' for everything. This however, does not necessarily mean relevance only in the field of drilling of wells, and the answer may be in the following :

a) Our willingness to accept the challenge to meet the changing needs and opportunities;

b) flexibility to gear to the new requirements;

c) retain our pioneering spirit by offering a package of services;

d) act as a catalyst;

e) re-organise ourselves to serve in emergencies, such as drought and other natural calamities.

Future of Drilling Agencies in the Voluntary Sector, by Mr.J.N.Kathuria :

Mr.Kathuria presenting his paper on the 'Future of Drilling Agencies in the Voluntary Sector, answered the question of 'To be or Not To be' by quoting an unknown contributor to the Water Well Jounal, "It is better to drill a well than to build a monument .....". Expressing his optimism, Mr. Kathuria said that the drilling agencies in the voluntary sector definitely have a future. The problems generally being faced by the drilling agencies are due to lack of co-ordination which results in idle time, higher operating costs, wastage of finances, manpower etc. Further, with the cost of rigs, fuel, spares, salaries etc. going up and up, it is inevitable that the cost of drilling has to go up also. However, drilling agencies in the voluntary sector owe it to themselves and the people they aim to work for, to :

1) Make all efforts to bring costs down.
2) Produce as much as possible in as short a time as possible.
3) Not accept or expect to be paid the same rates as commercial agencies.
4) Broaden their horizons and help educate beneficiaries and all concerned, about ground water, its exploitation and management.
5) Stress the importance and value of time.

Mr.Kathuria expressed the need for an Association of Drilling Agencies in the voluntary sector for co-ordinating the efforts of member agencies, undertaking liaison activities with the manufacturers and suppliers for ensuring ready availability of spares etc. and with the Government to persuade them to exempt rigs,

spares and supplies from levy of excise duty, sales tax etc.

For bringing borewells within the reach of small/marginal farmers, Mr.Kathuria said that most wells can, with proper water management, irrigate more land than the average holding of the "target group". As such it is becoming possible for them to accept community wells with sprinkler irrigation system, to share both the costs and benefits. He felt that vol-agencies have a major role to play in convincing and organising the small farmers for accepting this concept of sharing the limited water resources.

Talking about the "cheaper indigeneous drilling devices", Mr. Kathuria felt that while such drilling rigs do have a role to play, especially in revitalising dug wells, they can only complement or supplement the work of high speed rigs. He cautioned that while comparing cost of drilling, all factors should be taken into account and not just some.

Water well Technology in India - A Cycle Shop Concept, by Mr. D.K.Fouzdar :

Mr. Fouzdar while outlining the growth of and need for tubewells as a desirable alternative to traditional dug wells for our rural water supply systems, outlined the set of problems often encountered in installation, management and maintenance of handpumps. He said experience has shown that against numerous attempts made only a few succeed in providing potable, reliable, efficient and drought immune source (tubewell) with a handpump for rural community. Of the several contributing factors to the success or failure of the drinking water tubewell/ handpump programme, choice of technology is one of the fundamental and most important factor, because if the technology is simple and inexpensive, participation of the beneficiaries is more or less assured.

Pointing out the serious problem of drinking water supply in atleast 30% of the Indian villages which lack good approach roads, Mr.Fouzdar suggested the use of local level slow drilling devices in preference to fast drilling rigs, since these can be transported on bullock carts etc. and are labour intensive. Though such devices cannot do much in relief operations like droughts but in long term programmes these machines can give as much output, if not more, with equal capital investment. However, from the management view point centralised operation of slow drilling devices is not feasible since this implies managing of a large number of skilled, semi-skilled and un-skilled labour. He, therefore, proposed the promotion of small autonomous units at the grass roots level for efficient use of slow drilling devices, under the guidance of apex drilling agencies operating fast drilling equipment. Such autonomous units, besides drilling borewells, should also be engaged in pump installation/repairs, well development, etc. with a radius of 20-30 miles, so that they can be easily approached by the villagers for their day to day problem with handpumps.

The approach suggested above, termed as the 'Cycle Shop Concept for the Drinking Water and Sanitation Decade', visualises a new role for the drilling agencies in the voluntary sector. In addition to offering a package of services and bringing about perfections in their existing infrastructures, these drilling agencies can act as apex agencies, to catalyse and encourage a number of lower level voluntary entrepreneurial agencies, since the need for such agencies to drill a large number of bores and maintain handpumps in the country is going to grow continuously.

Discussions :

The consensus that emerged from the discussions that followed on the papers presented, is summarized as under :

1) AFPRO and the drilling agencies in the voluntary sector, have indeed been the pioneers and catalysts in introducing and promoting high speed drilling rigs, and deep well hand pumps for rural drinking water supplies in India. In addition, the Water Development Society, Hyderabad, had also played a leading and pioneering role in the manufacture of high speed indigeneous water well drilling rigs and in-well drilling equipment suitable to the needs of the hard rock areas.

2) Since drilling of water wells has become a common and on-going activity, with the State Governmnets, numerous private agencies/ entrepreneurs, drilling of wells in a traditional manner by agencies does not have much relevance. The drilling agencies have to come out of this situation and develop a new orientation, direction and approach to their work. The need for broadening and diversification of activities was accepted by all.

3) For boradening the activities of the drilling agencies, it is necessary that the agencies should try to offer a package of services to their target groups, rather than just drilling a borewell. The package of services could include exploration, drilling, development, yield testing, water quality testing, installation of water lifting devices and advice on conveyance, distribution and use of water. In addition, drilling agencies could more actively participate in revitalization and development of wells.

4) For diversifying the activities, drilling agencies should be engaged in water resources development and not just in groundwater development. This means, the drilling agencies could be engaged in planning, designing and executing surface water utilisation schemes, water and soil conservation measures, afforestation programmes etc., that is, to accept the responsibility for integrated land and water use planning and execution.

5) Besides the above, the drilling agencies should accept the responsibility of organising small/marginal farmers for obtaining credit and deriving the benefits from community wells, better water managements systems etc.

6) As a part of their social responsibility and technical competance, the drilling agencies should improve their working efficiency and reduce the idle time, so that drilling costs for the farmers are reduced as far as possible and that these be much less than what is being charged by private commercial agencies. For this drilling agencies may even think of operating slow drilling devices themselves or promoting a number of small voluntary agencies/entrepreneurs who would undertake drilling activities in their neighbourhood and maintain/repair handpumps installed for rural water supplies.

# Relevance of Voluntary Agencies in Water Resources Development

Col. B.L. Verma

The contribution by the voluntary agencies in water resources development of the country in physical terms will perhaps amount to no more than a postage stamp fixed on the walls of the Red Fort. Yet in the field of development of groundwater resources in the hard rock areas of the country, they made a contribution that made history. It was the voluntary sector that introduced in India, the down-the-hole hammer drilling rigs, the systematic investigating techniques, and perhaps the first terrameter. The revival of the percolation tank and the recharge system, along with pumping test units were also the contribution of the voluntary agencies. More than anything else, it was the pioneering spirit of the voluntary agencies, coupled with the dynamism and flexibility that created what can be termed as a revolution in the ground water resources development in the hard rock areas of India. It was the introduction of these machines and their performance that acted as a catalyst, inducing UNICEF, other International Aid agencies and the Governmen. of India to multiply their number.

Today in India we have over 3000 drilling rigs in the public, private and voluntary sector. The country manufactures its own rigs of all types, spares, investigating equipment, well loggers and pumping test units. Swamped by the number of rigs and multiplicity of agencies, plagued by their own inefficiency, infighting and failure to keep pace with development in technology, the voluntary agencies find themselved at a cross road asking the question - 'Are they relevant?'

With the Government's resolve to bring under irrigation 14.30 crose hectares of land are bring to millions of our countrymen in the rural area the drinking water supply through a massive hand pump programme, the answer to the question is always 'YES'. They will, however, have to pause and think how they can still be pioneers and catalysts in this game, through a dedicated superior and home service a total package perhaps that makes the customer's rupee travel longer. Unless the voluntary agencies are willing to change their style of working and move out to be pioneers, and catalytic agents, they might as well bring down their shutters.

An attempt has been made in this paper to present a panorama of the work of voluntary agencies in the field of water resources development, their entry, their contribution and their relevance, and recommendation as to how they must reorganise themselves, if they wish to serve the small and marginal farmer in this field.

## INTRODUCTION

Traditionally the development of water resources in India has followed a set pattern. The major and medium irrigation schemes have been the domain of the Government. Minor irrigation viz. wells, ponds, tanks have been the result of individuals' enterprise. Same pattern holds true in the field of drinking water supply. While the role of the voluntary agencies in the field of water resources development in ancient India has not been documented, it is more than evident that large scale co-operatives were active harvesting, transporting and distributing water for irrigation and drinking in the hill regions. One of the ancient irrigation systems can be witnessed even today in the Zero Valley, in the Subansari Frontier Division of Arunachal Pradesh, where the Apatani Tribe, through an informal co-operative system have been operating what one would term a medium irrigation system. In the same region, yet another tribe the Daflas, whose settlements are on top of hills, have been getting their water supply through miles of bamboo pipes from sources known for good water and affording enough head for gravity flow. These practices of getting water for irrigation on collective or co-operative basis can be seen throughout the Himalayan region.

Work on soil conservation and water resources development in ancient India was also undertaken during famine and droughts, when the kings or rulers ordered large scale relief works employing millions of people on well digging, deepening, tank construction, pond revitalisation or desilting, canal digging etc. Religious or individual charities also donated or gave away in charity drinking water wells or baories, Food-for-work system seems to have been in vogue even in ancient India.

## HISTORICAL

It is in the twentieth century, however, that one can trace documented account of the voluntary effort in water resources development, when the voluntary agencies, departing from their traditional role of education, medical, charitable and relief work, entered into improvement of agricultural development. This was with a view to provide a sustainable base to the poor for economic uplift. In trying to improve the agricultural production the voluntary agencies inadvertently went into the water resources mobilisation. This was attempted in two ways :-

(a) Deepening and widening of existing wells, digging of new wells and installation of pump sets, and

(b) Construction of minor dams and reservoirs.

The experimental and operational projects in the field of minor irrigation on the above pattern, were mostly undertaken by church related agencies in all parts of India. The projects were invariably of pioneering nature and to a great extent catalytic.

FIFTIES

The first well drilling project, through a voluntary agency, in India appears to have come about in Coimbatore District (Tamil Nadu State), by the Church of Sweden Mission and Tamil Lutheran Church in 1953. Wide areas in Tamil Nadu had gone through consective drought for five years. At a very modest cost of US $50,000 were obtained three cable percussion rigs, two support vehicles, initial pumping equipment, operating costs for three years including the cost of bringing a technician from Sweden to India and train three local crews. Form 1953 to 1958, the project had drilled 150 successful wells (success rate 75%), fixed 75 hand pumps and had installed a number of submersible pumps. The State Government paid 75% of the cost of the public drinking water wells. At a later stage one rig was contracted to farmers and institutions and the income generated was used to extend the operational life of the project.

The pilot project learnt three major lessons :

(a) bore wells are not always an ideal solution, but the only possible one for obtaining quick and large scale results in time of drought and emergency;

(b) bore wells are in principle an ideal solution for public drinking water schemes in rural scene.

(c) It was found valuable and indeed essential to work closely with the Government, but it was also found to be helpful to have a sizeable operating budget to ensure flexibility and independence of action in case of bureaucratic delays.

SIXTIES

To Rev. John Mcleod, then with War-on-Want at Jalna, goes the credit of introducing the first down-the-hole hammer rig for water well drilling in India in 1965, through a self-propelled unit called 'HALCO TIGER' donated by Christian Aid, U.K. Drilling 100 ft. a day to a dia. of 4.5" , the machine was ideal for:-

(a) drinking water wells;

(b) trial bores for farmers to decide where and to what depth to sink or dig their wells.

Prior to the arrival of the rig, Rev.John Mcleod, while with War-on-Want, working under Church of Scotland, had been concentrating on deepening of existing wells, with blasting, and that is when he came to the conclusion that answer to the problem of ground water resource development lay in high speed drilling.

The efforts of the voluntary agencies in Coimbatore in South India and Jalna in Maharashtra were path finders. This led to the major entry that the voluntary agencies made in the field of water resources development, specially the ground water resources in 1966, when in response to an appeal to tide over impending food shortages, over 70 foreign and Indian voluntary agencies, and groups met at Delhi at what came to be known as consultation on Food Production. It was in March 15th, 1966, at the India International Centre, that a group consisting of Christian Aid Agencies from Europe and America, Ford and Rockfeller Foundations in USA, United States Agency for International Development, Officials from Ministry of Food and Agriculture in India, met to have consultations. The key note address to this group was delivered by the Minister of Planning, Mr.Ashok Mehta. Addressing the meeting, Mr. Mehta said:

> "To those of you who are thinking of taking up some work for the first time, my earnest request would be that you should try a selected area and concentrate your efforts, because a concentrated effort will enable us to know what we can achieve and what we cannot achieve."

He went on to say :

> "What is to be done? I am sure you have among yourseleves experts on irrigation, experts on electrification, experts on fertilization, experts on soil surveys and I do not propose to spend my time discussing this, and if you have no experts you can get them without difficulty. There is no lack of experts for this purpose, but what we don't have in such abundance in the world are experts who are able to make human beings feel that there is no need to remain despondent. There is no need to feel that you are being ignored, forgotten, that you are not a part of the forgotten world, that the re rest of the world realizes that their freedom is meaningful only to the extent that the hunger and the starvation of these many millions are removed. Can we communicate to them this feeling - that in overcoming the difficulties, we have a sense of poignant urgency which is completely personal?
>
> Otherwise, as I said, I don't see the Church introduce any new dimension into this matter. The Governmnet are doing a job; they will continue to do it. If we need any money, we go to your Governments also and raise loans, go to your banks and riase loans. Money is not the thing; money is important but money does not inject any new dimension into this matter. Materials do not inject any new dimension into it. What injects a new dimension is, as I said, a sense of solidarity, that we realize that the human factor is of critical importance here, and that implies a belief in the solidarity of man. I think that was precisely what was meant, when we began our proceedings with a prayer. Are we treating this problem of overcoming poverty and misery by charity? You can always collect some food and give to the people. Where will that take you? The Indian people are so proud as anybody else. There is

no question of charity ; there is not question even of sharing. There is a question of helping them with tools, with techniques, with possibilities whereby they may be able to produce much more. They can; indeed we can triple our output today. There is no difficulty. We can diversify our agriculture. But as I said there are two other hurdles. One is to create among our farmers a sense of hope, of confidence, of purpose, a feeling that the burden of the ages are going to be lifted. And two, to find enough men and women of goodwill who feel that this is perhaps one of the most important tasks to which we must, with which we must identify ourselves."

Finally, Mr.Ashok Mehta wound up by saying:-

"The human reclamation requires a special type of social engineering, that to my mind, is the big challenge. Technically the problem can be solved; a certain amount of resources will be needed but the mobilisation of resources will come very easy if you can somehow mobilise the human potential."

The meeting which conluded on 17th March, 1966 recommended:

Water Resources :

The following needs and priorities were set up by the first group :

(a) Deepening of existing wells, using available labour for this purpose. This would also provide an excellent opportunity for spreading the 'food for work' scheme which was a very useful method of satisfying immediate food needs.

(b) New wells should be dug and landless people should be settled on new lands.

(c) On the whole two methods of financing were suggested:

(i) To provide necessary incentive to the farmer by giving him a quarter of the cost of well construction as a grant on completion of the well.

(ii) Some form of a loan fund to be set up to help with long term assistance for well digging efforts.

(d) It was recommended that help should be given to instal pumps where water has to be lifted, and where a minimum of 20 acres could be irrigated by this effort . This would help the production of a third crop before June each year in many parts of the country. Pumps could also be installed in shallow streams where water could easily be lifted.

It was further suggested that a scheme should be devised to purchase second hand diesel pumps that are discarded in areas where electricity is now being supplied. These could be reconditioned for use in areas devoid of electric power.

(e) There was need for a team to explore the water resources available in various parts of the country so that efforts at boring wells should not go waste.

(f) Finally, it was decided to explore the possibility of setting up a mobile blasting and well digging team.

But more than anything else the Consultation on Food Production called jointly by the Indian Social Institute and the Committee on Relief and Gift Supplies from 15th to 17th March 1966, recommended the creation of an action committee named: ACTION FOR FOOD PRODUCTION. It was to be a single action programme designed to help local agencies accomplish specific tasks allotted to food production.

The aims and objectives of AFPRO jointly agreed upon were :

(i) Coordinating :

To act as a coordinating body for providing technical assistance, information, training, advice, and other useful services to food production and related projects in India.

(ii) Advisory :

To act as technical adviser to agencies and project holders engaged in promotion, organization and financing of food production and related projects in India.

(iii) Funds :

To administer funds in connection with food production and related projects.

(iv) Projects :

To estimate, organise and administer food production and related projects, subject to the conditions laid down in the Rules & Regulations, Article 14, Section (e).

(v) Information :

To act as a 'Clearing House' for collecting information and disseminating it to projects and agencies engaged in food production and related projects.

(vi) Import :

To act as an Agency for arranging with Government of India or any State Government of India for importation of necessary equipment and materials for food production and related projects.

(vii) Personnel :

To secure and make available the services of suitable personnel to food production and related projects.

(viii) Conferences ·

To organize national and regional Food Production Consultations, conferences, study circles and seminars, and to assist project holders and voluntary agencies engaged in promoting food production projects, to study needs and develop an overall and well planned strategy aimed at making voluntary effort in the field of food production more effective.

(ix) Rural Welfare :

In general to stimulate, support and assist self-help efforts and community development programmes aimed at increasing food production and building up healthy and well-organised rural communities in India.

AFPRO immediately went into action and had, with a view to locate areas of operation, meetings with Ministry of Food and Agriculture, Government of India experts and officers related to 'Freedom from Hunger Campaign' with Director and members of the Indian Exploratory Tube Wells Programme and with Irrigation Ministers on central and regional levels. A major policy and interpretation meeting on AFPRO held at Delhi from December 5 to 10, 1966 was attended by some 250 persons from within India and representatives of major overseas agencies participating in the programme. The Minister for Food and Agriculture, Shri C.Subramaniam, and the Minister of State for Irrigation and Power, Dr.K.L.Rao, addressed the participants and answered questions. AFPRO has also been involved in an inter-agency Nutrition Group that meets monthly and includes USAID, Ford Foundation, Rockefeller Foundation, FAO, UNICEF, CARE, CRS, and a number of other bodies. The U.S. and other governments have provided transportation for goods and equipment donated by the Churches.

The generous response resulted in AFPRO receiving a million and a half US $ worth of drilling equipment and this started a new era in well drilling in hard rock areas of India.

Working on selected area strategy, AFPRO set up Regional Water Resources

Projects in the States of Maharashtra, Gujarat and Madhya Pradesh beginning in the middle of 1966, to tackle the acute drought conditions prevailing there. An emergency programme was set up in Bihar and U.P. in December with 2 Halco Tigers operating in Bihar and 1 Halco Minor and 1 Atlas Copco Compressor in U.P.

In 1966 itself AFPRO received two heavy drilling rigs from USA and Holland (IRS), with blasting equipment, a welding shop and vehicles to give them mobility. 11 Halco Tigers, 5 Halco Minors arrived from U.K. and 5 tractor compressor units were purchased in India.

The main features of AFPRO selected areas approach were :

(a) Identification of certain promising areas of fairly large size having potential for significant development of food production through the efforts of voluntary groups.

(b) Formation of an active area Task Force composed mainly of key project holders of the area for the purpose of working out and implementing an integrated approach to the problems of the area.

(c) Systematic study of selected areas by an AFPRO Technical Team in collaboration with the local task force to determine chief needs, increasing food production, gaps in existing services.

(d) Formulation of a realistic plan aimed at coordinating the efforts already being made and supplementing these efforts with additional programmes according to indicated needs and priorities. Plans and proposals would eventually be presented to interested agencies for required outside assistance and support.

(e) Posting of an AFPRO staff person in areas taken up for development to work with the local area task force on a continuing basis and to serve as liaison between the area group and AFPRO.

The emphasis has been placed on developing projects in relation to other activities in an area, and supplementing them by means of joint inter-project action with the additional services and facilities which the area needs if a substantial impact is to be made.

An example of this strategic area approach was setting up of AFARM (Action for Agricultural Renewal in Maharashtra). This registered society works to promote the coordination of the programme of voluntary groups with the plans of the government for agricultural development in the area. An office had been set up, with a full time officer, a member of AFPRO staff, General Agricultural Specialist.

The AFARM office acted as a Clearing House and operated as follows :

(i) Project Holders owning drilling machines, blasting units, lorries, tractors etc. kept the office informed whenever their machines are likely to be idle - in this way the office knew when the equipment would be available for hire by other project holders in the area.

(ii) Project holders who wanted a certain machine to undertake a programme wrote to AFARM office setting out the details of the job to be done e.g. if the person has 25 firm orders for bore wells then they could request the use of a Halco Tiger for one month. The AFARM officer tried to match the demands with the machines available. If requests far exceeded the machines available, it was a good indication that the area needed more machines to be requested by AFPRO to the funding agencies.

(iii) Technical advice was also provided.

In this way AFARM provided a forum for consultation and a means of increased coordination of the voluntary effort in the area. It also provided a forum of consultation with the government, the official Agricultural Credit Institutions, and the Agricultural Colleges.

Utilization of Groundwater Development Equipment

Over-all view of results achieved: A total of 27 drilling rigs and 30 air compressors had been supplied by Member and Supporting Agencies to Projects in connection with the AFPRO Water Resources Development Programme. The machines have in use in 24 projects located in 8 different States of India. Excluding machine that were not yet operational, or for which data was available, the total number of wells drilled and blasted with the rigs and compressors supplied to project was as follows :-

| | Type of Work | Drinking Water Wells | Irrigation Wells | Test Bores | Total |
|---|---|---|---|---|---|
| 1. | Drilled with rigs | 1118 | 535 | 247 | 1900 |
| 2. | Drilled for blasting with compressors | 79 | 2517 | - | 2596 |
| 3. | Extension drilled with compressors | - | 100 | - | 100 |
| | Total | 1197 | 3152 | 247 | 4596 |

These figures were for 20 drillings rigs (9 Halco Tigers, 6 Halco Minors, and 5 others); and for 17 air compressors that were used for blasting and extension drilling operations - all except about 100 of the 2596 wells drilled and blasted with compressors were existing wells that were deepened. The remaining 100 represent new wells constructed. Of the 535 irrigation wells listed as drilled with drilling rigs, approximately 340 are existing open wells in which boring was done in an effort to improve their yield. The remainder are newly constructed irrigation tubewells. All the drinking water wells drilled with rigs were new bore wells.

Available data indicates that the success rate for wells drilled with rigs was as follows - (a well has been defined as successful if has proved worthwhile to fit a pump and put the well into operation) :

| | | |
|---|---|---|
| 1. | for all wells (drinking and irrigation) | 72 per cent |
| 2. | for drinking water wells | 79 per cent |
| 3. | for irrigation wells | 59 per cent |

These rates are based on 1560 wells drilled by drilling rigs for which success or failure has been reported by project holders. Although the data is incomplete, it appears that the great majority of successful wells are actually in operation.

So much for AFPRO. Leaving them alone around December 1969, we now survey what was happening elsewhere, and the work being done by numerous project holders.

One thing, however, was established beyond doubt that a hole in the ground need not necessary become a water well. This led to the idea of a total or package service.

(a) Geophysical survey for location of sites;
(b) Drilling;
(c) pump testing

and if possible fix the pump, and led to establishment of what we are familiar with, the Geohydrological Investigation Teams (GIT) in AFPRO.

It was also seen that the voluntary agencies in the field of development of ground water resources were generally a great success and were much in demand and appreciated because-

(a) they were providing a pioneering service;

(b) they were acting as a catalytic agent in introduction of technology appropriate to the situation.

(c) dedicated package service.

And now a panoramic persentation of the Drilling Projects in the sixties.

## Water Resources Development Projects
## 1966 - 1969

### Maharashtra

One of the first regional meeting held by AFPRO was held in Jalna in June 1966, resulting in formation of regional association of project holders under the name of 'Action for Agricultural Renewal in Maharashtra' (AFARM), with 13 projects as the initial members. This was in conformity with AFPRO's approach of 'Selected Area Strategy'.

### Madhya Pradesh

Malwa Economic Development Society moved into the field of drilling with the receipt of a Sanderson Cyclone (a large dia. down-the-hole hammer rig capable of drilling 6" to 8 dia. bores). This machine was pressed into service in Indore, which was facing an acute water shortage. Later it moved out to drill large number of irrigation bore wells in Madhya Pradesh.

The equipment of MEDS was dramatically expanded by the addition of a cable percussion rig and a very large WABCO reverse circulation rig for high speed drilling of large irrigation wells in alluviam formations, both donated by OXFAM. A further addition to this project was a smaller version of Sanderson Cyclone, designated Sanderson II, allocated by AFPRO

Simultaneously another autonomous Well Drilling Society, (WDS) Water Development Society, came into existence at Indore. With the help of FFI (Netherlands Foundation Food for India), the project received one Crawlmaster Ingersoll-Rand drilling rig and one Halco Tiger with a support vehicle. With a view to participate in a 7000 borewell programme in M.P., WDS received two additional WABCO Reverse Circulating drilling rigs.

Yet two more projects in M.P. came up at Jabalpur under Narmada Development Society, and Bisrampur (Raipur) Rural Life Programme, each with one Indian made cable percussion rig and compressor equipment.

### South India

AFPRO held its regional meeting for water resources development in South India on May 10, 1966. As a result of the meeting, AFPRO Interim Committee decided

in October 1966 to seek funds for 12 'Tiger' packages - each consisting of 1 Halco Tiger Rig, 2 Tractor-Compressor Units and supporting equipment. The projects that emerged were :

(a) Bangalore Water Resources Department (Mysore Diocese) Halco Tiger and Ingersoll-Rand.

(b) Vikarabad Rural Service Unit (Andhra Pradesh) 2 Halco Tigers, several Halco Minors and Compressor units, and 12 Bencher units, specially designed for extension drilling and revitalisation of open wells.

(c) Coimbatore Agricultural & Water Development Project (CWADP); a continuation of well drilling project originally sponsored by Church of Sweden and Tamil Lutheran Church. One Tiger package, one Halco Minor and several Compressor units for blasting and revtialisation.

(d) Madurai Water Resource Development Project (Church of South India) - funded by OXFAM. A Tiger package, heavily reinforced with blasting units.

Another drilling programme in Mysore State was undertaken with a Sanderson II gifted to AFPRO by U.S. Protestant Agencies. After doing exploratory work in U.P. and Andhra Pradesh and participating in Bihar emergency programmes, the unit moved to Hubli to satisfy the urgent needs of a large Tibetan refugee resettlement programme. From November 1967 to May 1968, it completed its task and handed over the equipment to Swissteco, which was operative in the area.

Other Areas

Rural Development Project, Ankleswar (Gurarat);
Irish Presbyterian Project, Dahod (Gujarat);
Both operating AFPRO owned tractor and compressor equipment for drilling and blasting.

REWARD (Rajasthan Emergency Water & Agricultural Relief & Development Society) With a Halco 625 Rig.

There were a number of other projects in Bihar, Rajasthan and U.P. for which necessary equipment and technical assistance was provided by AFPRO.

Tne year 1970 saw AFPRO relating agencies holding 27 drilling rigs and 30 air

compressor units, having achieved in the short span of less than 3 years, 1900 borewells, and extension drilling 100 wells.

An evaluation of the work of drilling agencies at a Forum meeting of AFARM held at Ahmednagar on 18 November 1968, listed the reasons for their success and acceptability by the people and Government :-

(a) Project holders working together in close cooperation ;

(b) flexibility to meet the changing needs and opportunities in the field of water resources development ;

(c) involvement in the governmnet' s on-going programme ;

(d) a desire to participate in the nation building programme

and determination to work in areas which were not covered by Government, but following intensive area approach which could show results.

The projects were professionally competent, the equipment was appropriate and they had funds to absorb the bureaucratic delays and take risks in carrying out new experiements and innovations.

The Projects hereafter zoomed; more equipment was added; spares were plentiful till the projects stood on the peak. During this period factories were set up to manufacture drilling rigs in India. Government (Central and State) had imported large number of rigs and the private entrepreneurs had procured a sizeable fleet due to well boring being a highly remunerative venture.

From 1974 to 1982, there has been a sharp decline. Project after project has closed down; some due to mismanagment, others due to infighting and yet others due to sheer incompetence and fright to withstand the competition, but mainly due to lack of direction and goals. A number of drilling agencies in the voluntary sector today can be counted on fingers. These agencies feel that they are committed and have a sense of direction and that they are relevant in water resources development in today' s context.

This then is the question before us : Are the voluntary agencies relevant today in water resources development programmes of the country? And if the answer is 'yes' then we must at this meeting decide - how. The answer might lie in:

(a) Our willingness to accept the challenge to meet the changing needs and opportunities ;

(b) flexibility to gear to the new requirements ;

(c) retain our pioneering spirit by offering a package of services (refer to Annexure I) ;

(d) Act as a catalyst.

(e) reorganise ourselves to serve in emergencies, such as drought and other natural calamities.

The meeting must address itself to the question then, of our very survival and relevance, and How are we going to meet this challenge.

ANNEXURE I

## PAPER ON 'RELEVANCE OF VOLUNTARY AGENCIES IN WATER RESOURCES DEVELOPMENT'

Package of Services That the Voluntary Agencies Can Offer in Water Resources Development:-

1. Open Well

   Site selection/feasibility studies
   determine optimum diameter and depth
   yield testing
   selection of type and H.P. of pump
   testing of chemical quality
   sanitary protection of wells
   conveyance system
   obtaining loan/subsidy - help in

2. Revitalization of Open Well

   Survey for deeper aquifers
   increase in diameter, lining
   digging, blasting
   extension drilling
   suitable pump installation

3. Borewell (for irrigation & drinking water programmes)

   selection /feasibility study
   drilling
   electrical logging
   assembly and pump installation
   sanitary protection of wells
   yield testing
   testing of chemical quality
   conveyance system
   help in obtaining loan/subsidy

4. Pumping Test on Borewell

   Selection of suitable pump H.P.
   Determination of pumping depth.

5. Fishing of Equipment

Recovery of well assembly and pump by using PTU facilities and proper fishing tools

Recommissioning of tubewells

6. Windmill Installation for remote users from electrified areas

Selection of site on open wells/ borewells of low discharge
installation of windmill and pump
construction of storage and conveyance system.

7. Hydram

Select suitable sites for water storage and installation of hydram in remote areas and under typical conditions
Prepare layout/cost estimates

8. Water Harvesting and Storage

Survey for construction of percolation tanks, check dams, weirs
Lift irrigation schemes

9. On-Farm Development and Comprehensive Area Development

Survey for availability of water resources, storage and conservation
Water budgeting, conveyance system
Land use and cropping patterns
Using hydrogeological, geophysical, remote, surveying methods and estimation by pumping tests,
Meteorological data, artificial recharge techniques,
Surface structures, borewells, etc.

10. On-Going Govt. Programmes

Services can be linked with Govt. water-shed development programmes like IRD, IADP, IAAP, DPAP, CADP & SFDAP and drinking water programmes.

## REFERENCES


| | | |
|---|---|---|
| 1. | Role of voluntary agencies in Agricultural Development Following the AFPRO Evaluation Conference<br><br>(A paper read at the Forum by AFARM on Groundwater in the Deccan - on December 18 at Ahmednagar) | Yngve Frykholm<br>Executive Director<br>AFPRO |
| 2. | Inaugural Address<br><br>(Social Action - Vol. 16 No.4 - April 1966, pages 150 & 156) | Ashok Mehta<br>Minister of Planning,<br>Govt. of India |
| 3. | Two Years of Work<br><br>(Social Action - Vol. 19, pages 36.44; 1969) | E. Reid<br>Executive Secretary,<br>AFPRO |
| 4. | Agricultural Projects Organised by Catholic Agencies<br><br>(Social Action, Vol. 16 pages 177-183; 1966) | S. Santiago |
| 5. | From Theory to Practice The Indian Social Institute Extension Service<br><br>(Social Action - Vol.17; pages 296-309; 1967) | S. Santiago and<br>R. Lobo |
| 6. | Christian Churches as Agents of Socio-Economic Development in India | Yngve Frykholm<br>Executive Director,<br>AFPRO |
| 7. | AFPRO News Notes, June 1981 | |
| 8. | From Theory To Practice AFPRO<br>(Social Action - Vol.19; pages 46-50; 1969) | E. Reid |

## Future of Drilling Agencies in the Voluntary Sector

J N Kathuria

The following, quoting an unknown contributor to the Water Well Journal, should help answer the question of " To be or not To be" posed in the background paper for this Seminar.

" It is better to drill a well than to build a monument. When you drill a well, you invite nature to fill it : when you build a monument, you challange nature to destroy it.

Build a monument, and your name will be known, but merit, if any, is soon forfotten. When you drill a well, your name may not be known, but generations will drink of its water and be refreshed. When you build a monument, you perpetuate your name but drill a well, and you perpetuate your influence.

Build a monument, and you mark your grave; drill a well, and its abundant supply symbolizes your immortality. You live again in lives refreshed as they drink of its water.

The monument is a symbol of self-centered life, and the stars in their courses are pledged to destroy it. The well is a symbol of unselfish service, and the resources of God are pledged to fill it."

In 1966/67, AFPRO was amongst the first to import high speed drilling rigs in to the country. This was done under pressure of the drought prevailing in Madhya Pradesh, Bihar etc.

Basic guide lines for preparing a project proposal are bound to get shelved for a relief operations. However, as we have to think of participating in development programmes and not just distress relief, it would be useful to consider the following basics for determining the viability of a drilling project:-

1. What is the area to be covered.

2. What is the groundwater potential available.

3. What is the average yield per well in that area.

4. What are the number of wells to be drilled.

5. What is the time frame during which this has to be done .

6. How many rigs are presently available and how many more are expected to be available.

7. Is there scope for additional rigs.

8. Does the " time frame" and the life expectancy of the rigs match.

9. If not, will there be any work for the rigs elsewhere for the remaining part of their " lives"

Lack of co-ordination of the above will result in idle time and higher operating costs, and consequent wastage of finances, manpower and work potential.

The optimum condition, from the point of view of the Drilling Agencies, would be for the complete exploitation of the available ground water to synchronize with the life of the rigs deployed. However, as the pace of development and human factors are likely to outweigh the above considerations, we have to look for ways and means of varying the basics without unfavourably affecting the economic viability, especially in the case of rigs already procured.

As the above are inter-related, if we can vary one factor, we will automatically alter the corresponding factor. e.g., if we increase the area of operations, we also increase the number of wells and also the number of rigs required. So the solution would appear to be to work in a larger area of operation and movement of rigs from different areas after completing the work in a given area, if the time frame can be varied to permit the same. This would obviously call for a lot of co-operation between agencies and as such, an association could be very useful.

With the cost of rigs, fuel, spares, salaries etc. going up and up, it is inevitable that the cost of drilling has to go up also. If it has to be kept down for any selected group, the shortfall has to be made good from other sources. The situation is exactly similar to the search for a subsidy for failed wells. The Drilling Agencies can try to improve efficiency further, to bring costs down. The manufacturers and suppliers, can do their bit by atleast ensuring ready availability of spares, if not by bringing down the prices of the rigs, spares etc.

An association of Drilling Agencies can try to persuade Government to exempt rigs, spares and supplies from levy of excise duty, sales tax etc.

As the role of the Drilling Agencies is to provide irrigation and also drinking water, the emphasis on the so called " Target Groups" may be misplaced, and the worry about their ability to pay for drilling of wells, may be an over reaction.

Most wells can, with proper water management, irrigate more land than the average holding of the " target Group" . As such, it would be logical for them to

accept community wells, to share both the costs and the benefits. Simple as it may sound, it is very difficult to "Sell" this concept to the small farmers. If Voluntary Agencies, or extension workers can overcome this resistance, the problem can be solved, atleast in those cases where the holdings of such small farmers are adjacent.

According to the June '81 issue of the US Water Well Journal, when in October '80, an earthquake killed 12,000 in Algeria and left about 2,50,000 homeless, the world poured millions of dollars into that country as assistance. Yet the same day, over 25,000 died throught the lesser developed countries, due to inadequate water supplies and sanitation. The same number died the day before, the day after, and every day since, because each day, millions of men and women (and children) walk miles, to bring polluted water home, more than two billion people living in these countries. This continuing tragedy, finally inspired the establishing of the International Drinking Water Supply and Sanitation Decade by the United Nations. The Water well industry has a major role to play in helping bring the generally abundant ground water within reasonable reach of the population. The technology is relatively simple and readily available. The cost effectiveness is very high and the results quickly and clearly visible.

In view of the above, it is hoped that the adhocism of Government Drilling Programmes will soon be a thing of the past. At least in Karnataka, the State Government isplanning a continuous programme to drill 15,000 wells per annum. This does not mean that all problems have been solved; but it is definitely a step in the right direction.

The drilling agencies, especially those in the Voluntary Sector, owe it to themselves and the people they aim to work for, to :

1. Make all efforts to keep, if not, bring costs down.

2. Produce as much as possible in as short time as possible.

3. Not accept or expect to be paid the same rates as commercial agencies.

4. Broaden their horizons and help educate beneficiaries and all concerned, about ground water, its exploitation and management.

5. Stress on the importance and value of time.

At two Seminars in the last few years, proposals have been made for use of Calyx rigs and "cheaper indigeneous drilling devices", which presumably mean the same thing, as the same words can describe a relatively low priced indigenous high speed rig.

However, it would be interesting to compare the cost benefit ratios, in case of high speed rigs, Calyx rigs and the manualy digging of wells, ensuring that all factors are considered and not just some.

# Water Well Technology in India—A Cycle Shop Concept for the Drinking Water and Sanitation Decade

Dilip Fouzdar

Dug wells symbolise rural water supply system in India as much as the bullock cart sumbolises Transport. Both systems, due to the heavy influx of imported macro-level technology, have suffered the threat of obsolescence. In reality, however, both the systems have displayed their deep rooted vitality.

The tubewell is, in fact, a desirable alternative to our rural water supply systems due to its inherent merits, i.e. the reliability it offers in terms of supply (of water from the sub-surface rock formations) and protection it promises against biological contamination.

Technological advancement from the bullock cart to the bicycle makes interesting reading in the Indian context. On one hand it is effective and appropriate and on the other hand it is spontaneous and socially accepted. Within a tolerably short span of time and under an un-favourable environment, the bicycle was able to gradually percolate from a comparatively higher to lower socio-economic strata. It has all the qualities of a poor man's implement.

The 'action groups' implementing drinking water programmes include various government agencies manned by qualified engineers and managers. The drilling agencies in the voluntary sector though in a minority, are also effective action groups. The pioneering role of voluntary agencies, their initiative and drive, places them in a prominent position in the rural drinking water programmes. All these 'action groups' together have so far been able to create meaningful changes in the rural water situation. Yet, the tubewell/hand pump programmes do not seem to have established their roots in the rural environment.

With the progressive extension of hand pumps, density of which has already reached an unmanageable level, the question often centers around three sets of problems.

I. Difficulties in Installation

* Unapproachable villages;
* Villages with dry wells;
* Unsuitable groundwater quality.

II. Management of Hand Pumps

* Choice;
* Repairs and maintenance;
* Improper construction or frequent breakdowns;
* Replacement/renovation (of tubewell units) after prolonged use.

III. Social Behaviour

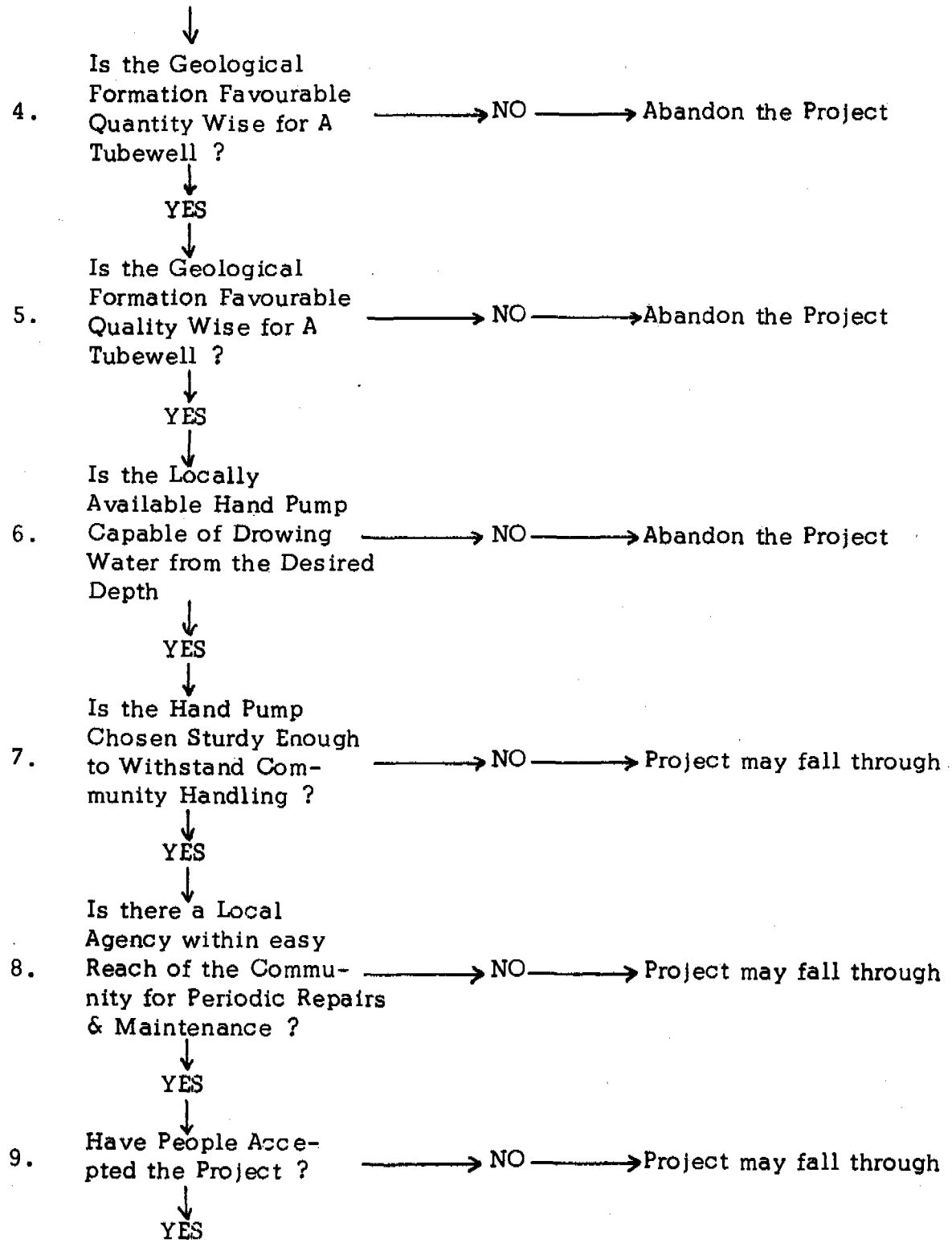
* Heavy population load on a single handpump;
* Tubewell location is not acceptable to the community;
* Tubewells are not evenly distributed among all sections/ castes of the community;
* Taste of water not accepted.

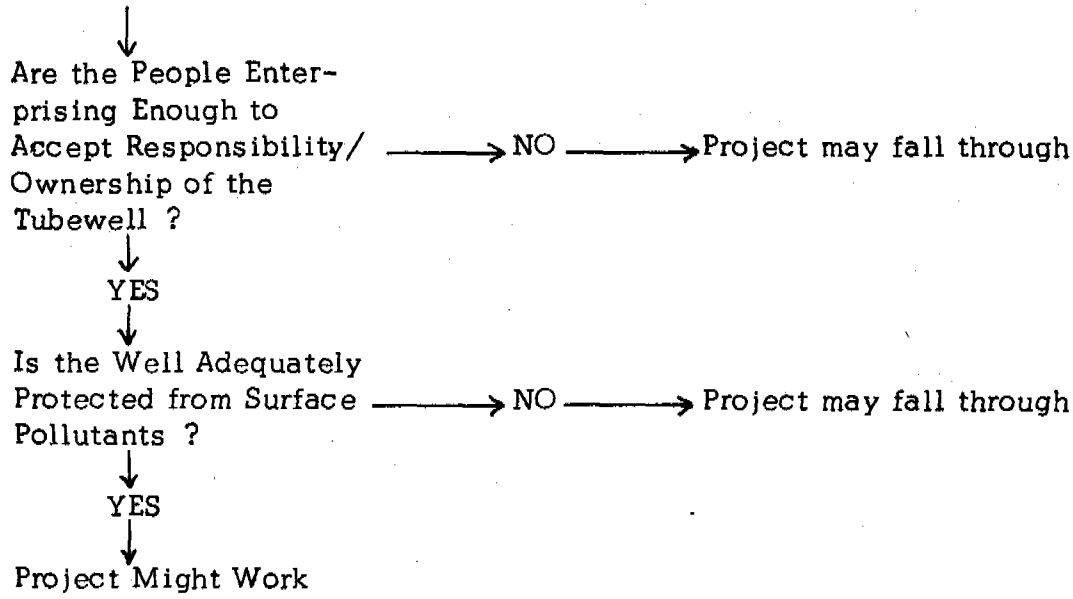
The situation is known to whosover had any dealing with the rural drinking water programmes.

To review the situation the following questionnaire is designed for trouble shooting and deciding priority issues which may help in sorting out the problems in any given situation.

TABLE-I THE HAND PUMP HURDLES

1. Can the Machine Reach the Site ? → NO → Abandon the Project
   ↓ YES
2. Is the Machine Capable of Drilling Upto the Desired Depth? → NO → Abandon the Project
   ↓ YES
3. Can the Machine Negotiate Existing Geological Formations Efficiently ? → NO → Abandon the Project
   ↓ YES


4. Is the Geological Formation Favourable Quantity Wise for A Tubewell ?
NO
Abandon the Project
YES
5. Is the Geological Formation Favourable Quality Wise for A Tubewell ?
NO
Abandon the Project
YES
6. Is the Locally Available Hand Pump Capable of Drowing Water from the Desired Depth
NO
Abandon the Project
YES
7. Is the Hand Pump Chosen Sturdy Enough to Withstand Community Handling ?
NO
Project may fall through
YES
8. Is there a Local Agency within easy Reach of the Community for Periodic Repairs & Maintenance ?
NO
Project may fall through
YES
9. Have People Accepted the Project ?
NO
Project may fall through
YES




It would be obvious that against the numerous attempts made, only a few succeed in providing potable, reliable, efficient and drought immuned source (tubewell) with a hand pump for the rural community.

The Table-I reveals two types of problems: one relates to proper commissioning and implementation. An improper approach at this stage leads to wasteful expenditure, producing little or no results. Obviously the results and side effects arising out of implementaion and commissioning of projects would show up almost instantaneously. The other set of problems are related to the utilisation of the project and social behaviour. This is, by and large, of long term nature and the results are qualitative. It is difficult to predict at the time of commissioning whether or not the project would really work in the long run. Assuming that the commissioning was proper, the project may still not work due to :

* breakdowns and lack of local repairing facilities;
* non-acceptance due to socio-cultural reasons;
* lack of initiative among people.

Therefore, taking all other variables to be common, the success or failure of the drinking water tubewell/handpump programmes clearly rests on the choice of technology, because if the technology is simple and inexpensive, participation is more or less assured. In India our alliance with highly sophisticated and expensive drilling machines has an awful in-built barrier for rural drinking water programmes. The entire operation is too expensive and complex for the rural community to understand, adopt and participate in. The next problem is related to pumps. The most durable and efficiently designed pump can provide trouble free service only for 10-15 months. When breakdown occurs, the villagers are left with their traditional ponds and dug wells. This leads to misuse

and lack of protection for the expensive installation (tubewell). The social impact that the tubewell could create due to the ease and convenience (vis-a-vis cumbersome rope and bucket or a long walk to the pond) and improved health (which is caused due to the control on water borne diseases - though it takes time for everyone to realise) is also eroded. In Bihar, hundreds of tubewells were constructed during the drought of 1967. A majority of them cannot even be traced now.

BIG MONSTERS OR SMALL MONSTERS

Successive droughts in various parts of the country have cleared the way for highly sophisticated and expensive drilling rigs to enter the drinking water arena. Interestingly, the drilling machines fulfil only a small requirement of the entire system (of rural water supply using hand pumps). Yet they tend to dominate the scene because they involve major financial allocation - both in terms of capital and consumables, and also in terms of organised manpower at the execution stage. The planners and builders of the drinking water programmes often realise that when drinking water is the priority issue a drilling machine is summoned, but as soon as it arrives, the drilling machine itself becomes the issue. I am sure, many would agree that the urgency of drinking water supply in many interior (unapproachable) villages is ignored by the operators of drilling machines, because of poor road communication. The proposal is dropped outright or rejected (after due consideration) in order to avoid unproductive travel time and other risks involved. This is a serious matter because at least 30% of Indian villages lack good approach roads for the mobile drilling machines. Incidentally these are the villages that lack in proper drinking water facilities. The initial capital involvement and the expenditure in terms of consumables are not really compatible with the general economic conditions of the rural poor. Yet preference lies with the expensive and sophisticated drilling machines. This can be deduced from the following factors :

i. Drilling machines are in heavy demand during drought when huge funds are allocated on ad hoc basis against drinking water supply for the villages.

ii. The operators of this programme, trained managers, engineers, scientists and planners opt for sophisticated machines due to their design superiority and (apparent) fast output with minimum involvement of manual labour.

iii. Technically too, the sophisticated devices are considered to be superior.

The alternative to these highly sophisticated expensive drilling machines are the local level slow drilling devices often used for the purpose of drilling cavity tubewells, in-well drilling for dug-cum-borewells and shallow borewells.

These include :

* hand boring;
* hand percussion or bamboo scaffolding;
* calyx or 'chill shot' drill.

Out of the above, hand boring is used only in alluvial areas while the other two are equally efficient in alluvial or soft formations as well as fractured crystalline rocks.

Slow drilling devices, cannot do much in relief operations like droughts but in long term programme these machines can give as much output (if not more) with equal capital investment. Centralised action with slow devices may be difficult since this implies managing of a large number of skilled, semi-skilled and unskilled labour. But, small autonomous units at the grass roots level can function quite efficiently with these devices. The technical superiority of sophisticated devices may not hold good under the Indian context because here the activities of the machines are really not organised and coordinated in an integrated manner with other related (scientific) inputs for better results.

The slow devices, however, require some modifications in their operations and they too require scientific inputs like siting of wells on hydrogeological considerations supported by geophysical soundings and proper pumping tests. Both slow and fast drilling system require attention towards proper completion measures.

Under the perpetual drought and flood situation, harnessing of water resources would require a systematic approach. If tubewells are installed obviously dug wells must gradually phase out because in the context of total groundwater utilisation in an area for irrigation and drinking - the dug wells would fail to serve during the drought and hence would naturally go out of use. The progress of irrigated agriculture in a given watershed is mostly spread in the valley areas. This would tend to affect the water-table situation of the uplands where most of the un approachable/interior/under-privileged villages are situated. Future droughts in these villages are expected to be far more severe unless such villages are also equipped with tubewells.

The capacity of an India Mark II pump is 12,500 lpd to 14,000 lpd. If similar pumps are installed. They can serve , on an average, a population of 250. Assuming that one tubewell must be provided for a population of 250 or part thereof, we get the following figures from the 1971 census data.

TABLE-II REQUIREMENT OF DRINKING-WATER-TUBEWELLS IN INDIA

(Source: Report of the Committee-Panchayat Raj Institutions)

| Population | No. of Villages | Requirement of Tubewells per Village | Requirement of Tubewells |
|---|---|---|---|
| Less than 200 | 150072 | 1 | 150072 |
| 200-499 | 168561 | 2 | 337122 |
| 500-999 | 132990 | 4 | 531960 |
| 1000-1999 | 81973 | 8 | 655784 |
| 2000-4999 | 36005 | 20 | 720100 |
| 5000-9999 | 4974 | 40 | 198960 |
| 10000+ | 1358 | 41 | 55678 |
| Total for India | 575936 | - | 2649676 |
| | Add: 10% for failed wells | | 264967 |
| | | Total | 2914643 |
| | | Say | 2900000 |

Table-II indicated numerical approximation based on the population of 1971. If the community is to be served adequately by tubewells alone the required number of tubewells would take roughly 18500 machine-years to be drilled by sophisticated fast drilling rigs. This figure may multiply several fold if irrigation tubewells are also taken into account. It is, therefore, not very late to take a fresh look at our choice of technology.

The hand pumps are apparently to be used in a limited way as out of the total tubewells drilled only a fraction are fitted with hand pumps and the remaining are powered by diesel or electrical pumps to serve large scale drinking water programmes or for the purpose of irrigation. As per table-II the total hand pump requirement works to 26,50,000.

The future water lifting arrangements for rural water supply could be improved by incorporating the idea of using renewable sources of energy like biogas, windmills, solar energy or minigenerators tapping kinetic energy of water. Of the above, the windmills and minigenerators work on simple machanical principles, their repair and maintenance too, requiring similar approach as that of hand pumps.

WORKING MODELS

In the entire operation of installation of hand pumps for rural drinking water supply, we have already made some headway. Only time can say how effective our approach so far has been. While designing the approach the operators should bear in mind that the programme should work in a manner such that:-

* self-help attitudes among the community should be prevalent and no part of the programme should tend to work against these attitudes.

* the approach should take care of all the existing situations and all the available resources.

Taking this view, we can visualise a new role for the drilling agencies in the voluntary sector. On the one hand they may bring about perfections in their existing infrastructures, by incorporating other technical supports to render integrated service in water well drilling. On the other hand, they may act as apex agencies to catalyse and encourage lower level voluntary/entrepreneurial agencies, who could be easily approached by the villagers for their day to day problems with handpumps. Some of these grass root level infrastructures may have one or two calyx drills/hand boring machines to offer services of the kind that drilling agencies are presently rendering. The necessary hydrogeological/well testing support may continue coming from the apex agency or other central agencies like CGWB, State Groundwater Boards or AFPRO GITs. The two models may work side by side since in the same region, mobile drilling machines would not operate in the unapproachable villages.

TABLE-III

| | Apex Drilling Agency | Grass Root Level Agency |
|---|---|---|
| 1. | Status | |
| | Voluntary | Voluntary/Entrepreneurship Agencies |
| 2. | Equipment | |
| | (i) Hydrogeological team | (i) Pump installation/well development/pump repair units |
| | (ii) Drilling team with fast drilling equipment | (ii) Calyx drill/hand boring units |

| | | |
|---|---|---|
| | (iii) Pumping test units | |
| | (iv) Pump installation/ well development/ pump repair units | |
| 3. | Area | |
| | Part of a state 8-10 districts | Within a radius of 20-30 miles |
| 4. | Coverage | |
| | (i) All approachable villages | (i) All approachable and unapproachable villages. |
| | (ii) Drinking water and irrigation bores. | (ii) Maintenance/repair/replacement of handpumps. |
| | | (iii) Drinking water and irrigation bores. |
| 5. | Mobility | |
| | Motor vehicles | Bullock carts, cycles and motorcycles. |

---

This is the basic proposition for a cycle shop concept. The services rendered so far by the ' action groups' in drinking water supply is indeed valuable, but the impact they have so far created merely conforms to the proprgation of the idea that tubewells are (technically) a superior proposition for rural water supply. This has been demonstrated though in an expensive manner. We are yet a long way to go in order to prove that tubewells/hand pumps are rather workable propositions for the rural India and that the technology can really percolate down to the grass roots level.

REPORT ON THE SECOND WORKING SESSION :

## Need for an Organisational Set-up in the Voluntary Sector for Water Resources Development

| | | |
|---|---|---|
| Chairman | : | Gen. V.Minas, Usha Telehoist, Calcutta |
| Speakers | : | Mr. V.G.Joshi, ELC WDP, Betul |
| | | Mr. K.M.Namboodiri, AFPRO GIT, Coimbatore |
| | | Mr. M.K.Moitra, AFPRO GIT, Patna |
| Rapporteurs | : | Mr. C.Uday Shankar, AFPRO GIT, Hyderabad |
| | | Mr. R.K.Daw, AFRAM, Poona |

## Organisational Set up of the Voluntary Sector for Water Resources Development

V.G. Joshi, ELC Water Development Project, Betul, M.P. 460 001.

A suitable set up for an organisation or an association of voluntary agencies involved in Water Resources Development is to be formulated. Basically what we need to decide is what should be the broad aims of such an association and what approach should such an organisation adopt. In other words we need to work out guide lines for the formation and operation of the Association of Voluntary Agencies involved in Water Resources Development.

The Administrative structure of such an organisation can be decided upon by adopting a suitable constitution of any existing professional association, and such a constitution can be modified to suit our purpose. I would suggest here that if it is decided to go ahead with the formation of such an Association, an adhoc body should be formed to work out a suitable constitution

I feel that some of the functions that the proposed Association should undertake are :

1) Clearing house : The Association should function as clearing house. The Association should introduce a system for regular internal communication. The important information like work potentials in various parts of the country, availability of rigs, availability of personnel etc. should be shared with all member organisations. On the other hand member organisations should also post this information to the Association.

2) Documentation facilities : The Association should gather technical information on Water Resources Development Programmes in various parts of the country. Technical information such as :
   a) drilling condition,
   b) drilling problems,
   c) suggestion on suitable drilling methods and rig types,
   d) other facilities available in the area through Voluntary Agencies/ NGOs/etc.

   Such information should be made available to member agencies on request.

3) Seminar and Conventions : The Association should keep track of Seminar, Conventions, Workshops, Conference etc. This information should be posted to interested members, who wish to participate in such scientific gatherings. The Association should also be made responsible for organising yearly conventions of Voluntary Agencies.

4) Consultancy Services : The association should keep in touch with various professional bodies, NGO's and semi-Govt. Bodies involved in WRD programmes. Quite often such organisations are in need of consultants for specific jobs, like,

a) Water Resources Evaluation Studies,
b) Water Resources Exploration Studies,
c) Water Resources Development Planning,
d) Training facilities etc.

Such requests should be directed to member agencies.

5) Training facilities : The Association, through its efforts, should create training facilities for various need-lines in WRD. These facilities should be open to member agencies. The Association can also create funds for training through various training programmes and give suggestion for improvement.

6) Technology Development Research : The Association should keep track and accumulate information on technical and technological development in the field of WRD all over the world. Such information should then be passed over to member agencies. The Association should also gather information on changes, modifications and new techniques, implemented by member Voluntary Agencies and feed this useful information to other member agencies.

7) Quality Control : The Association should work out, introduce and implement such norms, through its member agencies, which will ensure good quality of service, and help to achieve our aim to provide safe and sufficient water to all. The Association should also try to remove such practice, in drilling agencies, which threaten to create Ground Water pollution problem due to substandard work.

8) Future Prospects : The Association should familiarise Govt. officials and organisations, on role and contribution of Voluntary Agencies in the field of WRD. The Association should keep in touch with Govt. officials and planning Agencies services can be utilised. The Association should also try to influence WRD programmes in right directions, by providing information based on practical experience gained by member agencies.

These are some of the activities which can be taken up by the proposed association. I request delegates in this gathering to discuss merits and demerits of these and any other activities, which are not listed here.

## New Role of AFPRO GITs in the Field of Integrated Rural Development

K.M. Namboodiri

INTRODUCTION :

GITs were set up in the later part of sixties initially to help the Voluntary Drilling Agencies operating at the grass roots level throughout the country. Some spectacular achievements have been made in the field of groundwater development in the most challenging areas of the country by which, drilling in hard rocks was proved to be viable. The factor responsible for such commendable achievements was the meaningful collaboration between the GITs, drilling agencies and the sponsoring agencies.

But in subsequent years (by mid seventies) GITs and Drilling Agencies started drifting away from each other. AFPRO GITs started expanding its activities to broader areas such as 'surface water development', 'integrated land and water management', 'watershed management' etc. Excellent opportunities were also created for exchange of ideas right from the most advanced technologies to simple appropriate technologies. In few instances village youths were provided with on-the-job training in surveying, planning and designing simple minor irrigation schemes.

Today GITs and for that matter AFPRO as a whole are still in the process of widening the scope of their activities, e.g. Social Forestry, Pisciculture, Appropriate Technology and so on. How far we can afford to expand like this? What is the real impact of our services? Is it not time enough for AFPRO and GITs to direct its attention to a more active role in the field of development. A deeper rather than wider involvement in the developmental activities?

IMPACT OF GIT SERVICES - A CRITICAL REVIEW :

AFPRO GITs have done tremendous amount of work in the past 13 years - thousands of wells were recommended, number of minor irrigation schemes supposed to benefit thousands of acres of land were surveyed, planned and designed. Master plans for total land and water resources development and management in large tracts of land, prepared and submitted. All these statistics we have, but how are we to assess the real impact of our services ?

Though the new trends in GIT's approach seem to permit closer association with projects and more active and persistent role in the field of development, these

happen to be still in the experiemental stage (e.g. Devpimpalgaon, Lalpur dam, Lift irrigation scheme near Bangalore, Lal Bahadur Shastri Trust, Varanasi etc.). The following drawbacks still persist in our approach :

(a) We GIT's do not have a built-in system to acquire feed back information. The project holders seldon come back to us even if they have some problems while implementing the scheme.

(b) GIT's are not provided with opportunities for being exposed to the problems of execution of projects and improvization of technology based on such implications.

(c) GIT's do not have a built-in system for transfer of technology to the organisations working in the grass root level. This was experimented and found extremely encouraging in AGRINDUS, Mirzapur, U.P.

FUTURE ROLE OF GITs :

GITs role would be really meaningful only through deeper involvement in the development process. Here are some suggestions :

i. Water Well Drilling :

GITs should include water well drilling as one of its regular activities. This would complete the set-up required for ground water resources development. With the valuable feed back data thus readily available, GITs can reach nearer to perfection in the field of groundwater development. Simultaneously it would provide opportunity to serve people directly.

However, GITs may continue to help voluntary drilling agencies wherever the need arises.

ii. Integrated approach to total water resources development :

GITs can become members of executive bodies or advisory committees of ongoing projects thus assuring continuous support. In fact this could be a pre-condition for entertaining requests. Experts from AFPRO-HQ in the field of water resources, anumal busbandry, agriculture and appropriate technology should also actively contribute to such co-ordinated ventures. Devpimpalgaon experiement was a good start.

iii. Research and Training :

GITs can offer on-the-job training in water well drilling, simple procedures

of surveying, planning, designing and execution of minor irrigation schemes etc. Simple drilling machines, water lifting devices etc. are the possible avenues for research.

PROPOSAL FOR A MODEL GIT :

Keeping the above discussions in mind it is suggested that AFPRO might consider creation of one or two model GITs on an experiemental basis. A draft proposal is hereby submitted.

Venue :

It may be appreciated that there are hardly any voluntary drilling agencies in TAMIL NADU and none in Kerala. Drilling demand in Kerala is increasing day by day although it is steady in Tamil Nadu. Private drilling agencies not only charge heavy rates but also render very poor services, whereas Government rigs are too busy to be available. Hence, the common man is still on the waiting list. Regarding other fields there are many total water resources development and management schemes with CASA, RUHSA & ASSEFA ready for implementation. All these agencies demand our continued support until the projects are commissioned. Moreover, there are requests being received from Voluntary Institution in Kerala for technical guidance in setting up of water well drilling projects.

The above facts lead to a conclusion that there is a cause for an operational GIT in the south. Coimbatore appears to be the most appropriate centre, considering the following :

- Proximity to the project areas
- Good communication facilities
- Industrially and commercially leading
- Good climate
- No disturbance to the existing staff

Organisation :

To avoid all the complications involved in nominating board members, registering a separate body etc. this new GIT can continue as such under AFPRO, within the administrative control of WRD. Under the present circumstances since AFPRO has decided to levy service charges, it will not be a big problem to convert atleast one GIT to an operational unit on an experimental basis. Moreover, self supporting or generating more funds will not be its primary objective but to permit scope of association with the construction procedures so as to help improvisation of the technology and more active involvement in the developmental process will be the aim. No doubt, the operational expenses thus involved will be reimbursed by the beneficiaries.

Services :

The new GIT will render the following services :

Advisory/Consultancy :

1. Well siting

2. Detailed basin wise/area wise surveys to assess the total water resoucres potential and preparation of master plans for exploitation and management of the same.

3. Survey, planning and designing all types of minor irrigation/water water supply schemes.

4. OFD planning for command areas of irrigation schemes.

5. Soil survey, planning for reclamation and crop planning.

6. Supervision execution of schemes prepared by GIT.

Operational :

1. Drilling all kinds of water wells including extension drilling.

2. Yield testing

3. Installation of bore well pumps.

4. Water quality analysis (chemical)

Training and Research :

1. Conducting Seminars/Workshops.

2. Training courses for grass root level volunteers on simple techniques of surveying and planning for minor irrigation schemes and thumb rules to be followed while execution of these schemes.

3. On the job training for village youths on simple drilling techniques.

4. Experiments on fabrication of simple and appropriate drilling rigs that can be fabricated and operated efficiently by village black-smiths and unemployed youths.

5. Experiments on simple water lifting devices.

Criteria for entertaining requests :

The priorities will be accorded in the existing order for entertaining requests. However, enough publicity will be given in the voluntary sector regarding GIT's services so that the traget groups draw maximum benefit. Except for the site investigations for wells all other surveys will be undertaken only after preliminary visits and being satisfied about the credibility and feasibility of the scheme. Assurance of funds, co-operation of beneficiaries, Government clearance etc. will be a few important guiding factors, Another condition is that all bore well sites recommended by the GIT shall be essentially drilled and yield tested by GIT itself or in its presence. In other words, only those sites the drilling of which can be supervised by GIT will be surveyed and recommended.

For all other schemes GIT will play the role of a technical consultant until the scheme is commissioned and its recommendations should be binding on the project. Wherever possible, GITs could become members of the Executive/ Advisory Committee of projects/schemes.

**********

(Mr. Namboodiris paper was further elaborated with specific details of the project. Since the meeting has the limitation of discussing a proposal rather conceptually from a viewpoint these details had to be deleted from the proceeding records. Any reader interested in such details may however approach Mr. Namboodiri personally - Editor)

# Selection of a Water Well Site

M.K. Moitra, AFPRO GIT Unit IV, 7 Pataliputra Colony, Patna.

It has been desired here to highlight situations usually encountered while drilling a water well. Although the problems in this paper appear to have been put forth in a rather frivolous manner but one hopes that the seriousness of the problems will not be lost by the manner of presentation. A little attention may remove these minor but otherwise serious problems faced by a beneficiary while drilling a successful water well.

The most auspicious moment that the religious scriptures permit are chosen, coconuts are broken, with other offerings, and a very hard prayer, as was never made before, even by the stringent atheist, is performed, before it is started. This possibly, is the common scenario while the drilling of a water well begins in most part of hard rock areas in our country.

The stakes are high. A successful water well means a new vistas to an agriculturist and a failure is a doom for a very long time to come. The money involved is only a few thousands of rupees.

A situation like this is almost a common experience that a water well driller faces most of his working days. The tension builds up as drilling proceeds, the gushing water being expected at very next foot. It reaches the height when the planned depth is reached and yet no water struck. The client runs around to collect more cash and tries his luck for another twenty feet followed by ten more feet and finally tries the last few feet. The situation has all the in-built ingredients for a stimulating gamble, where a driller is not a mere observer. He is also involved in the success or failure of a bore well created by him.

In the end a frustrated driller moves his machine to the next site leaving a dejected "beneficiary" behind, condemned and broken for the rest of the life. Such a situation, if not be completely eradicable, can at least be averted in most cases, with proper understanding and a down-to-earth approach, simply by selecting a "proper site", before drilling.

A site, of course is always selected, Mexicans do it by throwing their hat in the air and selecting the spot where the hat drops. Siting of a water well in our country from age old period had been a sole concern of the black magicians, diviners, clergymen and the rest of the fortune tellers.

A diviner, if found wrong, merely proves that he is not a good diviner. The search for better diviner goes on. Divining can never be wrong. For a successful diviner, his reputation moves far ahead of him, failures naturally forgiven. But today it is as much a concern of the scientists.

Although scientific and suitable techniques for water well siting are available in our country for the better part of past 10 years, but it has not been able to replace the mysticism involved in such work. Even today a water well is first located by a diviner, and only later is confirmed by a scientific siting.

Electrical resistivity surveys for well siting, sometimes referred to as vertical electrical sounding, is fairly accurate, economical and a quick method. A water well site could be investigated within 2 to 3 hours by a team of three. The cost of such survey may range from Rs. 300/- to 500/- which is less than 5% of the drilling cost and about 2% to the cost of a complete well in all respect.

A driller is well aware of all these developments. But drilling is a full time job loaded with all the problems one may care to imagine. It may be a common experience that co-ordination with a siting team becomes difficult. Incidences like, when the machine is ready, the site is not yet cleared and vice versa, or where the rig is ready the site is not approachable and vice versa, are rather common. Since co-ordination has been a major problem so far, the aspect of siting had been left to the customer alone. Neither is it desired by most, to share the responsibility of a possible failure.

But shying away from problems never helped. Drilling agencies particularly in the voluntary sector can definitely meet this extra challenge by raising a team of their own providing this service, in-built into their total work. If such additions are not feasible, the customer can be guided to suitable agencies. There are also many enterprenures who are competent to render service in site selection. If properly encouraged, many more agencies will be formed to meet this challenge and bridge this demand & supply gap. And a beneficiary will receive the fruit of modern science.

## RAPPORTEURS NOTE

The following papers were presented in this session :

1) Organisational Set-up of the Voluntary Sector for Water Resources Development, by Mr. V.G. Joshi, ELC WDP, Betul :

The paper outlined the reasons for the need of such an Association, and the possible functions that it could undertake. It also suggested guidelines by which such an Association could become operational.

2) New Role of AFPRO GITs in the Field of Integrated Rural Development, by Mr. K.M. Namboodiri, AFPRO GIT, Coimbatore.

This paper made a broad review of the evolution and work of the GITs, since their inception, with the intention of developing a future role for the GITs. Mr. Namboodiri's proposition was to make one GIT functional in the field of tube-well drilling, so that AFPRO could gain experience in the possibility of providing one more phase of water resources development work directly to beneficiaries, and to obtain feed back, which the GITs were not getting presently. The paper went further to outline organisational and financial implications of taking such a step.

3) Selection of a Water Well Site by Mr. M.K. Moitra, AFPRO GIT, Patna.

Mr. Moitra's paper dealt with, not so much as the "selection" of a site but rather with its non-selection and consequences thereof, or the field situation where scientific selection of a water well site attains a negligible priority. The paper points out the need for coordination, and understanding in the water well industry between the rig operators and the scientific ground-water investigation groups, the lack of which often ruins the so-called beneficiary.

Discussion :

The discussion started with an emphasis for the need for a strong organisational set up for coordination between the agencies involved in water resources development and for broadening the understanding of water resources development to mean much more than tube-well drilling. There was a basic agreement on these issues. Since the question of formation of an Association needed further debate, and since such a discussion was not scheduled, it was decided by the body to discuss this subject in a special session. A heated debate was sparked off with the suggestion that the AFPRO GIT had a limited utility in Maharashtra since the Govt. had organisations involved in similar work. Counter arguments to this suggestion

were that the financial institutions still preferred GIT Ahmednagar's services for well siting, and GITs of other areas have proved ground-water availability in areas that were considered to be "dry". The example of Jammalamadugu, AP was quoted where 22 successful wells were drilled in 1981 with proper siting by GIT, Hyderabad, where as all earlier efforts of the Govt. had failed.

The discussion then took a turn for the need for coordination for efficient use of machines. The lack of genuine indigenous & imported spare parts was felt to be a big drawback, preventing the efficient functioning of rigs. Some alternatives were suggested like developing local manufacturers, and using existing import channels.

In the discussions on the need for GITs to become operational in tube well drilling the two general view points were : GIT should become operational in drilling to have a rightful stake in the implementation of their investigation results, for obtaining and recording accurate field data at the time of drilling, which projects were not giving, and for monitoring. The counter proposal was that GITs be attached to projects to achieve the same ends, without going through the problems of operating equipment. A third suggestion was that since projects were tending to create their own investigation units, where GIT services were not available, then GITs should also be allowed to become operational in areas, like Tamil Nadu & Kerala, where there was a lack of projects involved in drilling.

The need for standardisation of procedures and maintaining professional standards through a central body, was stated in order to avoid crash programme & crisis situations, where quality of work and coordination was some times sacrificed for speed.

## Report on the Special Session—Need for an Association

Rapporteur : Raj Kumar Daw, AFARM, Poona

In a special session on the night of 4th August 82, the basic guidelines for the formation of an Association of voluntary agencies in water resources development was discussed at great length.

The formation of an Association had been raised a number of times, the last occasion having been in August 81 at Hyderabad. The present session consisted of a discussion on the same topic, on the basis of a paper prepared by Mr. V.G. Joshi of ELC WDP, Betul.

The salient points of discussion were as follows :

1) It was recognised that a certain amount of preparatory work was required before the official creation of the Association. A Steering Committee consisting of one representative each from AFPRO, New Delhi, Swisstecho Drilling (or Omega Drilling), Hubli, and ELC WDP, Betul, were to meet as and when necessary to work on the following issues :

   a) Legal Status of the Association.

   b) Nature of Membership.

   c) Otuline of objectives and functions.
   (using Mr. Joshi'paper for a guidline)

2) The office facilities of AFARM, Poona, are to provide the temporary base for the Association till such time as it comes into legal existance and decides on its own location. The staff of AFARM will therefore initiate all correspondence for the Association till its legal creation and convene meetings of the Steering Committee.

3) While the Steering Committee works out the problems posed to it,

   It was decided to collect the following information as soon as possible :

   a) Inventory of equipment : Equipment related to Water Resources Development activities like Rigs, Compressors, Blasting Equipment etc., giving details of manufacturer, year of manufacturer, present

condition, ownership, mobility (nature of carrier), investigation facilities, pumping test facilities etc.

b) Status of spare parts for the above equipment : Available stocks, future requirements of major items, known sources of supply in India , methods of import, if imported.

c) Repair facilities : available for maintenance of equipment.

d) Terms and conditions of work : Work rates, major sources of work (Govt., Pvt. Individual, Institutional - like banks etc.), Nature of work.

4) It was agreed that initial contributions of Rs.500/- each, would be requested for, from agencies seeking membership of this Association. It was decided to request AFPRO, New Delhi, to make of a lumpsum grant or Rs.10,000/- meet the initial expenses of creation of this Association.

5) It was agreed that the name of the association should be National Association for Water Resources Development.

## REPORT ON THE THIRD WORKING SESSION :

### Economics of Drilling

| | | |
|---|---|---|
| Chairman | : | Mr. J.M.Gandhi, M S S M, Jalna |
| Speakers | : | Mr. J.N.Kathuria, Omega/Swisstecho, Hubli |
| | | Mr. D.C.Changan, AFPRO-GIT, Ahmednagar |
| Rapporteurs | : | Mr. D.K.Fouzdar, AFPRO, New Delhi |
| | | Mr. J.D. Lemos, A W D M S, Bangalore |

## Report on the Third Working Session--Economics of Drilling

### Rapporteurs Note

The two papers presented in this session - both dealing with 'Economics of Drilling', dealth with two different aspects of drilling. Mr. D.C.Changan, who drew attention to an idea originally propogated by two U.S.Scientists Dr. James Waltz and Tim L.Decker, dealt with the subject of salvaging of the failed wells while Mr.Kathuria dealt with the economics of drilling operations and related management practices. Since drilling operation is only the means and not the end, both speakers on 'Economics of Drilling' were able to bring home the basic content of the discussion - the economics of 'water' tapped through drilling.

Mr. D.C.Changan presented the idea of hydrofracturing, as a summary for the purpose of dissemination. This generated a lot of interest since most of the participants wanted to absorb the idea with respect to blasting. A substantial part of the discussion was therefore devoted to blasting techniques and one of the speakers discussed in detail about a useful blasting technique often used in developing wells in fractured rocks including basalts. In this, liquid explosives and sand are packed in successive layers and the blasting is carried out.

The result is that cracks that develop in the rocks and the sand presumably enters the cracks by not allowing them to close back. This auguments groundwater transmissibility to a greater extent. This happens in the hard rock formation which have isolated vents and openings that provide storage without having any provision for transmission. In Deccan trap areas this problem is rather acute.

The hydro-fracturing method is infact a combination of methods. There are cracks in the rocks which are often isolated and can be seperated from a productive (water bearing) fracture only by an inch or so. If these fractures can be interconnected, the well could be made productive. This is exactly what is done in this method by first introducing an inflatable packer and thereafter introducing a high pressure water (500-10,000 psi or more) through the packer. This would obviously cause fracturing in the rocks. During the pumping (of water) small particles of high strength plastic material or even sand is introduced which enters the crack to maintain the openings. The hydrofracturing fracturing technique could be adopted as a useful well development technique. Some experiments are required to be carried out and the results may be compared with the cost incurred as against the increase in yield. The basic difference with blasting, in this case, was that here the explosion is extremely controlled and therefore no side effects (caused by a hostile explosion ) are envisaged.

In India, where most of the drilling operation is carried out without a predrilling investigation (Hydrogeological/Geophysical), there is also a strong likelihood of misusing the method. Also this method, like other unproductive

drilling ventures, is prone to emerge as an additional source of expenditure for the poor and marginal farmers. Somewhere during the course of presentation and discussion, a note of caution would have been appropriate.

On the other hand, this method could be practiced on an experimental basis in a controlled way in order that a suitable method of well development in hard rock areas is evolved - a measure that is so much of a necessity for the water wells in the hard rock areas.

Mr. J.N.Kathuria initiated his talk by suggesting that the drilling units could be run viably either by engaging the machines to the maximum extent or by increasing the price (of drilling) so as to compensate for the deficit. He observes that revenue of drilling should be assessed and evaluated on the basis of expenditure incurred per unit depth of drilling (per foot or per metre). Therefore, use of fuel and lubricants should be calculated on the basis of per metre of drilling and not on the basis of per hour of machine running which is usually done. It was also stressed that after having organised staff and equipment, if the unit is idle for want of work it would inevitably incur losses though this phenomenon should not fall under the purview of economics. This is obvious because, at best, one can orient the men on machine for the most economic output to benefit the consumers. If work demand fluctuates the way it does in the water well drilling industry of today, it is rather difficult to deliver the goods, at the minimum expenditure to the beneficiaries.

Mr. Kathuria, in a straightforward manner, presented the fact that the voluntary agencies, most of which are formed out of idealistic considerations, expect that a professional working in it should also be idealistic. A driller should be expected to handle his job properly and he in turn expects to be paid in lieu. It is often argued that if the men on the machine are quite dedicated they should be satisfied with less emoluments since they are working for the poor.

For doing a professional job the approach should be equally professional and therefore for doing a superior job in terms of quality and quantity, better persons have to be chosen. If such people are not paid at par with their market value the entire proposition will fall through. He suggested ways and means of producing more in terms of drilling (footage). The increase in production rate by additional shift operation is always a desirable alternative. The approach to achieve this may however vary from agency to agency. At this juncture, mention was made of payment of incentive to the driller and the drilling crew. All these were presented with an emphasis that the time related cost do not comply with the production related cost. Since drilling is charged on the basis of depth of drilling at the rate of metres/feet drilled, the expenditure heads should also be analysed on the basis of metres drilled. During the deliberations, reference was made to the depreciated value of the drilling machine and accessories, idle time, mechanical maintenance and stores management and all other relevant matters.

The discussion that followed were mainly on four topics :

i) Incentive

ii) Drilling target

iii) Idle time

iv) Depreciation

The question of incentive was discussed in great detail. The various types of incentive mechanisms were discussed. All these incentive systems were aimed at increasing the production rate for the purpose of decreasing the cost. Some of the drilling agencies pay on the basis of footage drilled beyond a fixed monthly target and some pay it on a lumpsum basis.

In some units, the rate of incentive keeps on increasing as the output increases. It was also suggested at one stage that beyond a peak the incentive rate should decrease.

The fear of misusing the machine was expressed since the crew is liable to work under strain. It was also stressed that when the amount for incentive goes beyond the monthly emoluments, the crew suffers during the slack seasons and for other idle periods. Also, when the machine is old, the performance reduces and therefore is most likely that the incentive system would fail since incentive mechanisms are tuned generally on optimistic condiserations. It was, however a majority view that an incentive system has the in-built disadvantage that the crew would be prone to overwork and therefore strain the machine and expose themselves to work hazards.

Drilling target is a related issue and it was put forward that while a Halco 625's maximum recorded drilling in an year was 18,413 ft, the average performance per machine per year for this kind of a machine is 7813 ft. There was not much discussion on this topic. It seems a detailed evaluation is required to resolve this issue since the entire incentive mechanism would depend basically on this data.

Similarly, the discussion on idle time evoked tremendous interest. The idle time of drilling machine is caused due to many factors, like machanical breakdowns, short supply of stores delay due to rains and programming and finally unproductive time for travelling and delay due to the poor road approach. So far some idea could be formed from the statement of SWISSTECHO/OMEGA, Hubli, that in a particular year idle time due to various delays were as follows :

| | |
|---|---|
| Travelling | 8.70% |
| Mechanical breakdown | 16.17% |

| | | |
|---|---|---|
| Rains, Programming & other uncertain elements | | 23.61 % |
| Short supply of stores | | 3.17 % |
| Total | : | 51.65 % |

This automatically means that the total time used for actual drilling was 48.35%. While discussing depreciation, it was questioned as to how a 10% depreciation should help when price escalation on the machine is appreciably higher and that the life of a drilling machine is rarely 10 years which would be evident from the past experience.

It was suggested that one has to be cautious on the question of depreciation. The life of a machine may be prolonged if a systematic maintenance method is inculcated within the system. Yet, it is safer if the depreciation is earned keeping in view the replacement value of the machine rather than the purchase value.

The session on 'Economics of Drilling' was very lively and interesting. From the above summary of discussion itself it is evident that there remain many unanswered questions which need to be further discussed with the participation of a few more agencies. The topic of 'Economics of Drilling' therefore remains a topics of discussion in future for the drilling agencies in the voluntary sector.

Dilip Fouzdar

## Economics of Drilling

J.N. Kathuria, Swissteco Drilling, Hubli.

I have been asked on a few occasions to comment on cost/revenue estimates submitted to financing institutions, by people wanting to buy rigs. Almost invariably these had been prepared by manufacturers. While manufacturers can be expected to highlight the benefits of purchasing their equipment, they cannot be expected to make simple mistakes like multiplying penetration rate in terms of meters per hour, by working hours per day, by the working days in an year, to arrive at the annual drilling capacity of their rig. Needless to say anyone basing an estimate of revenue on such figures, will be in for a very unpleasant surprise later.

It is not only some manufacturers who are responsible for giving information which results in wrong estimation of costs, but even drilling agencies with experience also. They are perhaps reluctant to disclose their costs. I recently came across such an agency, who claimed they were not doing too well and wanted some tips. They provided the following information :-

1. They owned two indigenous rigs.
2. They drilled 4000-8000 feet per rig per month.
3. They averaged 9 months working time per annum.
4. They charge Rs. 210/- per metre for drilling.
5. Their staff salary bill was Rs. 10,000/- per month.
6. They paid a commission of Rs. 10,000/- per month, on the work done.
7. Bit life was around 5000 feet.
8. The Bits and Down Hole Hammers used by them, were not satisfactory.
9. They had no problems with their equipment.
10. They had a 5 years bank loan of Rs. 8.00 Lakhs @ 14% interest.
11. They got their casing pipe @ Rs. 40/- per foot and billed their customers @ Rs. 65/- per foot.

Assuming the revenue on the lower side by taking the lower figure of 4000 feet per month per rig for 9 months, i.e. 36000 feet per rig per annum, I find as per the figures below that they should be receiving Rs. 41.85 lakhs per annum PLUS revenue on pipe sales, out of which the expenses not covered would be Maintenance & Repairs, Fuels & Lubricants, Taxes, Insurance, Administration and Overheads.

| COSTS | | Rs. | Ps. | DRILLING REVENUE | Rs. | Ps. |
|---|---|---|---|---|---|---|
| Salaries | 10,000/- x 12 = | 1,20,000 | =00 | $\frac{72000 \times 210}{3.28}$ = | 46,09,756 | =00 |
| Commission | 10,000/- x 9 = | 90,000 | =00 | | | |
| Bank interest (averaged over 5 years) | | 67,200 | =00 | | | |
| Bank installment | | 1,60,000 | =00 | | | |
| Depreciation @ 10% assuming 8.0 Lakhs per rig | | 1,60,000 | =00 | | | |
| | | 3,09,200 | =00 | | | |
| Bit cost @ Rs. 8,000/- per Bit | $\frac{72,000 \times 8,000}{5000}$ | 1,15,200 | =00 | | | |
| | | 4,24,400 | =00 | | | |
| Difference between Income and Expenditure | | | | | 41,85,356 | =00 |

* Revenue from pipe sales not included.

Expenses to be accounted for :

Fuels & Lubricants.

Maintenance & Repairs.

Overheads -

Taxes.

Insurance.

Administration.

Could anyone connected with drilling believe these figures?

In Drilling, as in any other industry there are two kinds of costs, Time Related and Work Related, besides some that cannot be correctly classified under either. Eventually they have to be related to the unit of work done, which in the case of drilling would be, per metre drilled.

Economy can be achieved in either of two ways, reduction in total expenses for any head of account, or by being able to spread it over more work done. To illustrate this, let us assume a make of drill bit costs Rs. 8,000/- and gives us a life of 500 metres. While it may appear to be economic to go in for a bit, which costs Rs. 7,000/-, it will not be so, if the life of that bit is less than 437.5 metres.

Before trying to analyse how to economise, let us list the costs involved in drilling. These can be broadly classified as :-

1. <u>WORK RELATED</u>

   Maintenance & Repairs.

   Fuels & Lubricants.

   Drill Bits.

   Incentives.

2. <u>TIME RELATED</u>

   Staff and Administration.

   Accommodation.

   Taxes.

   Insurance.

Depreciation.

Interest on capital.

3. OTHERS

Staff Welfare and Medical Aid.

Miscellaneous.

Taking the work related costs first, it should be obvious that good maintenance will help keep the costs down. An engine or compressor needing repairs will waste fuel and the reduced efficiency will not only add to Fuel costs, but overall total costs also, as the rig will produce less holes per unit of time.

As such, the importance of good maintenance cannot be over emphasised. The best make of machine, even taken together with the best driller and the best organization, will not be able to work economically or complete with an inferior machine, if it is not kept in good mechanical condition.

Bad fuel or adulterated fuel will contribute to the same end result. So it is important to buy the fuel from reliable sources and to prevent contamination during transport, storage and use.

Bits too need maintenance, A dull drill bit wastes time and fuel, consequently money.

The above points emphasise good maintenance AND preventive maintenance. The 'when' and 'how' will differ from one project to the next.

Time related and other costs can be reduced best by producing more, The biggest contributor is the staff. It would be false economy to try to find cheap labour, if they cannot give optimum production from a machine. At the same time, it would be undesirable to pamper the staff to the extent, where they feel that anyone of them is indispensable. Although shown in work related costs, incentive have a big role to play in cutting down time-related and other costs. Each project would, I am sure, be having its own way of handling this issue.

Once the total costs for a given period of time have been estimated or ascertained, comes the most important question "How much work can be done in the same period", as without this estimation, neither the charge nor the break even point can be thought of. The amount of work that can be done will depend on the machine, its condition, the operators AND lastly but not of least importance would be the management, which has to control to whatever extent possible, the biggest enemy of

any project, Idle Time, whether it be for programming, movement or repairs and maintenance.

From a study of the Annual Reports of AFPRO, who are among the biggest fleet owners of drilling rigs, we find that the average annual performance of various rigs is as follows :-

| Make of Rig | Max. drilled during any one year | Average drilled per annum 1969-77 |
|---|---|---|
| Halco Tiger | 13391 ft. | 5117 ft. |
| Halco 625 | 18413 ft. | 7813 ft. |
| I-R Trucm-3 | 29835 ft. | 13876 ft. |
| Sanderson Cyclone | 13419 ft. | 10518 ft. |

Figures taken from Swissteco's records show that the annual performance can be revised for Ingersoll-Rand Trucm-3 rigs and that of an RMT rig introduced as follows :-

| | | |
|---|---|---|
| I-R Trucm-3 | 25858 ft. | 14620 ft. |
| RMT | 16114 ft. | 13800 ft. |

Figures taken from the January 1981, issue of the US Water Well Journal indicate that; for firms drilling wells between 100-300 feet depths, the average annual performance is 18290 feet.

As such, it can be seen that excluding flashes in the pan, the average capacity per DTH rig having a 100 psi Compressor, will normally not exceed 20,000 feet per annum, when considered over a number of years. In fact, in many cases it will be considerably lower. Talk of more than one shift operation cannot be justified over any prolonged period. Apart from poor programming by the clients like PHE Departments, who are the biggest customers for most drilling agencies, lack of trained personnel, the fact that in India , manufacturers of rigs, spares, accessories etc., can rarely supply anything off the shelf, also needs to be kept in mind.

For our projects, we consider 20,000 feet per rig per annum as optimum and 60-62% as the break even point.

My analysis of drilling costs for two projects for the last year is as follows :-

| | PROJECT I | PROJECT II |
|---|---|---|
| Utilization | 62.65% | 37.00% |
| Work related costs Rs./ft. | 27/76 | 27/99 |
| Time related costs Rs./ft. | 21/74 | 36/79 |
| Other costs Rs./ft. | 0/83 | 1/49 |
| Total Rs./ft. | 50/33 | 66/27 |

While the costs in terms of Rs./ft., differ considerably, they come very close if a correction is made for idle time, i.e., time related and other costs spread over total capacity. The corrected figure would then be :-

| | PROJECT I<br>Rs./ft. | PROJECT II<br>Rs./ft. |
|---|---|---|
| Work related | 27/76 | 27/99 |
| (Time related and other costs)x percentage of utilization expressed as a fraction of 1.00 | 14.14 | 14.16 |
| | 41/90 | 42/15 |

This should help illustrate the effect of idle time on drilling costs.

## An Overview–Hydro Fracturing Technique and Effectivity in Indian Conditions

Dilip C. Changan (Hydrogeologist)., AFPRO - GIT., Unit - I, Ahmednagar 414 001.

This note basically deals with the discussions on applicability of Hydro-Fracturing Stimulation Technique in Indian conditions considering the cost of drilling, especially in hard rock areas.

This technique is being used in U.S.A. Since 1977 and results thereof for 30 borewells after stimulation, have been given by Dr. James Waltz and Tim.L.Decker, in the article appeared in Johnson driller's Journal vol.53, No.2, Second quarter 1981.

PREAMBLE :

This technique basically involves creation of additional cracks/fracture in the low yielding domestic wells by means of brushing, shooting and then pumping water, into a sealed well under high pressure ranges between 500-10,000 psi.

For more details, the original article can be referred to .

APPLICABILITY TO INDIAN CONDITION :

The hard rock formations of igneous and metamorphic origin constitute over 70% of the Indian geographical area. A majority of the wells located in these formations derive water from vertical/horizontal fractures. In many cases it is a known fact, that a bore well is dry or very low yielding because it missed the water bearing fractures by few inches. Also, it normally happens that the wells will be very low yielding, because the fracture/cracks intercepted by the bore well are too minute to yield sufficiently. Hence this results in abondoning the well because though water is struck it is insufficient to meet the requirement.

As pointed out in the article, the improvement of yields of domestic well, by a few liters per minute, after stimulation efforts, would be a great benefit to the client, as this avoids the investment for taking up new bore well.

COST TO THE CLIENTS :

With the given figures in article as the Capital investment (Exclusive of Truck) is approximately $ 10,000/- i.e. Rs. 1,00,000/-

However, if this Hydro-fracturing stimulating unit is commissioned in India, the cost is worked out considering actual expenses viz. pick-up van, salary and benefits for crew, depreciation, maintenance etc. as below :

| | | Rs. |
|---|---|---|
| A) | CAPITAL INVESTMENT : | |
| i) | Hydro fracturing Equipment (Imported and accessories | 1,50,000-00 |
| ii) | Truck (Indian) | 2,00,000-00 |
| | | 3,50,000-00 |
| B) | OTHER EXPENSES : | |
| i) | Depreciation @ 10% per annum | 35,000-00 |
| ii) | Salary benefits for 3 crew per annum (It includes, batta, C.P.F. Gratutity etc) | 47,130-00 |
| iii) | Interest on Capital Investment @ 15% per annum | 52,500-00 |
| iv) | Maintenance @ 10% per annum | 35,000-00 |
| v) | Road Tax insurance for the unit | 5,000-00 |
| vi) | Miscellaneous Expenses @ 10% | 35,000-00 |
| | | 2,09,630-00 |

Therefore, overall expenses work out ot be Rs. 2,09,630.00 per year for a Hydro fracturing stimulation unit. However, if 150 bore wells are attempted with the help of this unit in a year the procedural expenses are very modest to the clients i.e. Rs. 1397-53 or say Rs. 1400/- per stimulated bore well (excluding transportation and profit to the contractor/drilling agency). Hence if the

cost for one bore well (stimulated) is kept to be Rs. 2,500/- plus transportation extra on Km basis, it appears to be economically feasible to contractor and as well to the clients.

However with the existing drilling rates if client has spent Rs.9,000/- for a unsuccessful bore of 4 1/2 " dia drilled upto a depth of 200'. With the above price structure for hydro fracturing a client/owner risks only Rs. 2,500/- or say Rs.3000/- with transportation. This means on an average client probably risking only 33.33% over and above the original cost of the unsuccessful bore well. More over if the stimulation efforts proves successful client is saving Rs. 6,000/- on what a redrilled bore well would normally cost with no guarantee of reliable yield. In addition the client is also provided with the accurate data pertaining to the production and reliability of the well. This data enables him to select and install a suitable pump.

CONCLUSION :

In conclusion I would like to strongly advocate the urgent need to initiate this technique in our country, especially in hard rock areas where failure rate of the borewells could be as high as 40% even catering to domestic needs.

Also it is relatively a low total investment, compared to what it needs to invest in drilling, pumping test and service equipment. Hence this technique not only provide a broader range of service to the needy clients but also a profitable proposition in itself to the contractor/drilling agency.

ACKNOWLEDGEMENT :

The author wish to record his appreciation and gratitude to Mr. J.B.Singh, Executive Director, Col. B.L. Verma., Head WRD., AFPRO New Delhi. Also my thanks are also due to Mr. L.V.R. Reddy, Officer Incharge and colleagues AFPRO - GIT., Unit-I, Ahmednagar., who helped while preparing this paper.

# REPORT OF THE SIXTH SESSION

## Rapporteur's Note

| | | |
|---|---|---|
| Session | : | SOCIAL ENGINEERING |
| Chairman | : | Mr. T.K. Mathew |
| Speakers | : | Col. B.L. Verma<br>Mrs. Nalini Singh<br>Mr. A.P. Fernandez |

## RAPPORTEUR'S NOTE

This session brought some very interesting though controversial topics for discussion. Chairman Mr. T.K.Mathews opened the session by sounding up on the need for and significance of social engineering.

| | |
|---|---|
| Col. Verma | Explained how he realised that much more is needed for development than mere engineering outlook, through number of illustration. He realised the dire need for incorporating social parameters while designing projects, especially after joining AFPRO where he could look at development projects from a different angle. |
| Mrs.Singh | Continued reacting to Col. Verma's observation. While agreeing that voluntary drilling agencies have limitations in tackling the social problems, she made some suggestions as to how they can involve people right from the planning stage of schemes e.g. drinking water schemes. Responding to Mr. Roy Chowdheri's remark that women of the village should be consulted for selection of sites for drinking water wells, Mrs.Singh observed that infact women's opinion should get priority. The need for "Armchair Sociologists" to move into grass root level, training the community in maintenance of projects, need for tackling the hetrogenous social problems coming in the way of even simple programme such as drinking water schemes etc. were also dealt by Mrs. Singh. She wondered whether the voluntary drilling agencies have a planned system so as to immediately respond to natural calamities. |
| Mr. Fernandez | Apart from actively responding to discussion on "Social Engineering", Mr. Fernandez took the audience into a new area viz. Expectations of Donor Agencies from Recepient Voluntary Agencies. He classified the Donors into three groups viz. |

- Those who do not have any expectations and are content just by sending aids

- Those who are satisfied by data on physical achievements

- Those who have concern about social engineerings.

DISCUSSION :

Many people spoke during discussions. The gist is given below :

- Socio-politico-economical aspects of rural areas are so complex that it is almost impossible for voulntary drilling agencies who are primarily technocrats to involve deeply.

- The need and extent of compromise a technocrat should make on scientific approaches in order to suit the social needs and constraints.

- Technology is neither neutral nor absolute and since there is human brain, it has responded to some social need before being derived.

## CONCLUDING SESSION

| | | |
|---|---|---|
| Speakers | : | Dr. S.T.Guiar |
| | : | Col. B.L.Verma |
| Vote of Thanks | : | Mr. J.M.Gandhi |
| Rapporteur | : | Mr. R.K.Daw |

In his concluding address, Dr. Gujar briefly recapitulated the important points of discussion raised during the meeting. These were :

- Relevance and Viability : A topic which was discussed at length, but still left many unanswered questions.

- Incentives vs Quality : There was a need to share experiences of the field so that projects can learn from each other.

- Compensation for failed wells : Each project has its own method of compensation. Some build in the costs of failed wells into their total charges and give discounts, some have earmarked funds to meet such expenses. However, accurate information is needed on the basis of which standard norms can be adopted to tackle this question.

- Interchangability & Convertibility of Spares : A great deal of elaboration is needed in this question. Experiences on reconditioning needs to be shared to put machines back to use.

- Training : Voluntary agencies have become a source of trained personnel, and since this is a reality, where we loose our trained manpower, training should be done on a larger scale and continuously so that better people go out into the market through us, and so that voluntary agencies going into new areas have trained manpower to draw on.

- Pump maintenance : This is an aspect of water resources development where voluntary agencies have a substantial role to play. Under the present circumstances, the maintenance of hand pumps is entirely left to the Governmnet, and this facility does not function very effectively.

- Association : The need for an Association has been felt for a long time, and at this meeting some concrete steps have been taken to form the Association. It should provide the voluntary agencies with a common forum, and in information system.

Since it was firmly decided in favour of " to be" , there was a greater need for emphasis on the efficiency and quality of service from the voluntary sector. It is not enough just to provide water, which the private contractor can do, though there is a question of quality here also. It is necessary for voluntary agencies to address themselves to the questions of conservation and management of water.

Col. Verma, in his concluding remarks, felt that voluntary agencies involved in water resources, were no more hanging on to the apron strings of AFPRO, and had found their own feet, Those projects which had inherent weaknesses, had become defunct. However, the discussions of this meeting indicated such a broad range of problems that it might be necessary to discuss these problems on a regional basis. Col. Verma proposed that the next meeting of this group be held under the auspicies of the Association.

It was agreed that the next meeting be convened during 3rd to 5th August 1983. Mr. Kathuria and Mr. D'Lemos kindly offered to undertake arrangements to convene the next meeting at Bangalore.

Mr. Gandhi, on behalf of AFARM, thanked the delegates for attending the meeting at Aurangabad.