Slow Sand Filtration Project

MEETING OF REPRESENTATIVES OF
SSF-PROJECT COUNTRIES

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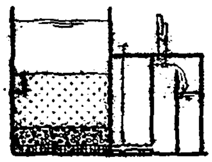

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Introduction

Slow sand filtration is an appropriate technology for treatment of surface water supplies for rural areas in developing countries. It has many advantages

- It prodives a single step treatment for raw water with turbidity not exceeding 50 NTU .
- It simultaneously improves the physical, chemical and biological quality of raw water .
- It is simpler to operate than alternate technologies.
- Operating costs are low and based on labour rather than energy or chemical inputs .
- It is reliable. There is no machinery to fail .
- Construction is simple and pre-fabrication may be possible .
- The technology is ' tried and proven ' - operating experience is many decades long .

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DESIGN AND CONSTRUCTION OF SLOW SAND FILTERS

By

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Introduction

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It should also be recognised that slow sand filters are not a prescription for all situations. Where land and labour costs are high and large volume of water is to be treated as for urban cities or filter sand of desired quality and quantity requires to be transported over a long distance making it expensive, slow sand filters may not be appropriate. Also, when raw water is subject to sudden and severe changes in quality, particularly with respect to inorganic suspended matter, additional treatment prior to slow sand filtration is necessary. This would increase the cost of the installation. These limitations, however, do not constitute serious constraints in villages and small towns of developing countries.

Design Considerations

(i) Design period : Quite often treatment plants are designed to serve a population 30 years into the future. Cost calculations show that there is very little economy of scale in slow sand filter construction. Hence, design period should be short, not more than 10-15 years. This will help optimise the investment in water supplies and reduce the capital required for initial construction.

(ii) Design population : While estimating the design population, the potential for future growth and development of the community in sectors like agriculture, industry, transportation, education, health services etc., should be given due consideration.

(iii) Per capita supply : The norms differ from country to country and with the size of population, the availability of raw water and mode of water distribution. In India, the recommended norms are a minimum of 40 lpcd for water supply through handpumps or central public stand posts and 70 lpcd when house connections are provided.

(iv) Plant capacity : The total design volume of water requirement may be filtered over a period of 24 hours or over only a few hours as is common in small plants. Hence, in order to arrive at the size (area) of the filters, it is desirable to express design flow in terms of quantity per hour rather than per day .

(v) Rate of filtration : The commonly used design rate of filtration is 0.1 m/hr. Recent studies[1] have shown that it is possible to produce safe water at a rate of 0.2 m/hr or even 0.3 m/hr but with relatively shorter filter runs. Traditional design practice, does not allow even occasional overload and hence provides for one extra unit to take care of shut down period when a filter is taken out of service for cleaning or repairs. Such a design is very conservative and increases the cost of the plant considerably. In the light of available experience, a maximum of 0.2 m/hr is quite acceptable when some filters are not in use with the normal rate still at 0.1 m/hr .

(vi) Continuous Versus Intermittent Operation : Filters designed to run continuously need, for example, an area only one third of that needed for 8 hour operation but require more number of operators. Pilot studies[2] have shown that when filters are operated intermittently, a short-time after startup, the bacteriological quality of filtered water deteriorates. Hence, as far as practical, filters should be designed to run continuously . From cost considerations, very small installations may have to be designed for intermittent operation. In such cases, post-chlorination is essential to ensure safety of delivered water quality .

(vii) Number of filter beds : For uninterrupted production, a minimum of two filter units should be built. Three or more may be desirable to gain flexibility and reduce overload on filters when one or more units are put out of service for cleaning or repairs.

For a given filter area, the cost of filter media and underdrain is practically the same irrespective of the number of filter units. However, when the number of units is increased, the cost of construction will increase due to increased wall length. The extra cost to be paid for higher flexibility and reliability is only a small fraction of the cost of the least flexible, acceptable design which has only two filters and may often be judged a good investment .

(viii) Filter shape & layout : Filters may be circular or rectangular in shape. Circular filters are not economical except for very small installations. Arranging rectangular filters facilitates common wall construction, easy operation and maintenance. Local topography, placement of pump house and other facilities and possible future expansion may influence the plant layout. The layout should be compact enough to facilitate effective day today operation and maintenance of the plant .

(ix) Depth of filter box : It is a general practice to provide a total depth of 3-4 meters for the filter box. A depth of 2.7 m as per details below, can reduce the cost without affecting the process efficiency. With permeable capsule under drains, the depth of box could be further reduced.

Free board	...	20.0 cm.
Supernatant water reservoir		100.0 cm.
Filter sand	...	100.0 cm.
Supporting gravel	...	30.0 cm.
Underdrain system	...	20.0 cm.
Total	...	270.0 cm.

(x) Choice of filter sand & gravel : Undue care in the selection and grading of sand for slow sand filters is neither desirable nor necessary. Use of builder grade or locality available sand can keep the cost low. Similarly, rounded gravel, which is often quite expensive and difficult to obtain readily, can be replaced by hard broken stones to reduce cost.

Construction aspects

The construction of slow sand filters has to be based on sound engineering principles. The structural design, the construction methods and materials are governed by local conditions. Some of the important considerations that need attention are (i) the type of soil and its bearing capacity ; (ii) the ground water table and its fluctuation and (iii) the availability & cost of construction materials and labour .

Water-tight construction of the filter box should be guaranteed, especially when the ground water table is high. The top of the filter should be at least 0.5 m above the ground level in order to keep away dust, animals and children. The danger of short-circuiting of raw water may be prevented by roughening the inside of the walls[3] .

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The inlet structure is an important component of a slow sand filter and should be so designed and constructed as to cause minimum disturbance to the filter bed, while admitting raw water and to facilitate its routine operation and maintenance. The outlet structure usually incorporates means for measuring the filter flow and for backfilling with clean water after the filter has been scraped. In order to avoid occurrence of negative head in the filter bed, the crest of the outlet weir should be placed slightly above the top of the sand bed .

A filter needs to be cleaned periodically and this is done by lowering the water level a few centimeters below the sand bed and scraping the top layer of 1-2 cms of sand. It is found in practice that draining the water through the filter bottom takes several hours, at times 1-2 days. In order to obviate this difficulty, a supernatant drain out chamber with its top just above the sand level, has to be provided. By a suitable design, the inlet to the filter and the supernatant drain out could be combined in a single chamber. To facilitate drainage of surplus water entering the filter and scum that may accumulate on the supernatant water, an overflow pipe/ weir should be provided for the filter .

Cost considerations

Minimum filter cost

The cost of a slow sand filter excluding pipes and valves can be considered to be made up of two components :

(i) the lumped cost for floor, underdrains, sand and gravel and

(ii)the cost of filter walls. If 'n' number of filters are constructed for a given area 'A', for the cost to be minimum, the sum of the lengths (of filter walls) should be equal to the sum of widths. This is true whether the filters are arranged in a row or on either side of a central gallery . The cost function for a slow sand filter can be developed for any place by knowing the unit prices for the materials of construction and labour. The minimum cost function based on 1979 perices at Nagpur has been worked out as :

$$C = 350\ A + 1140\ (\sqrt{2\ A\ (n+1)}\ )$$

where C is cost in Indian rupees

A is the area of the filters in sq.m., and

n is the number of filter beds

Economy of scale

A general cost equation for filter beds can be written as :

$$C = K_A (A)^a \quad \text{where}$$

A is the total area of the filter beds, K_A is the cost per unit area of filter bed construction including walls and 'a' is the exponent which represents the economy of scale factor. Using cost estimates for filters of different areas, the cost function has been worked out as :

$$C = 1218\ A^{0.857} \quad \text{where Area is in sq.m.}$$

The high value of the exponent shows that there is very little economy of scale and hence plants designed to serve over a long time into the future is not a sound investment.

Cost comparison - Slow sand versus rapid sand filters

There is a common feeling among design engineers and decision makers that slow sand filters, because of their large area, are always more expensive than conventional rapid sand filters. This stems mainly from two reasons. As discussed earlier, the traditional design practice is very conservative and provides for one or two extra units as standby. This escalates the cost of installation. Secondly, though there is no economy of scale in slow sand filter construction, plants continue to be designed for 30 years into the future. The net result is a high capital investment which the community or the Government can not afford due to scarce available resources.

In some of the States in India general guidelines limiting the estimated per capita cost have been laid for purposes of administrative (Government) sanction of rural water supply schemes. Because of false presumptions mentioned above, many practising engineers have not been considering slow sand filtration as one of the alternative technologies at the planning and design stage. Of late, however, there have been welcome signs of change in the attitude of design engineers.

For surface waters of low turbidity, slow sand filters have proved cost effective for water supplies to villages and small towns . Comparative cost estimates of a few small conventional rapid sand filters and slow sand filters of same capacity are given in Table .

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COST COMPARISON OF RAPID SAND AND SLOW SAND FILTERS

Sr.No.	Plant capacity (mld)	Cost (Rs. in lakhs) Rapid Sand	Slow Sand	REMARKS
1	1.00	4.05	2.91	Pre-treatment with hydraulic (baffled) flocculators and circular settling tank with no mechanical scrapers
2	2.10	5.25	5.51	Pre-treatment with sludge blanket clarifier
3	1.91	8.10	5.07	Pre-treatment with clariflocculator
4	2.27	8.92	6.02	Pre-treatment with clariflocculator
5	6.70	11.50	20.00	Pre-treatment with clariflocculator
6	7.00	10.50	20.04	Pre-treatment with clariflocculator

N.B. :- The cost of plants are as per the rates prevailing at the time of construction (1978-80)

The cost figures for the conventional plants have been obtained from construction companies, while those for slow sand filters have been worked out using the same unit rates for costs of material and labour. The basic assumption made in the comparison of costs is that no pre-treatment is required before slow sand filtration .

It can be seen from the table that even the capital costs for slow sand filters of capacity upto 2 mld is comparable to or even less than that of equivalent capacity conventional rapid sand filters. It is well-known that the operation and maintenance cost for a slow sand filter is always lower than that of a rapid sand filter plant. The logical conclusion, therefore is that slow sand filters are economical upto a population of about 50,000 (a plant of 2.5 mld to provide a per capita supply of 50 lpd). It can be seen from the population census of India that this population size covers almost the entire rural communities and nearly 90 per cent of towns in the country .

The table further shows that the capital cost of slow sand filter installations of capacity greater than 5 mld is higher than that of equivalent capacity rapid filters. In such cases, it is necessary to work out the annual costs before a rational comparison could be made. While doing so, the advantages of slow sand filters which can not be directly quantified in terms of money, should be taken due note of. For example, the quality of water from slow sand filters will be less corrosive than a chemically treated water and the long term effect of such waters on distribution system can not be directly evaluated. Similarly, the problems due to discharge of waste water and sludge from water works providing chemical treatment and its effect on the receiving streams or land are difficult to assess. There are other factors such as availability of men and material, ease of construction, simplicity of operation and maintenance, reliability of service etc., which also need due consideration in deciding the final choice .

Summary

The advantages and limitations of slow sand filters for rural water supplies in developing countries have been briefly reviewed. Important design considerations and construction aspects are discussed and rational basis for design of slow sand filters suggested. A cost comparison of slow sand and rapid sand filters has been presented and the need for a realistic evaluation of all factors that influence the choice between them is stressed.

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Ind.Jour.of Env.Hlth., 22(2),136-150 (1980) .

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AN INTRODUCTION TO THE SUBJECT OF OPERATION AND MAINTENANCE OF SLOW SAND FILTER PLANTS

by

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Slow sand filters have been used for both village water supplies and town water supplies, but currently, the maximum use of the method is for village water supplies. Hence the present discussion is addressed to the operation and maintenance of village SSF plants though some of the points covered may apply to urban plants as well.

O and M Objectives

The goals in the operation and maintenance of village SSF plants may be enunciated as (i) the production of water which is bacteriologically safe all the time, (ii) which is free of bad tastes and odours and (iii) production of water in adequate quantity. Bacteriological safety assumes utmost importance in village plants as terminal disinfection may not be reliable in the rural situation and the filters will have to form the main barrier against carryover of bacteria into the supplied water. Tastes and odours demand attention because in the face of unpleasant tastes, the villages may well resort to other, untreated and therefore unsafe waters for their drinking water needs.

Requirements for Achieving Objectives

For achieving the O and M goals set forth above it is necessary that the plants be well designed and constructed and properly operated and maintained. It is also necessary that the plant performance be monitored regularly and follow-up measures taken as required.

The design of village SSF plants require special attention to minimize operational needs and to simplify operational steps. The design should also be proof against operational aberrations. These design requirements arise from certain special features of the village plant management, viz., meagre staff, lack of skill on the part of the staff, and limited provision for technical supervision.

Operational Steps

The sequential operational steps involved in SSF plants are (i) pre-treatment, (ii) raw water flow regulation, (iii) filter operation, (iv) post-treatment and (v) periodical cleaning of the beds. The characteristic features of each of these steps are discussed below :

Pretreatment

Certain characteristics of the water (seasonal or perennial) may cause problems in operation such as rapid clogging in case of high turbidity ($\geq$ 50 NTU), H_2S generation in filter beds in the case of high organic content water and clogging and taste and odour problems in the case of high algal counts. The solution to these problems have generally to be thought of at the design stage itself after through study of the raw water quality and after pilot plant studies if required. The solutions that have been used are storage tanks, plain sedimentation tanks, rapid roughing filters, horizontal-flow prefilters and even trickling filters.

In operation, the only options open are to improve turbidity removal by seasonal coagulant addition to the storage and sedimentation tanks and to control the problems of organic matter and algae by prechlorination and $CuSO_4$

addition. However, it is not known how the filters are affected by these measures. Hence these should be done only under higher level supervision. It may also be noted here that some of the pretreatment measures themselves might cause operational problems, e.g., algae and weed growths in storage tanks.

Raw Water Flow Regulation

Raw water has to be regulated on a daily basis to maintain the filters at MWL. This can be achieved either by equilibrium float valves or by manual control of inlet valves combined with overflow at MWL. The latter may be the best operational solution as float valves may be costly, not readily available and liable to repairs.

Filter Operation

This may be considered as the most sensitive operation affecting finished water quality. The feasible modes of filter operation are (i) Continuous feed-constant output, (ii) Intermittent feed-continuous (declining) output and (iii) Intermittent feed-intermittent output. Generally, for village plants, the second mode is adopted in design as it reduces staff requirements though it may increase area requirements. The third mode affects bacteriological quality of filtrate and is not advisable.

The steps involved in the operation of filters are i) deciding the filtration rate and ii) setting the filter to the decided rate. The filtration rate is generally decided at the time of design. However, during operation it may turn out to be unsatisfactory, in which case the only option may be to increase the filter bed area and reduce the filtration rate to a satisfactory level. Setting the filtration rate requires regulation of the

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filter outlet value to give the designed discharged over the effluent weir when the filter is at MWL. The regulation may be required only once in a few or several days. In regulating the outlet values one has to guard against sudden changes in flow and excessive rates of filtration (accidental or wanton). Suitable rate limiting devices should be provided during design and construction itself so prevent excessive rates of filtration.

Post Treatment

Aeration at the effluent weir has been suggested to take care of odours in the effluent and to oxygenate the water. Similarly aeration of effluent and recycling has been suggested to take care of oxygen deficiency of raw water and consequent anaerobiasis in the filter bed. However, the efficacy of aeration over a short outlet weir with just a few centimeters of fall is a matter for study.

Terminal chlorination is the most usual post-treatment provided for slow sand filters. Though a properly designed and operated slow sand filters can give bacteriologically safe water, post chlorination is still desirable as a measure of second line defence especially when the raw water is heavily polluted bacteriologically.

Though chlorination may appear as a simple operation, it is beset with many difficulties in the village setting, viz., i) frequent non-availability of bleaching powder, ii) clogging of dosing equipment, iii) operator neglect, iv) difficulty in regulation of dosing with changes in filtration rate under declining mode operation v) uncertainty of contact time , vi) public resistance on grounds of taste and odour. Technical solutions have to be found out at least for problems (ii), (iv) and (v)

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but even after that the post-chlorination step in a village plant may not be 100 per cent reliable. Hence the proper operation and maintenance of the filters should not be overlooked.

Terminating the Filter Run

In SSF plants the filter runs are terminated when the head loss has reached a maximum (as indicated by reduction in filtration rate even though the effluent regulating valve is kept fully open). The rate of head loss will depend on turbidity, algal content and organic content of the influent water. It is to be noted that only certain types of algae (e.g. diatoms) may cause rapid clogging of filters. Where clogging of filters is rapid and filter runs become short, the reasons will have to be investigated by a higher level support and remedial measures taken such as pre-treatment and, in case the clogging is due to algae on the filter bed, shading of the filters.

Cleaning of Filters

While cleaning the filters special care need to be taken as in the following steps :

i) Draining rate of the bed not to be excessive.

ii) The bed to be drained only a few inches below sand surface.

iii) The sand to be scraped as soon as possible after draining without allowing it to dry out.

iv) Only 1-2 cm top layer of sand to be scraped at a time.

v) Sand not to be replaced every time.

vi) Pollution by the labourers to be minimised.

vii) Cleaned bed to be backfilled with filtered water from adjacent bed before letting in raw water.

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Before recommissioning a resanded filter much greater precaution may have to be taken than after periodical cleaning to ensure bacteriological safety of water. In such cases bacteriological testing may well be necessary.

In addition to resanding, maintenance may be required only in the case of pumps and valves. Valve maintenance can easily be attended to by the operator himself while in the case of pumps, the operator would require skilled assistance. Where the SSF plants are run by a state level organisation, pump maintenance could be done by a touring maintenance team. Where the plant is run by a local agency, the best alternative may be to entrust the pump maintenance to authorised local mechanics under a Service contract system.

Monitoring of SSF Performance

Monitoring is required to give quality assurance, and to identify deficiencies in design and operation which can be rectified in the particular plant and also serve as pointers for new plants. The monitoring will consist essentially of testing the quality of raw and treated waters.

In the rural situation there are several constraints to the adoption of a proper quality monitoring programme, such as lack of adequate laboratories, lack of facilities in the existing laboratories and the long distance to them which may involve unacceptable delays between sample collection and testing. The cost of testing may also be high.

A major point to be considered after the cleaning operation is the criteria to be used for putting the filtered water back into the supply. The initial filtrate may carry some pollution brought in during the cleaning

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operations. Also until the filter skin is re-established bacterial removal may not be effective.

It has been suggested that after filter cleaning, the filtrate should be run to waste for several days until the bacteriological tests prove the water to safe. But such a procedure may not be possible in many cases especially in rural settings. In most cases the feasible alternative may be to run the filters at a reduced rate initially and slowly increase the rate, run the filtrate to waste for a few days, and ensure effective terminal chlorination at least for some weeks thereafter while letting water into the supply.

Maintenance

The major maintenance measure required in an SSF will be resanding. The need may arise only after many years of operation. Resanding may be done by the 'throwing over' process in which the new sand goes to the bottom and the old bottom layer comes to the top. The question may be raised whether old scraped sand after due washing or fresh sand should be used. This should be decided based on local economics. Taking into consideration the above constraints, performance monitoring will have to be started in a modest way. Initially selected plants may be taken up for monitoring based upon the laboratory facilities available and the tests carried out seasonally, limiting the parameters to the most essential ones. The suggested parameters are turbidity, colour coliforms and E.coli I. Simultaneously efforts must be made to build up regional district laboratories.

While considering quality monitoring we have also to think of the quality standards to be satisfied. Slow sand filters may easily satisfy the WHO Standards for turbidity and colour. However, in regard to bacteriological quality

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for the filtered water (before chlorination) fresh thought may be necessary as the filters may often show coliforms but no E. coli I.

Records

Records are to be maintained so as to provide a check on the work of the subordinates and also to provide data for planning future improvements. In village SSF plants which will have limited staff, the records to be maintained should be the barest minimum. They may consist of data on daily hours of operation of raw water and clear water pumps, quantities of chemicals used and daily output from the plant; and periodical loss of head and rate of filtration. The records should also show the dates on which different filters are taken out of operation for cleaning, when they are put back into operation, when filters are resanded and recommissioned.

Staff Pattern

The basic staff requirement at an SSF plant is an operator. The number of operators will depend on the mode of operation of the filters and the No. of shifts. It is desirable that there be at least one helper at a plant irrespective of the No. of operators. The operational staff will require higher level support at such times as cleaning of filter beds and resanding and when there are problems of pretreatment. A supervisor is necessary for this and he should make periodical visits to the plant.

Management

In regard to the management of the SSF plant two alternatives can be thought of one, management by the village council and the other, management by a national body such as Water Board. Any water treatment plant involves

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technical aspects in its operation which can be regulated properly only by a professional body. Hence management by the second alternative may be best suited.

Community Participation

The areas in which the community could be involved in Slow Sand Filter's Operation and maintenance are in providing voluntary labour for resanding and cleaning of filter beds. Day to day operation requires a certain amount of technical competence and discipline which cannot be expected of voluntary village workers.

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EXPERIENCES IN THE DESIGN, CONSTRUCTION AND OPERATION OF SLOW SAND FILTERS AT POTHUNURU

by

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INTRODUCTION

The village Pothunuru is situated 13 kms. from Eluru, on the Roads & Buildings Road from Eluru to Kovvur (via) Gundugolanu in West Godavari District, Andhra Pradesh, India. The population of the village as per 1971 census is 3254. The village folk used to get their drinking water directly from tanks fed by the Godavari River Canal. Health problems such as Amebeosis and Gastro-enteritis were common among the people. There were also complaints of undue fatigue due to hard labour.

A scheme was proposed to give protected water to the villagers with a per capita supply of 10 gallons (45 litres) per day by the Andhra Pradesh Panchayati Raj Engineering Department under Rural Water Supply at a cost of Rs 3.68 lakhs. The scheme envisaged filtration through pressure filters originally. During the execution of the scheme, this was selected by " NEERI " and the Panchayati Raj Department for providing slow sand filter units under the research-cum-demonstration project with a financial assistance of Rs 50,000/- from WHO International Reference Centre for Community Water Supply, The Hague, The Netherlands.

DESIGN DETAILS OF SLOW SAND FILTERS

The slow sand filters were designed for a filtration rate of 50 gallons (225 litres)/sft per day (24 hrs) and 16 hours working. Two filter beds each of size

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10.97 M x 7.92 M x 3.0 M (overall depth) to give 33 G.P.M. by each filter are constructed with the following details (total requirements 62,360 gallons per day). The side walls of filters are of R.C.C. 40 cms thick and bottom is provided with 15 cm thick, 1:1½:3 R.C.C. raft.

(A) Filter Support-cum-Drains

The filter support is prepared out of 20 cm x 20 cm 5 cm. C.C. 1:1½:3 perforated bricks supported over solid bricks of 20 cm. x 10 cm. x 5 cm. C.C. 1:1½:3. Five perforation of 6 mm. dia. are provided in each brick. The filtered water collected through these perforations and the open joints between the bricks, flow through the lateral drains into a central drain of 30 cm. x 30 cm. x 30 cm. The central drain is covered with R.C.C. (1:1½:3) perforated blocks of 5 cms. thick.

(B) Filter Media

	Depth	Quantity used
a) Hard, broken granite stones		
1) Passing through 25 mm Ø sieve and retained on 20 mm Ø sieve	15 cm.	34.10 cum.
2) Passing through 12.6 mmØ sieve and retained on 6.3 mm Ø sieve	10 cm.	17.38 cum.
3) Passing through 4 mm Ø sieve and retained on 2 mm Ø sieve	10 cm.	17.38 cum.
b) Course sand		
Passing through B.S.S.No. 14 sieve and retained on B.S.S. No. 24 sieve	10 cm.	17.38 cum.
c) Fine sand		
Passing through No. 14 sieve and retained on No. 60 sieve	1.0 mt	173.8 cum.
Effective size of the sand	0.3 mm	
Uniformity coefficient	2.2	
Total depth of filter media	1.45 M	

The Godavari River Canal water is fed into a summer storage tank which serves as a sedimentation tank.

Raw water from the intake well situated in the summer storage tank is pumped to the filters with 2 H.P. Motors (one standby provided). The clear water from the S.S.F. beds flows through 'V' notch chambers to the collection well and is pumped after chlorination; to an elevated service reservoir of 20,000 gallons capacity for distribution through 30 public standposts.

EXPERIENCES IN CONSTRUCTION AND OPERATION

As far as the construction of filters is concerned, there has not been much of a problem. The shuttering for walls alone had to be procured. It is desirable if they are got manufactured departmentally for use on various schemes, since petty contractors in rural areas will not be able to do this.

For the filter media, the sieves were prepared by the department by purchasing required wire mesh from Hyderabad. As the meshes available in the market cannot withstand, sieving gravel, special sieves by drilling holes (of required size) in M.S. plate were prepared. The sieving of gravel was carried out at the site itself. The quarry is about 95 kms away.

Sand was obtained from Tammileru, a small river passing adjacent to Eluru. The quarrying place is about 18 kms from the plant site. In the beginning sand, sieving was tried at the filter site, but as it was consuming lot of time, the balance was done at the quarry itself. Ten sieves of 1.20 M x 0.75 M sizes were used for sieving sand and it took 15 days engaging daily 40 labour. The sieved sand was conveyed and washed at site engaging 10 labour. The main difficulty noticed is for sieving and washing. The

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Tammileru river sand generally contained good and fine sand of less than 60 BSS mesh is found to be very little.

For measuring the clear water discharge V-notch made of copper plate (1'-0" x 0'-9") 7" depth and marked with a line to represent the design discharge is used.

The procedure for the operation of the slow sand filters involves mainly two things. One is to regulate the flow of clear water from the filters to the designed rate and the second is to regulate the flow of raw water into the slow sand filters so as to maintain a constant head of standing water over the filter media. For the second operation, the method in practice is to provide the valve at the inlet side and to regulate it, till the head is constant. This can be made more simpler if an overflow arrangement is made for the flow of excess water entering the filters by providing an outlet pipe at the maximum water level and diverting excess water back into the raw water tank. Thus the operation of the slow sand filters can be made more simpler with only one regulation of flow at the outlet. This aspect may be considered wherever the slow sand filters are situated adjacent to the raw water tanks. One qualified mechanic has been engaged by the Gram Panchayat and the engineering department is observing the performance. Bleaching powder is being used in the chlorination plant to give a residual chlorine between 0.15 to 0.25 ppm.

ADVANTAGES OF SLOW SAND FILTER

When slow sand filters are used, the raw water from the sedimentation tank is directly pumped to the filters. There is no need for a coagulation tank, as in the case of rapid sand filters or pressure filters. The operation is comparatively simpler, perticularly for the people in rural areas and results are excellent. The existing pressure filter installations are not giving proper removal of turbidity and the strainers are gradually getting clogged. Further repair and maintenance of pressure filter is difficult in rural areas.

The maintenance cost is also less in the case of slow sand filter, as it does not need alum which costs about Rs 1,200/- per M.T. Regular backwashing and frequent repairs as in the case of pressure filters are not required.

It is noticed after usage of filtered water, that the morbidity rate has declined and the public are maintaining good health. There have been no cases of Gastro-enteritis. The public also feel that they are able to stand vigorous work better.

CONCLUSIONS

In conclusion, the results and experience with slow sand filters show that they are found to be better for rural areas. The cost of the structure can also be reduced by suitable designs or adopting open earthen tanks wherever more space is available.

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OBSERVATIONS ON OPERATION AND MAINTENANCE OF VILLAGE DEMONSTRATION PLANT ON SLOW SAND FILTRATION AT ABUB SHAHAR, HARYANA (INDIA)

by

Gurdeep Singh,
A. Raman &
J.L. Nagpal

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INTRODUCTION

The village demonstration plant (VDP) at Abub Shahar treats water drawn from the Bhakra canal. Because of the long detention afforded at the headworks of the canal (Bhakra Dam), the canal water has generally been of quite low turbidity (10-0.3 NTU) and COD (9-4 mg/l) and its bacterial quality has been fairly good (E.coli I :1600-33 per 100 ml). Considering the quality of raw water, the function required of the VDP is mainly that of polishing and bacteriological purification.

At the VDP, both the raw water and the filtered water have to be pumped. The plant has been designed for 8h of pump operation divided into 4h in morning and 4h during evening and 24h of filter operation based on raw water storage.

The Public Health Engineering Department, Government of Haryana is in charge of the operation and maintenance of the plant. The plant has one full-time (8 h) pump operator for its day-to-day operation. For maintaining the lawns and garden in the plant, unskilled labour is provided extra, and they are diverted as and when required for periodical cleaning of the filters. A Junior Engineer makes occasional visits to the plant for overall supervision of its operation.

OPERATIONAL EXPERIENCES

The plant was completed early in 1979. The monitoring of the plant was started in June 1979. During most of the months since then, the plant has been subject to severe power cuts enforced in the region as a whole getting supply only for about 4h per day. In the last two months, the plant has been receiving full power supply. The experience with the operation of the plant is discussed below.

i) During the periods of power cuts it was difficult to meet the daily water demand from the plant. The operator had to remain alert almost allthrough the day to avail of the power whenever supply commenced. Further, the power cuts induced the operator to run the filters at very high rates during supply hours causing deterioration in filtered water quality. Such problems have to be tackled in the design stage itself and, when village SSF plants are planned, the possibilities of power cuts at the sites should be assessed and taken care of in the design.

ii) The daily operational rounds at the plant proved rather tedious for the operator particularly during adverse weather as in the severe summer and winter months on account of the considerable distances between different units which had been left for purposes of landscaping. It is felt that village SSF plants should generally be designed with compact lay-outs.

iii) The regulation of the filter inlets, filter outlets, etc. at the VDP required considerable effort daily. As village SSF plants will generally have limited staff, they should be specially designed to require little effort for daily regulation.

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iv) It has generally been recommended that during initial commissioning, the filters should be backfilled with clear water. But, this procedure could not be adopted at the VDP as clear water was not available and the filters were instead topfilled with raw water. It is felt that in such cases it may be better if filters are not topfilled but only backfilled with raw water, but after chlorination. To enable such a procedure, right at the construction stage a temporary pipe line has to be provided from the feeder main to the filters to the filter outlet chambers.

v) It has also generally been recommended that while commissioning new SSF units, the filtrate should be wasted for several weeks. But, this procedure could not be adopted at the VDP due to public pressure to start the supply of water. Under such circumstances filtrate wasting may have to be restricted to a few days and adequate terminal chlorination provided until the filters ripen.

vi) So far there has been no problem at the VDP from plankton growths in the storage tank (27 days' capacity) preceding the filters. However, lately there has been considerable growth of aquatic weeds (Potamogeton, Elodea) in the tanks. Aquatic weeds in storage tanks has been a serious problem in most of the SSF plants in Haryana and they are now being controlled by emptying the tanks and removing them (weeds) manually once in a few years.

vii) So far there has been no problem at the VDP from plankton growths in the supernatant water over the filters; but, in summer months, there has been growth of algae on the filter skin (schmutzdecke) with patches of it floating up occasionally. The algae did not cause any odour nuisance nor resulted in accelerated clogging of the filters.

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viii) When the filters were overloaded by the operator in the face of power cuts, they required frequent cleaning. But, under normal loading as during the last few months, the head loss in the filters has been found to increase quite slowly (About 10 cm total head loss only has been observed in one and half months in a filter cleaned in July 80). This can be ascribed to the very low turbidity of the raw water.

ix) Towards end of May, 80 the filters suffered a sudden increase of head loss from 8 cm to about 70 cm in 2 weeks. There were heavy dust storms in the area then and it is not known whether the sudden clogging of the filters was caused by the deposition of windborne dust.

x) The filters did not present any difficulty for cleaning, the process requiring only about two labourers for two hours per bed. During summer months, when there was algae growth on the filter skin, the skin could be rolled of from the bed readily and cleaning was easy. At other times, the bed had to be scraped with a blunt edge.

xi) There has been no need so far for resanding the filters. The sand scraped from the filter beds has been kept heaped at the site without prior washing. New sand is rather costly at Abub Shahar (about Rs 140 per m^3) and hence it may be economical to wash the old sand and use it for resanding when required.

xii) The overall performance of the filters depended very greatly on the rate of filtration adopted by the operator. In the initial stages when the operator was adopting very high filtration rates to meet the power cut problem, the filter effluent showed high E. coli I counts (3-23 per 100 ml). But, after proper training, the operator started adopting normal filtration rates, the filter effluent quality improved showing zero E. coli I counts on all occasions. Experience indicates that, in order to ensure high bacteriological purification all the time in village SSF plants it will be necessary to provide a rate-limiting device on the filter outlet so that the filter will not run at high rates even under operational aberrations.

xiii) The terminal chlorination arrangement at the plant (drip-feed tanks placed over the clear water reservoirs) did not function well due to clogging and required frequent attention in regulating the feed rate to suit the filter discharge. There appears to be a need for developing an effective and easy method of chlorination for village SSF plants.

SUMMING UP

The experiences gained during the monitoring of the VDP at Abub Shahar from June '79 has been described above. It is felt that most of the operational problems encountered at the plant can be overcome by suitable modifications in design and training of the operator.

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INTRODUCTION TO TRAINING OF OPERATORS

Prepared for the Meeting of Representatives
of SSF - Project Countries, Nagpur, India

September 15-19,1980

By

H A HEIJNEN

Introduction

In national water supply programmes a number of important components may be distinguished, which are vital to the achievement of the objectives set in such programmes.

At the national level

- political commitment to the goals set for national water supply programmes .
- required funds especially the foreign exchange needed for some treatment systems .
- manpower planning to fulfil the jobs which need to be created during the implementation of the programmes as well as for the subsequent period of operation and maintenance of the supplies realized.
- Collaboration with Public Health Agencies .

These agencies can give invaluable support to water supply programmes by not only executing their regular Health Education Programmes but gearing these as well towards sanitation education and user's education .

At the sub-national and local level

- planning and implementation of the engineering aspects of water supply schemes

- operation and maintenance of the installed facilities.
- community participation, especially with regard to involvement in the entire project and acceptance and the sharing of responsibility for new facilities.

Depending on the situation these components can prove a means to arrive at the implementation and subsequent proper functioning of a local water works or form a serious constraint to achieve the same .

Finance, political commitment and manpower planning are of a higher order with which we will not occupy ourselves during this session .

The remaining topics will be extensively covered during the various workshops .

However, the most important function, many times deciding upon failure or success of the water supply scheme, is the operator .

He has not yet been named but, if all is well, engineers and public health officers should be fully aware of his presence when planning for the execution of water supply projects and related sanitation education activities.

Because once a treatment plant is commissioned, the operator has in fact become the key person in the process of running the plant.

Although national water agencies recognize the importance of the operator with respect to the performance of the water supply, they do not sufficiently realize that it is vital that the operator is trained well and paid accordingly to the local circumstances. For, the great

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distances and the poor infrastructural provisions in many countries; make it usually impossible for mobile maintenance teams to give assistance within four or five days. Therefore, training should aim at teaching the operator to independently cater for routine operation and maintenance as well as repair simple failures of the system.

It must be admitted here however that in a lot of developing countries due to the low average level of education, there is a great demand for trained people of any profession. In view of that, one could object to give the operator too high a level of training because of the risk that after his training he can be lured away by another employer who is the position to pay him higher wages. Personally I feel, that such a reasoning is shortsighted. The responsible agency should not degrade the training course but should find other ways to ensure that a particular operator continues to be employed by the agency. This could for instance be realized by asking a small training fee from the trainee which could subsequently be refunded during a period of two or three years if the operator continues to work for the agency.

A well-balanced programme ensuring a good level of training will eventually prove a more economic solution since it will increase the reliability and continued performance of the water supply systems, thus for instance reducing the number of mobile teams needed for operation, maintenance and supervision.

Selection of the Operator

Although it might not always be possible, the agency responsible for the construction of the waterworks should in consultation with the community, try to choose a local man or woman to be trained as an operator. Care should be taken to make sure that the chosen persons are respected in the community, otherwise it will be extremely hard for them to fulfill their duties .

- at least primary education
- basic knowledge, in reading and writing, of the official and local language (s)
- not too young (depending on cultural circumstances a youth might not be accepted as reliable, or not be respected)
- preferably previously employed or engaged in a technical job (e.g. mechanic) or in a function in which the applicant showed responsibility (e.g. member of executive board of (women's) cooperative, farmers association or parish council)
- preferably local inhabitant of good standing with a fair guarantee of prolonged residence .

In many cases a man will be selected to operate the plant. However, one should keep in mind that the duties of the operator can very well be fulfilled by a woman as well . Moreover since the majority of the users of the water supply are women, it will sometimes in view of possible user's education activities the operator may undertake, even be more advantageous to employ a female operator .

Selection Procedure

Depending on socio-cultural and socio-economic circumstances, many options are available to select somebody to follow a training course for a job as operator of a water treatment plant. A possible set-up might be, as given below :

- a written baseline test, followed by
- an interview by a committee consisting for instance of a representative of the responsible waterboard, an

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instructor at the training course and a respectable local representative .

If the candidate passes the test and the interview he will be invited to follow the training course (or as the case may be : given an on-the-job training) . At the end of the course, the instructor will evaluate his knowledge and abilities and decide whether he is suitably trained to satisfactorily run a water supply plant .

Technical Knowledge and Skills

The knowledge and skills required to operate and maintain a water treatment plant including Slow Sand Filtration, should be reduced to a minimum. However, in order to allow the future operator to find his own place and recognize his indispensability in the overall set up of the water supply systems, it is advisable to provide the trainee with sufficient background information. This additional bit of information is also required to enhance his effectiveness when advising the population on the use of water, the reasons why the watering of cattle upstream of the intake is forbidden etc. The following topics may be included in the general background information :

- Water cycle
- Relationship between pollution and disease, hygienic habits and health etc.
- Objectives of a water supply system .
- Sources of water available for supply .
- Impurities contained by those sources.
- Subsequent need for treatment of such raw waters.

When this background has been filled-in and the trainee understands the origin of the water which can be desired from the various sources, he will also grasp the need for treatment when using surface water as drinking water source. It has hen become time to focus on the particular type of water supply system the operator will be taking care of .

The following general sequence might be followed :

- The water supply system from source to distribution, briefly describing the various components .
- The pre-treatment process, explaining : how and why .
- The slow sand filtration process, brief indication of the main features
- The distribution process; clear water storage, chlorination equipment - pumps and piping .

The effectiveness of this fairly theoretical approach can be greatly enhanced by using a number of teaching aids to stimulate the trainee . Especially visual aids such as slides and films as well as maquettes of ready treatment plants will be extremely helpful .

When instructing the trainees about the pre-treatment system and the Slow Sand Filter Plant they should be made fully aware of the improvement of the water quality brought about by the applied treatment. For, this awareness is

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required if the trainees are fully to understand the precautions which they have to take during their operation and maintenance activities, in order to safeguard the quality of the effluent .

Slow Sand Filter Operation Skills

During the course ample time should be spent to train the operators both theoretically and practically in the various operational skills required.

The following procedures should be known by heart by an operator :

- Commissioning of a new filter (althou n they might only do that once every year and usually under supervision) .
- Starting up and shutting down procedures.
- Daily adjustment procedures, concurring with the mode of operation .
- Daily and periodical control .
- Maintenance procedures
- Filter cleaning, sandwashing etc.
- Breakdown procedures, action by operator if he is able to remedy the failure himself or otherwise information to higher level agency.
- Daily (or periodical) record keeping .

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It is important to allow the operator to gain sufficient practical experience with the various procedures, both during the course as well as during the first few months of independent operation. For that reason, regular visits of a supervisor to plants were recently trained operators are employed, is advisable .

Next to the skills required for the operation and maintenance of the Slow Sand Filter Process, there are also quite some skills involved in the Operation and Maintenance of the pre-treatment system, pumps and chlorination equipment. Since the weakest link in a chain determines its strength, it is obvious that due attention must also be given to the instruction of these skills.

Sampling

At present the laboratory facilities in many countries do not allow to frequently take drinking water samples from village water supplies. However, every few months, an effort should be made to atleast test the village water supply system for bacteriological quality. As far as the operator is concerned, the only tests he can be expected to perform are tests for turbidity and chlorine residual. However, these two tests, he should indeed be able to perform because comparison of the turbidity before and after treatment gives a fair indication of the efficiency of the filter while the presence of a chlorine residual normally ensures the hygienic quality of the water .

Social Abilities and Responsibilities

The necessary technical capabities of the operator have been extensively listed in the foregoing. However, his job requires social abilities as well. The operator is running a community water supply and this necessarily entails interaction between the operator and all levels of the community (Diagram 1) .

A continuous supply of safe water can only be obtained if the community abides by certain rules regarding, for instance, the use of the water supply and the protection of the intake. Consultations between the responsible local authority and the operator have to result in a set of regulations to that effect (Annexure I). The active application of these regulations can only be expected if the need for them is justified and understood through proper health information programmes. The village health worker and the operator must cooperate on these programmes. In those cases where there is no support from the health sector, the operator should be trained to organise a simple sanitation education programme himself .

Another important item is the demonstration aspect of the plant. The operator should be willing and able to inform visitors, school-children, women's associations, etc., about working and health aspects of the plant. These demonstrations will help to establish a notion of the great value of drinking water and thus promote a positive behaviour towards the proper use of such drinking water .

The operator should receive an adequate briefing on the local administration and management structure of the supply system as well as a training for the management tasks he is supposed to perform .

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The smooth running of the filtration process and distribution system is not only safeguarded by the interactions which are mentioned above, but also by tutorial activities of the operator. An operator should be able to train a few assistants who can monitor the plant and repair minor breakdowns in his absence.

Since there are so many items which should be considered, a checklist on the social abilities and responsibilities has been included as Annexure II.

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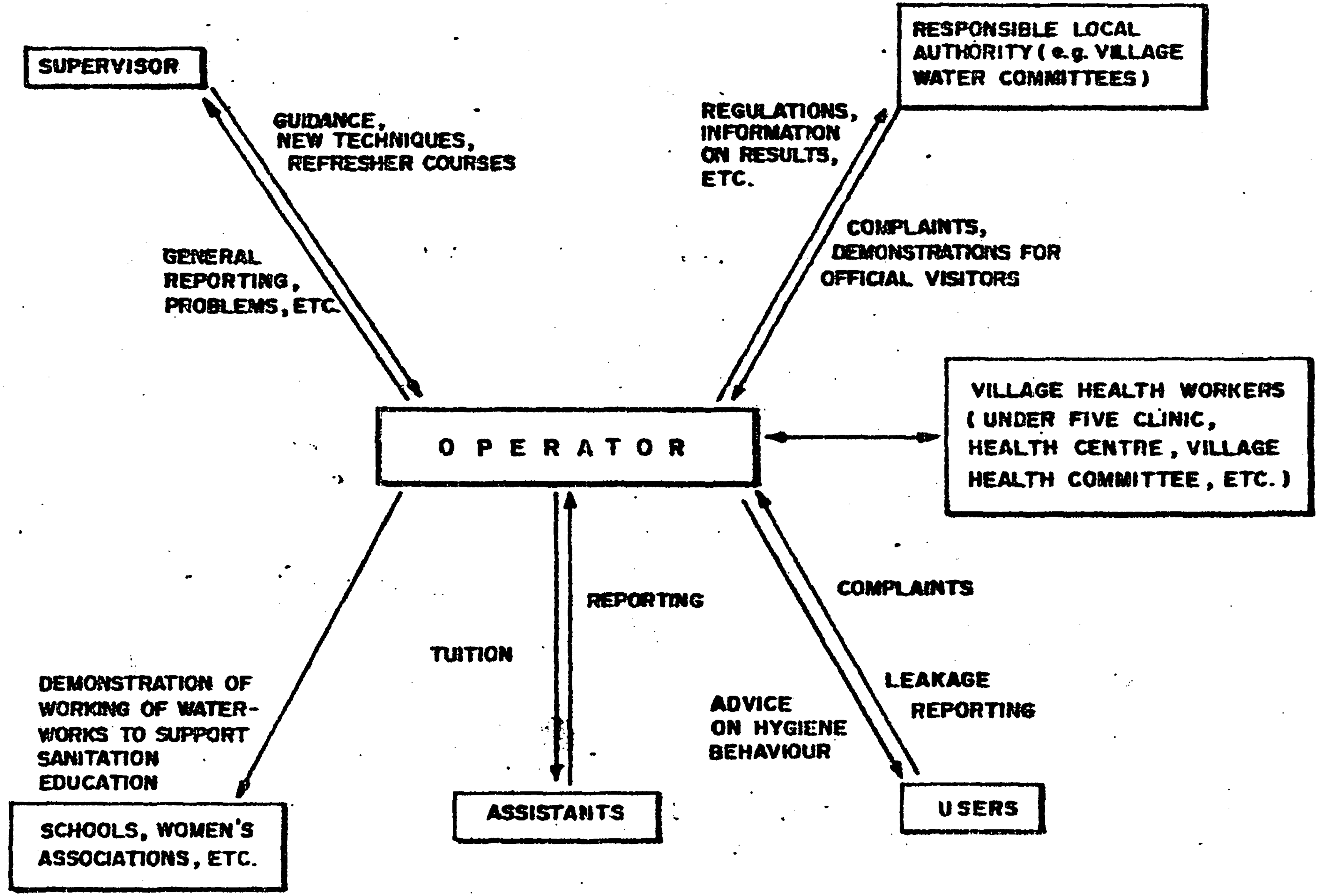

DIAGRAM 1/ FUNCTION RELATED COMMUNICATIONS OF THE OPERATOR

Annexure I

Village Waterworks Regulations

In order to prevent misuse by the public which might result in malfunctioning of the plant, a set of regulations may be prepared and implemented. These should also aim at the development of a certain social control towards the protection of the drinking water facilities.

The regulations can possibly include some of the following items :

- no sewage disposal or clothes washing directly upstream from the intake ;
- a responsibility clause for that part of the piping which is passing over somebody's land ;
- a responsibility clause for standposts near public buildings : for example, standposts in the schoolyard will be looked after by the headmaster and the tap in the hospital yard will come under the supervising responsibility of the medical officer incharge ;
- arrangements for the regular cleaning of the standposts and immediate surroundings ;
- arrangements for watering of cattle ;
- regulations for the use of water for irrigation ;
- immediate reporting of breakdowns .

The local water council and the operator should, through mutual consultations, produce such a set of regulations. When the necessity of these rules if fully understood by the population, it will strengthen the community involvement, thereby reducing the risk of frequent breakdowns .

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Annexure II

SOCIAL ABILITIES AND RESPONSIBILITIES

Operator-Supervisor :

- report periodically ;
- report immediately when heбp required in repairing failure ;
- accept professional guidance ;
- study new techniques, including sanitation at village level ;
- follow refresher courses.

Operator - Local Government, Traditional Rulers, Village Water Committee

- report periodically ;
- demonstrate the working of the plant to official visбtors ;
- develop a set of regulations and sanctions ;
- arrange community labour
- agree upon water ~~water~~ rates or taxation

Operator-Local Health Organisation

- partake in existing education programme or initiate simple sanitation education programme .

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Operator - Users

- give correct example through proper hygienic practices ;
- advise and correct the consumers ;
- take action on frequent misuses ;
- take away the causes of complaints ;
- encourage reports of leakages and breakdowns by immediate repairs ;
- encourage social control at village standposts, etc.
- announce intermittent water supplies due to maintenance .

Operator - Assistant Operators

- give technical training ;
- teach responsible behaviour through operator's personal disposition ;
- train assistants to advise the population on water use .

Operator - School, Women's Associations or other local organisations

- demonstrate the working of the plant to clarify the need for proper water use and to illustrate the value of the purified water ;
- partake in local sanitation programme .

POSSIBLE TOPICS FOR DISCUSSION AT THE HEALTH EDUCATION WORKSHOP OF THE INTERNATIONAL MEETING OF THE SSF - PROJECT PARTICIPANTS

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1. Determination of the <u>functions</u> of a baseline of a baseline health survey :

- collection of data for DWSS/programme planning (e.g. selection of project areas based on health conditions)

outcome - oriented
- collection of data for local HE programme planning (e.g. identification of communication networks, environmental/health beliefs)
- collection of data for impact evaluation (e.g. improved environmental health behaviour, lower incidence of WR disease)
- conscientization of the population on their health environment

process - oriented
- stimulation of community involvement self-reliance and analytical skills .

2. <u>Methods</u>

A. <u>For Impact Evaluation Function</u> :

Before / After study or controller experimental design

(i) <u>records</u> : tabulation + analysis of morbidity / mortality statistics from health institutions or other sources

(ii) <u>Examinations/Tests</u> (for health and nutritional status)

Stools
Blood
Weight for height for age (or use of Monley Cards)

(iii) Questionnaire Surveys

Sampling : whole population, or if sample how chosen ? household heads, or husband & wife together ?

Topics : Morbidity (by recall : over what periods?) health-related practices (which ?) knowledge of disease transmission (how detailed ?)

B For Community diagnosis function

TOPICS FOR COMMUNITY SURVEY

a. Community characteristics

b. Present conditions in water, sanitation and hygiene at community, institutional and household level .

c. Perception of present conditions and desired improvements; perceived constraints + criteria for improvements.

d. Knowledge of link water - sanitation - disease ; knowledge of water related diseases.

e. Present water collection, storage and use practices.

f. Specific beliefs on water, sanitation and water - related diseases.

g. Community leadership (formal, informal) and communication networks.

h. Decision-making patterns at community and household levels, including excluded categories ("powerless ")

i. Water quality (samples) at various points.

j. Morbidity / mortality patterns.

k. Local resources for health education programme planning and implementation .

l. Existing health care and health education organisation, nature and frequency of activities.

METHODS FOR DATA COLLECTION

a. Individual	-	observation
	-	behavioural mapping
	-	measurements, tests
	-	enquiry from key figures
	-	systematic household interviews
	-	records
b. Group	-	group interviews
	-	environmental walk + discussion
	-	study teams (self survey)
	-	using existing knowledge, observation, informal discussions
c. Community	-	public meetings led by local leadership, often followed by small group discussions
	-	panel discussions with local and project experts

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AN INTRODUCTORY PRESENTATION
ON
BASELINE HEALTH SURVEYS

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UW I

1 : INTRODUCTION

In dealing with this short introduction to Baseline Health Surveys, it may be admitted that comprehensive treatment is not feasible within the limited time allowed for this purpose.

There are ofcourse various forms (types) of health statistics, as is well known. The researcher will therefore be looking at various statistical data, depending on the purposes and scope of the particular survey to be conducted.

1-1: Put in the words of Bancrofts Introduction to Bio-statistics : " Statistics is the art and science of numerical distributions. "

In surveys, therefore, the Researcher will seek to determine the particular characteristics to be observed or measured (variables) . Obviously, these variables take on a value for each subject, or other experimental unit, under observation. Again, " these observed values differ from subject to subject thus providing the variability which is the raw material for statistics. "

2 : I have been researching the work of few authors on this subject-matter; and I think it is relevant at this point to introduce some excerpts from a treasured monograph of the Department of Social & Preventive Medicine, University of the West Indies dealing with some types of :-

2.1 : "STATISTICS RELATED TO HEALTH"
2.2 : "INTRODUCTION TO VITAL AND HEALTH STATISTICS"
2.3 : "THE USES OF VITAL AND HEALTH STATISTICS"
2.4 : "SOURCES OF VITAL AND HEALTH STATISTICS"

2-1.1: "SOCIAL DATA :

- Population of community - number, age and sex distribution, geographic distribution, population density and movement .
- Family details - size, nature, relationships, stability, interval between children, addiction, customs, habits and beliefs, births, deaths, sickness and marriages, etc.
- Education - literacy of men and women, literacy by age, children attending school, presence of books, newspapers etc.
- Communications - roads, transport .
- Mass Media - radio, press, television. "

2-1.2: "ECONOMIC DATA :

- Occupation - primary occupation, secondary occupation, unemployment data.
- Income - family income, per capita income, debts, tangible wealth .
- Expenditure - expenditure on food, clothes, rent, fuel, education, health and medical care, transport domestic services, recreations, charity . "

2-1.3 : " ENVIRONMENTAL DATA :

- Housing - type, floor, roof, walls, lighting and ventilation, furniture, number of rooms, over-crowding, persons per room, floor space per capita, owned or rented.
- Kitchen - type, location, fuel, rubbish disposal, food atorage .
- Water - source, distance from house, purity, population served by safe water. "
- Latrine - population served by sanitary latrines, type of latrines, other disposal methods.
- Insets and rodents - distribution, species, density .

2-1.4 : " NUTRITIONAL DATA :

- Per capita intake of calories, proteins, animal foods (e.g. *milk*, *meat and fish*, eggs.)
- Prevalence and incidence of nutritional diseases.
- Anthropometric data - height, weight. "

2-1.5 " HEALTH SERVICES :

- General - number of hospitals, health centres, distribution, number of beds per 1,000 population.
- Admissions - number, diagnosis, age groups.

- Staff - availability of doctors, nurses, technicians and other with reference of population .
- Equipment - transport, drugs, food supplies.
- Preventive services - population protected against communicable diseases (e.g. smallpox, diphtheria, poliomyelitis, etc.) Mothers receiving antenatal care, children receiving child welfare care services, population using contraceptive devices ; diseases eradicated or under eradication; survey data relating to diseases prevalence and incidence; registration of vital cycle statistical data; population covered by health and sickness insurance."

2-2 : " INTRODUCTION TO VITAL AND HEALTH STATISTICS

Statistics have become an essential and inescapable part of medicine. If we want to establish the relationship between smoking and lung cancer, we need statistics; if we want to test the efficacy of a drug or vaccine, we need statistics; if we want to know the health status of a community, we need statistics. Statistics are more widely used in social and preventive medicine - in the health and morbidity surveys; programme planning, operation and evaluation ; in field trials of drugs and vaccines; population studies, epidemiology and a host of others. The purpose of teaching statistics to health workers is not to produce statisticians, but to help them to think quantitatively , read journals critically and be able to assess probabilities .

Health statistics cover a wide range of topics of which the most important ones are vital statistics, population statistics or demography and statistical methods .

Every nation concerned with the health of its people must know what its health problems are - their nature, their size, and their distribution among the various population groups, how these problems vary from place to place, and how they change in time and by external conditions, economic and social. For any such assessment, certain basic measurements are necessary; these are called Vital statistics. Vital Statistics may be defined as the facts, systematically collected and compiled, in numerical form, related to, or derived from records of vital events. These vital events are the birth, deaths, marriages and sickness that occur in a community.

Accurately compiled and analysed, the vital events serve as ' yard sticks ' for measuring the health status of the population .

The main subdivisions of vital statistics are : mortality statistics, morbidity statistics, fertility statistics and population statistics . The term " health statistics " a relatively new-comer, has a wider meaning; it covers three measurements : (1) of the state of health, e.g. morbidity, mortality etc., (2) of factors affecting health e.g. nutrition, housing, social, economic and environmental factors and (3) items of service, e.g. preventive, promotive and curative services. "

2-3: " USES OF VITAL AND HEALTH STATISTICS :

Public health without statistics has been compared to a ship without a compass. The uses of vital and health statistics are several. The following are some of them :

- To measure the state of health of a community and to identify its health problems, their nature, their size and their distribution among the various population groups, so that available health and medical care can be used with maximum effect.

- For comparing the health status of one country with that of another, and for comparing the present status with that of the past .

- For planning and administration of health services.

- For prediction of health trends.

- For estimating the future needs of the community and to fix suitable targets for achievement .

- For evaluating the progress, success or failure of programmes and services already in operation .

- For research into community health problems. "

2-4: " Sources of Vital and Health Statistics :

The main sources of vital and health statistics are:

- The Census
- Registration of vital events such as births, deaths and marriages

- Notification of infectious diseases
- Records of hospitals and health centres

- Health and morbidity surveys
- Surveys of particular diseases
- Records of sickness - absenteeism
- National sample surveys. "

2-5: The study and understanding of Social and Cultural Factors in relation to the community are also of Vital importance in terms of " Organizing a Community For Action." The use of the Community organization method to facilitate and enhance effective Community Participation, may be considered quite relevant to our Health Extension Education and Community Participation Component of the SSF Projects.

2-6: Attached as Appendix I is a document " OUTLINE NOTES FOR LECTURE (DISCUSSIONS) ON ORGANIZING A COMMUNITY FOR ACTION " By : B L MUIR

Section seven (7) deals with a " Summary of some Critical Community Factors for Consideration "; and these may be looked at as selective examples.

2-7: What the famous authors - Cicely D. Williams and Derrick B Jelliffe has to say on " Cultural Variations ----- " in their " Oxford Medical Publication - Mother and Child Health," may be of relevance to any health programme survey :

" I would rather know something about the man who has the disease than about the disease the man has (Dr. Caleb Parry, Bath, 1770) "

2-7.1 " The local culture pattern is of great importance to MCH workers anywhere in the world for the following reasons :

It leads to an understanding of culture factors underlying disease patterns in the community. "

2-7.2: " It gives insights into peoples values, knowledge of, and attitudes to health and disease."

2-7.3: " It suggests how to ensure from a population the best cooperation with, participation in, and appreciation of health work carried out by personnel trained in a foreign, that, is scientific medicine."

2-7.4: " It may enable scientific medicine to become enriched by new ideas, methods and techniques. "

2-7.5: " CONCLUSION

Measurements of health, both for individual patients and for groups, are indispensable for the following reasons :

- They provide health staff with basic information about health status, patterns of disease, and about the factors that affect health .

- Through these measurements, it is possible to solve some problems and to create policies and programmes.

- It is also possible to provide information for the health education of politicians and of the public. However, epidemiologists, economists and politicians should not make use of figures without first assuring themselves of their accuracy.

- It becomes possible to measure progress.

- MCH services must not be formed in any rigid pattern. They must remain flexible, adapted to the changing needs and to the resources of the community. For these services in particular it is necessary to take measurements of health for guidance of policies and for assessing progress .

- Vital and health statistics will never be accurate without good maternal and child health services. The reverse is equally true. Both these areas of service must go forward together .

Basically there is a need for all health personnel to become 'measurement-minded' - descriptive observation must be complemented by the language of figures. "

2-7.6 It may be noted that we have quite subtly dealt with some of the general good reasons / purposes for Baseline Health Surveys .

Simply put, these surveys are needed to facilitate meaningful EVALUATION of health programmes - " to provide a foot - rule for measuring future progress."

The Researcher must be able to determine the measurable impact of the selected variables (. characteristics being studied or observed) on specific goals and objectives of the programme .

3: Here a summary of some essential requirements for effective evaluation may be mentioned :

3-1." The existence of a plan, scientifically prepared, setting forth clearly the aims and methods. "

3-2." The fixing of a baseline as a measure against which to compare results. "

3-3." The availability of staff properly trained in evaluation. "

3-4." The establishment of a system for the collection and analysis of data. "

3-5." The according of greater importance in the evaluation to the results than to the efforts expended. "

3-6." The evaluation of <u>all</u> aspects of the programme, distinguishing <u>firstly</u> ; activities and procedures that serve to determine the efficiency of personnel and services, or the validity of methods; "

<u>secondly</u> : objectives as they apply to partial phases of the programme ;

<u>thirdly</u> : the ultimate aims, and
<u>fourthly</u>: any special aspects to be studied, as, for example, the economic and social effects. "

3-7." The utilization of the results of evaluation at all levels. "

4 : " THE SCOPE AND CONDUCT OF COMPREHENSIVE HEALTH SURVEYS

The development of specific measurable goals and objectives for any Baseline Survey is imperative. These will largely influence or determine the scope of the survey. "

4-1:" Various methods may be used to elicit the information needed; which information must cover completely the specific objectives of the study. "

The use of the " Questionnaire " method and observation approaches are notable examples. Ofcourse, too, data may be obtained from various records of historical research and vital and biological statistical records. However, " surveys are particularly valuable when they can supply information lacking from vital or biological statistics. "

This is particularly so when work can be started on the basis of their findings, and ' before ' and ' after' figures are thus available for comparison ----- (Williams/Jelliffe)."

4-2:" Surveys may be expensive in money, transport, equipment and personnel. However, a careful study and choice of sampling technique may yield valuable results at a small expense. These are also some factors which might influence the scope and conduct of the Survey. "

4-3:" Aperiodic evaluation of the health of the community should be a prime objective of every health programme; and this includes the question of the provision of adequate quantity and quality of community water supplies, and hygienic usage and practices etc.

Here too Health Surveys will provide a spring and stream for health-related publicity and health education .

They also provide means of comparing local health services with those of health units elsewhere. " This Conference will, I think, offer opportunities for comparing, as example, our varioos Country Programme Survey experiences in the SSF Project .

4-4:The following excerpts from another U.W.I., Monograph on " EVALUATION IN PUBLIC HEALTH " is interesting and almost irresistible of mention here, in terms of their value to the subject under discussion .

Scope and Conduct of Comprehensive Health Surveys :

" The specific objects of a comprehensive public health survey should cover the assembling, analysis and interpretation of/accurate scientific data for one or more of the following purposes :

- To ascertain local health problems and, in particular, to determine, in terms of the internationally accepted vital and health statistical indices, the characteristics and prevailing level of community health. This will draw a base-line for measuring any change in the health status brought about by the programme :
- To recommend priorities in public health action ;
- To make an inventory of the facilities and resources already available for instituting a health programme so that skills and resource can be properly deployed for the major health demonstration programme or for individual projects;

- To elicit information about the various demographic factors suspected of having a direct or indirect bearing on health, that is, to provide a " public health diagnosis.";

- To serve as a guide to more intensive investigation into some local situation or problem ;

- To appraise the result of health activities ;

- To demonstrate the economic values of proposed health programmes and so inform leaders of public opinion, administrators and the people of needs, opportunities and advantages ;

- To meet some local situation of an urgent or temporary nature ;

- To secure co-operation and intelligent understanding of health effort before the public health programme is launched, and finally ;

- To provide an historical record of a community health experience and programme. "

5: CONCLUSION

Particularly, our distinguished participants who were associated with the international conference of representatives of countries participating in the SSF Research / Demonstration Projects, held in the Hague May 28, to June 3,1978; might recall the position this Jamaican representative took.

That due to differences in socio-cultural socio-economic, political and organizational framework, country programmes would need to be flexible to allow for possible consequential variations.

While we, therefore, basically subscribe to the spirit and letter of a common programme design, it was conceded that individual participating countries would be free to make such variations as might accordingly become necessary .

I am, however, pleased to advise that Jamaica has been able to accommodate the basic agreed programme outline with but some minor variations thereto .

We look forward to sharing our various Baseline Surveys experiences throughout these conference discussions.

sd/- B L Muir (Mr)
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1-9-1980

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APPENDIX I

OUTLINE NOTES FOR LECTURE

ON

ORGANIZING A COMMUNITY FOR ACTION

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Post-Graduate Diploma Commerce H (Health Education)

U.W.I.

The Bureau of Health Education, Kgn., October, 1978

1. INTRODUCTION

The Write wishes to advise his audience that what will be dealt with in these discussions should not be regarded as a full treatment of the subject. The time available would certainly not permit for anything even near an exhaustive discussion on the topic: only certain selective aspects as under will now be dealt with .

2. The objectives

Despite these limitations, however, it is earnestly hoped that you will :

(1) gain some knowledge and understanding of the community organization method and process ;

(2) gain some knowledge awareness, understanding and appreciation of the sociology - related dimensions of this Community Organization Method and Process ;

(3) Gain the basic knowledge and understanding of the methods and approaches which may be used effectively in implementing this community organization process in the Primary Health Care Programme of your Parish .

(4) Achieve greater skills, in the use of the Community Organization method and process, in pursuit of your health services goals .

(5) More widely and effectively apply your knowledge, understanding and skills of the community organization method and process in your health services/work activities.

3. It may be reasonably argued that as health workers, you must have previously had some training and/or practical exposure in atleast some (if not all) of the areas of thought and principles which will be discussed herein. However, REPITITION might be useful for REINFORCEMENT and CONSOLIDATION etc., of such knowledge, and it is hoped that added knowledge, interest, awareness and resolution to try these approaches on a continued basis (as the need arises) will result from these discussions .

4. Definition of the Community Organization Method and Process

This may be defined as the process by which the capacity of the community to function as an integrated unit, grows as it deals with one or more community problems. It is both a method and a process .

5. What will follow shortly are the following selected areas for discussion :-

a) The purposes / uses of the Community Organization Method / Process .

b) The Sociology - related dimensions of the Community OrganizationMethod/Process .

c) The Method / Approaches which may be effectively used to implement theCommunity Organization Method / Process in the Health Care Services of any community .

It may here be noted, however, that the use of this method / process may be extended towards the organization of the community for action in just about any other of the social services as well .

6. The Method / Approaches involved in Community Organization

a) The person-to-person approach

b) The Group Approach

c) The mass-communication media approach (e.g. Radio, T.V., The Press, Micro-phone Publicity at local community , e.g. Survey done by individual(s) of a community or by any health worker .

7. Summary of Some Critical Community Factors For Consideration

a) The felt health (and other) needs and interests of the people of the community.

b) The assessment of priorities as are, determined or perceived by the community .

c) The development of a feasible plan for the solution of problems or meeting the needs of the community.

d) The implementation of such plan involving community participation.

e) The approaches to be used .

f) The evaluation (assessment of the outcome of the planned and implemented programme activities.)

g) The physical boundaries of the particular community .

h) The population: age structure, sex, occupation.

i) The economics relating to the community .

j) The social groups; ethnic groupl racial grouping etc., of the community .

k) The attitudes, believes, customs and values (value system) of the community .

l) Physical Factors - Climatic conditions, housing conditions etc.

m) The health status of the community e.g. sickness and health behaviour, the incidence and prevalence, disease and infirmities etc.

n) The Leadership patterns of the community.

N.B. Kinds of leadership .

1. Headship - person is named as head; where the authority is given from above .

2. Leadership - Fellowship : where the authority is given from an individual below

3. Leadership through popularity - where the authority is ascribed to an individual .

4. Leadership through a particular talent e.g. Musicians; athlethes.

o) The power structure of the community.

p) The social amenities available in the community.

q) The perception of health problems, etc. by the community people .

N.B. The use of existing community organization or groups should be done : it may not be necessary or desirable to form a new type of group in some situations .

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THE COMMUNITY ORGANIZATION METHOD/PROCESS

The Purposes / Uses of the Community Organization Method / Process

1. Problem solving - meeting the needs of people .
2. Self-help - (the peoples own actions to be developed)
3. Participation of the people - planning etc.
4. Co-operation among people .
5. Actual utilization of social resources to meet needs - Where there are none,help,people to create them .
6. The use of Volunteers .
7. Co-ordination (Programmes and Agencies in the area)
8. The formation of a Community Council (How about Village Committees?)
9. Education of people .

The Sociological Dimensions of Community Organization

1. What is the population like (M/F Age Grouping)
2. Ethnic Composition; mobility (social)
3. Institutional structure - What are the characteristics of persons they are reaching ?
4. The Value System; what are the Mores ?
5. Do people feel they should participate in the activities of the community ?
6. Social stratification : are they distributed evenly or unevenly. The rights of people .
7. Interpersonal relationships.
8. The pattern of local leadership.
9. The power-structure in the community. Are there vested interests there ? Those who may want to block community efforts. Religious, political and others.

10. The ecological (environmental) situations.

11. Levels of poverty, delinquencies, water supplies.

12. Patterns of land use; building patterns etc.

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INTRODUCTION ON COMMUNITY PARTICIPATION

Dr. Alastair White

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I. Why should community participation be considered ?

The case for community participation in many fields of development is now well recognised. In the field of health services, for instance, it is a central aspect of the concept of Primary Health Care, which has been adopted by the World Health Assembly as the organising principle around which to " bring health to all by the year 2000 ". Altogether, at least ten distinct reasons have been advanced in favour of participatory methods, as discussed below. All of the reasons will not be found equally valid from every point of view, while some may be thought to apply in some situations and others in different ones, but they are not in general mutually exclusive, and taken together they make a strong argument.

1. (More will be accomplished.)

Much of the impetus for the movement toward community participation derives from the observation that conventional services have not been extended to the rural areas, or even the urban poor, at a fast enough rate. If people are to receive the services (also increasingly seen as their right) within the foreseable future, it is regarded as necessary that they themselves take action to provide them in as self-reliant a way as possible.

For some proponents, the implication is that the conventional service agencies are unlikely to change their approach, so that communities will have to organise themselves to meet their own needs if they are to be met at all. This pessimistic view of the potential for the reorientation of government agencies to the needs of the poor is obviously more justified in some countries than in others. It is in part a question of politics: whether the government represents or is genuinely committed to the interests of the poor majority of the population. In the second place, it is also a question of the interests and attitudes within the staff of government agencies: they are often able to exert a considerable influence.

In many countries there have been calls for self-reliant development efforts by the local communities, especially in the construction of public infrastructure. Coordination is required between community efforts (labour contribution) and external agencies or local authorities (materials, expertise). The experiences have often been disappointing: among the reasons, perhaps, is a general lack of interest among the technical ministries and departments for these small-scale improvements.

2. (<u>Services can be provided more cheaply</u>)

Perhaps this is only another way of looking at the foregoing argument: if services can be provided more cheaply to each community, they can be provided to more communities altogether. However, the reference to the comparative cheapness of a participatory approach is usually made from the perspective of government, and implies that resources are saved by a government agency which uses community contributions to help complete its projects, and are released for completing more projects or for other government purposes in general. Given that the cheapness is achieved only in part by a reduction of total costs, it is in part a transfer of a burden in real resource terms on to the community, relative to the position that would have obtained if the service had been provided directly. It is therefore of the greatest

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relevance to ask who benefits from this: it may involve a redistribution from the relatively poor to the relatively rich. In feudal societies, unpaid corvee labour could be called upon as a cheap way of meeting the requirements of the manor or the state, and there have been recent historical parallels in most parts of the developing world. The main difference between these practices and a labour contribution in a context of community participation is that in the latter case it is the contributing members themselves who should benefit: but in practice it cannot always be taken for granted that they will.

Cheapness need not only be a question of not paying for labour, however, but of adopting organisational and technical solutions which are cheaper and may also be more appropriate to the local environment. Village health workers, for instance, may actually be more effective than doctors in the village, if they are well trained for the circumstances in which they will work: they understand the environment, and are typically well motivated to work within it.

3. (Participation has an intrinsic value for participants)

Apart from the more instrumental advantages of community participation as a means to achieve other ends, it is often argued that people simply should be able to participate actively in the processes which affect them, having a voice in the decisions that are taken, and a part in their implementation. Apart from the intrinsic satisfaction that this may bring, and the avoidance of the feelings of alienation and powerlessness, we may also mention the possibility that an increase in cooperative interaction will lead to a more united community. These are, however, probably not measurable effects, and the increased activity will provide occasions for friction as well as for harmony.

Even participation may have little intrinsic value if it is, in practice, on terms defined by others.

4. (Catalyst for further development efforts)

This argument is more specific than the postulate that community participation will lead to a more united community. It is thought that the organisational patterns created for one project - the committees and the arrangements for voluntary labour - as well as the enthusiasm created by one success, will provide both the means and the stimulus for further efforts to tackle other needs. This assumes that it has been the organisational framework and the stimulus that have been lacking in the past, while other constraints are less important. Among the other constraints which should not be discounted are those stemming from social structure (such as the fear which people might reasonably have that others will gain more than themselves), or a lack of worthwhile projects which can realistically be completed by the community without outside help. Where these constraints do not exist or can be overcome - where, for instance, outside help is made available for further projects - there are certainly examples of communities which have completed further development efforts in this way.

5. (Participation leads to sense of responsibility for project)

It is thought that when people have taken an active part in the planning and/or implementation of a project, they will collectively consider the completed project as their own, have pride in it and a sense of responsibility for it, and therefore use it, do so responsibly and avoid damaging it, and do their best to maintain it. The argument is based in part on the familiarity which each community member will have gained with the project, but in greater part on the idea of the emotional investment he will have made in it.

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There is a question whether people always do feel this way: in some cases, it is suggested on the contrary, villagers feel that they have made their contribution at the construction stage and it is now more than ever the responsibility of government, the usual provider of such services, to maintain the project (Feachem et al., 1978). In any case, it is quite clear that if maintenance is to be carried out, special provisions must be made for it, and the sense of responsibility which the community may feel is not enough. As in some of the other expectations held about community participation, outsiders expect the community to respond as they themselves would, or think they would; but communities are not individuals. To speak of a community having a commitment to a project can only be a metaphor for a range of attitudes among individual community members, none of whom may value the project particularly highly in relation to his own private affairs.

6. (Participation guarantees that a felt need is involved)

This argument for participation differs from the others in that the advantage is not seen as being a consequence of the participatory effort, but in a better selection of project sites. Communities demonstrate their need for the project and their willingness to support and use it once completed, by making the collective effort to organise and participate in construction, or by making a financial contribution.

Where communities in effect compete for limited government resources by demonstrating their readiness to make a contribution, a number of anomalies can arise. The more backward communities and regions are likely to be left even further behind, since those which are already better off and closer to centres of power will be able to organise more effectively. There is a danger that in the competition, too many villages will go ahead with collecting money or actually constructing buildings for services which government is in no position to provide on such a large scale for several years at least (this happened in the Lesotho example); or (the case of secondary schools in Kenya) which it may never be reasonable to locate in so many small places. There is not even a guarantee that the projects are really wanted by a majority of the population, since when competition for resources comes to be a matter of the number of self-help projects begun, local politicians and dominant groups may exert considerable pressure on the population to take part. The poor may be induced to contribute to the building of, say, a secondary school to which access is theoretically open to all but which, in practice, caters primarily for the children of the better off (Lamb 1973; Grondin 1978).

7. (<u>Participation ensures things are done the right way</u>)

If the users take an active part in the planning and design of the systems they will use, then these systems will presumably be better adapted to their needs than if the technical solutions are decided by outsiders without consultation. Some observers, however, make a distinction between major technical alternatives and such questions as location (e.g. of standpipes) or the detailed design of the components of most direct interest to the user. The distinction may be useful, but there could be a danger that it will lead to the assumption that the population can have no view on the more basic design issues, whereas these may be fundamental to meeting their needs: an example is that it is essential to take pastoralists' knowledge into account in siting water-points in semi-arid pastoral areas, but they are often disregarded by more educated members of other ethnic groups (Parkipmy 1975).

It may be that the exercise of an open-minded and imaginative approach by the professionals or experts involved is as important as the participation of the users and is in fact a necessary complement if user involvement is to lead to improved design in most circumstances, since many users will simply assume that the experts know best and will not raise alternative possibilities themselves.

There is one potential problem which may be mentioned here: when given the opportunity to choose between different technical solutions, there is a tendency for people to choose the solution which is more "modern", sophisticated, or expensive, for reasons connected with prestige. This is particularly true if they will not bear very much of the additional cost of a more expensive solution, or if the cheaper one requires more work which they will have to do without payment. For instance: in Ghana, where communal village latrines are common, villagers often state a preference for the type emptied by vacuum truck over the deep trench pit latrine. The latter has to be replaced by village labour when it is full, whereas the vacuum truck operates at the expense of local government, an expense which is not charged to the particular village. Yet the pit latrine may be regarded as more appropriate to rural Ghana than the vacuum truck, which is subject to frequent breakdowns (IDS Health Group 1978, Vol. 1: 218).

8. (<u>Use of indigenous knowledge and expertise</u>)

Recent years have been a fundamental change in the attitude of professionals in many fields toward the value of the knowledge and skills possessed by indigenous practitioners in their fields. It is now generally accepted that indigenous practices are usually very well adapted to the circumstances in which they developed. One of the arguments for participation is that it enables progressive change to take place while making use of this knowledge and adapting it to new circumstances, rather than discarding it and devaluing its possessors.

There are two aspects: close attention can be given to local expertise during the process of consultation in the planning and design stage; and indigenous techniques and experts can be used in the implementation of projects. Examples of the latter include the use of the indigenous medical tradition in China, or (on a completely different scale of course) of indigenous building methods in the water storage projects conducted by Guggenheim among the Dogon in Mali (Guggenheim & Fanale 1979). This approach involves strong respect for and understanding of the indigenous technology, but a dynamic view which does not see it as a cultural heritage to be preserved separately and kept pure, but rather as a useful expertise to be improved upon by combination with elements of "Western" technology.

In many cases, of course, an introduced technology will be indisputably better in all respects; but sometimes indigenous techniques have advantages even when they appear less efficient or more costly: they use local labour and raw materials rather than imports; maintenance and repair will be easier for local craftsmen, and there will be less demand for scarce skilled manpower or spare parts; or the indigenous technique serves some additional purpose neglected in a superficial comparison.

9. (<u>Freedom from dependence on professionals</u>)

Largely because professional skills are scarce and can be sold in an international marketplace where fees are dependent on the rates of pay in rich countries, and, some would say, because the scarcity of these skills is institutionally maintained through insistence on unnecessarily long and expensive periods of professional education not geared to urgent local needs, professionals in most developing countries enjoy a standard of living incomparably higher than that of the mass of the population. In this context, a radical approach to community participation envisages the prospect of freeing the mass of the population from dependence on a virtual monopoly of expertise controlled by professionals. In the health field, for instance, in this view, collective self-care can replace the need for paying comparatively hige sums for treatment by a doctor (Warner 1977, 11)

In this extreme form, the view may be said to be born of despair of the political system ensuring a fairer distribution of income or access to adequate services.

However, a less extreme view sees scope for moving in the direction of disseminating more widely the knowledge and skills which have been the preserve of narrow professional elites, as in the case of the Chinese barefoot doctors. In the field of water supply, the suggestion is that a participatory programme can teach mechanical and other skills, and that every effort should be made to make this teaching as generally useful as possible. A villager trained in operation and maintenance might be enabled to open a mechanical workshop. Such training can also end a monopoly by one local craftsman (Westman & Hedkvist 1972, 7).

10. (<u>Conscientisation</u>)

Participation in efforts to bring about communal improvements should, even (or especially) if the efforts are frustrated, help people better to understand the nature of the constraints which are hindering their escape from poverty. They may learn how to make more effective demands on government, or acquire a new resolve to change a situation

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of oppression in which they find themselves.

This is, of course, precisely the reason why some governments which represent entrenched interests are suspicious of efforts to arouse community participation. Government agencies may be prevented from using participatory methods, or alternatively the forms of participation may be kept under strict control, defined narrowly in terms of the completion of projects and provision of services rather than in terms of increasing local organisational capacity, and de-emphasizing all elements which might bring into question the distribution of benefits from particular projects or the distribution of wealth and power at local or national levels.

In other countries, government's interest in improving the position of weaker sections of the population is to varying degrees frustrated by local power structures. Two broad approaches to the problem are possible: close targeting of programmes to benefit weaker sections, implemented through the bureaucracy and with administrative controls to ensure that the benefits reach those for whom they are intended; and, on the other hand, the encouragement of organisation among the poor to claim their rights. This begins with "conscientisation", the development of consciousness among the weaker sections concerning the structural causes of their situation, or at least of their rights under existing laws. The two approaches are not in conflict and may be adopted together, but they seem to reflect different opinions or assessments of what is likely to be successful. In India, for instance, the two approaches are reflected respectively in the Integrated Rural Development Programme with the strategy of " decentralised micro-level block planning for full employment", which carries planning down to the level of the individual family(Azad 1978), and the

National Adult Education Programme, whose objectives are explicit on the need for conscientisation. The differing opinions are reflected in different views of the role of local government institutions - in terms of their existing tendency to be "dominated by the rich and the strong" (India: Dantwala Committee 1978, 12) or in terms of their potential to serve as organisations more representative of the weaker sections (India: Mehta Committee).

Where local government institutions are less well developed, the committee structures created by community participation programmes may take their place to some degree, as they may also in the villages too small to have their own local government councils. Then, the same question often poses itself: are they necessarily dominated by the rich and the strong, perhaps even preventing benefits from reaching the weaker sections - or do they have the potential of strengthening the hand of the poor ?

II. The Definition of Community Participation

Despite the great diversity in the objectives sought through popular participation, and the different ways in which the term has been understood and interpreted, a certain consensus has begun to emerge upon a working definition among some of the international organisations involved in development. According to this definition, participation has three dimensions: involvement of all those affected in decision-making about what should be done and how; mass contribution to the development effort, i.e., to the implementation of the decisions; and sharing in the benefits of the programmes (World Bank 1978). A fourth element is sometimes considered : namely, local participation in evaluation. However, this may be considered part of the decision-making process.

These ideas can be understood so broadly as to be referring to the entire political and economic process of the country: popular participation then becomes another term to designate democracy, full employment or access to the means of production, and an equitable distribution of income, There is a large gap between these general (macro-societal) goals and the kinds of activities typically carried out in the name of participation. Indeed, there appears to be a real danger that the confusion of the broad goals with the founding of cooperatives, local community development committees, literacy or health education compaigns, or allowing people to choose the layout of roads or waterpipes in their neighbourhood (World Bank 1978) will divert attention away from the broad goals or give a spurious impression that they are being achieved.

Therefore, it has to be made clear that in discussing community participation here we are not concerned directly with these broad goals of democracy, employment, or income distribution: they must be pursued separately. The only exception is where community participation projects contribute-usually in a minor way - toward these goals.

Then, of the three dimensions mentioned, the sharing of benefits is of a different order: it does not distinguish projects in which services are delivered <u>to</u> the population, from those in which the population takes an active part. Therefore, while bearing in mind that the equitable sharing of benefits is essential, we take community participation to be defined by involvement of the local population actively in the <u>decision-making</u> concerning development projects or in their <u>implementation.</u>

Finally, involvement of the population in the physical work of implementing a project can hardly be considered as community participation unless there is at least some degree of sharing of decisions with the community. Thus, when an outside agency remains in total control of the process and merely calls upon the beneficiaries to give labour directly, one cannot speak of community participation even though there is an element of self-help labour. It is also necessary to make a distinction between the participation of some local individuals (beneficiaries) and the participation of the organised community as such. The word "community" denotes a social entity, organised in some fashion however loose and informal, and with some sense of identity, not just the inhabitants of a locality.

On the other hand, it may be unrealistic to insist that "true" community participation is only achieved when the local people are in full control of the process or decide entirely for themselves which activities should be embarked upon. It would be difficult for a sectoral agency of government, such as a water authority, to put into operation such a concept of community participation. Autonomy of this sort may be considered a special form of participation, to be achieved only under particular circumstances.

The Forms of Community Participation

1. Consultation

The basic means of giving the community some voice, involving it in decision-making. Main rationale: to ensure that the project or programme introduced by the outside agency is adapted to meet the needs of community members, and to avoid difficulties in implementation. It may involve :

1 a. Consultation with community representatives or leaders only.

It may well be considered that such consultation does not

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amount to real community participation unless the community is one where the decisions formally made by representatives or leaders are the result of wider consultation and consensus within the community, and unless the community is thereby involved in decision-making on significant aspects of the project which is being introduced.

1 b. Consultation with all sections of the community.

This is primarily a matter of ascertaining the views of those sections of the community which may normally be excluded from decision-making (women, certain ethnic minorities or low caste groups, the poorer sections), whose interests may not be genuinely represented in the existing processes of decision-making in the community. The rationale: to ensure that the project meets their needs also. This is not always easy, and there are differing views on the emphasis which can or need be given to it.

2. A financial contribution by the community

Cash collections made by and within the community, generally prior to or at the time of implementation of a project, usually as contribution to capital construction. Excluded, as not really constituting community participation, are cases which amount to a payment by individual families for service, even when it is an advance payment.

3. Self-help projects by groups of beneficiaries

In these projects a specific group of local inhabitants contribute their labour (and perhaps other inputs) to its implementation, while there is also the assistance of an external agency. Those who contribute will be recompensed by reduced fees for the services they receive, while non-members pay more.

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4. Self-help projects involving the whole community.

Projects in which every family in the community is expected to make a contribution (usually in labour), while there is also an input from an external agency. Food-for-work projects may perhaps be included here, though the element of community participation may be considered slight if it consists only of labour which is paid in cash or kind.

5. Community specialised workers.

The training and appointment of one or a few community members to perform specialised tasks (e.g. as community health worker, or operator of a community water supply system). The training and technical supervision are carried out by an external agency, but some form of community authority is usually also exercised over the specialised workers.

6. Mass action.

Collective work in the absence of a major input from an external agency. Often such actions are directed at environmental improvements (e.g. to drain waste water).

7. Collective commitment to behaviour change.

Cases where a community makes a collective decision to change customs or personal habits, and collective social pressure is exercised for the realisation of such changes. Examples range from penning of domestic animals to construction and use of latrines, or to the reduction of excessive expenditures in connection with weddings, funerals etc. While changes of behaviour may of course occur in other ways. Community participation is involved when an explicit decision is collectively taken.

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8. Endogenous development.

Cases in which there is an autonomous generation within the community of ideas and movements for the improvement of living conditions - as opposed to stimulation by outside agents. The community may, however, have recourse to external agencies to help with implementation, or indeed press for such help. On the other hand, where this is simply pressure for services to be provided, it hardly qualifies for the term "community participation", though in a wider sense this is an example of political participation.

9. Autonomous community projects.

The ambiguous term "self-reliance" is often understood in this sense: projects where any external resources are paid for by the community with funds raised internally, including the hiring of any outside expertise or professional staff. Such projects are therefore under community control.

10. Approaches to self-sufficiency.

Projects in which the objective is to satisfy local needs as far as possible by using local materials and manpower directly, not by purchasing goods and services from outside. "Self-reliance" is also sometimes understood in these terms.

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