

# the evaluation of village water supplies in Lesotho: some preliminary findings

## INTRODUCTION

The conclusions and recommendations recorded here are the product of approximately eighteen months work by a team of nine people. The members of this team are

Liz Burns	- Bacteriologist
Sandy Cairncross	- Civil Engineer
Aron Cronin	- Sociologist
Piers Cross	- Social Anthropologist
Donald Curtis	- Development Sociologist
Richard Feachem	- Civil Engineer, Project Director
Khalid Khan	- Civil Engineer
Douglas Lamb	- Economist
Hilary Southall	- Medical Statistician

The project commenced in April 1975 when Feachem made his first visit to Lesotho. The fieldwork ended at the end of July 1976 when the four long-term fieldworkers (Cairncross, Cronin, Cross and Southall) left the field and came to the University of Birmingham. Since the end of July the whole team, with the exception of Khan and Burns, has been gathered in Birmingham analysing data and drafting reports. The findings which we report in this document are provisional only and have been produced in considerable haste. We should be grateful therefore if these findings were not quoted or distributed outside your own organisation.

In arriving at these conclusions and findings an enormous amount of data has been compiled, analysed and sifted. Our work is unusual in that it has been produced by investigators from a variety of different disciplines working on a variety of different aspects of village water supplies in Lesotho. What we present to you here represents a distillation of the data which we have gathered and it is clearly not possible either in this document or in one afternoon to explain fully the methods of analysis and the process of decision making which have enabled us to come to these findings and recommendations.

The following abbreviations are used

DCDO	- district community development officer
FTA	- field technical assistant
Comrudev	- Department of Community and Rural Development (now the Ministry of Rural Development)
R1	- one South African Rand - worth approximately 64p.

## 2. THE COMMUNITY DEVELOPMENT APPROACH TO WATER SUPPLIES

### 2.1 Introduction

Rural water supplies in Lesotho since 1966 have been the responsibility of the Department of Community and Rural Development (Comrudev). From its inception in 1962 the Department has been concerned with the classic community development activities of adult education, 'self-help', and the stimulation of local leadership. This approach is fundamental to the water supply programme. Current activities are, however, dominated by:

- i) road construction through the food for work programme;
- ii) village water supply construction.

There has been a move away from the broader educational and 'people-centred' activities towards 'project centredness' which no-one particularly wants but which has been thrust upon the Department by the size of the exercise that it has generated.

We see no possible move away from project centredness given the fact that donors would prefer to fund itemised projects but see scope for diversification of Comrudev activities. In framing recommendations about how the water supply programmes can be better managed we bear in mind the need to let Comrudev administration as a whole broaden the range of its activities.

Community development principles are still subscribed to by Comrudev and are also strongly believed in by most of the donor supporters of the Department. These principles stress the importance of community participation, self-help and the possibility that outside help will act as a catalyst for further developments undertaken by the villagers themselves.

We find that actual processes in the field are always more complicated than these principles suggest, and that while this ideology emphasises villager response, much depends, in practice, upon the Government's ability to respond to village initiative and upon actual management procedures in the villages. We also find that when projects are framed and thought about by Comrudev, and by donors, largely in terms of their likely furtherance of these community development objectives, this may distract attention from more mundane but necessary virtues like administrative feasibility. There are three areas of indeterminacy in Comrudev water supply activities:

- a) policy formulation;
- b) implementation and maintenance procedures;
- c) the creation of village institutions.

These are considered in turn.

### 2.2 Policy formulation

The consequences of relying upon self-help ideology without more specific policy formulation are apparent in the enormous demand ('felt need') for water supplies that is apparent from 727 village subscriptions for water supplies when the capacity for building supplies is very small. We consider that demand must be held in check although it is still possible to respond first to villages which show themselves willing.

### 2.3 Implementation and maintenance through self-help

Here, too, there is a need to firm up procedures if there are to be economic and social benefits from using self-help as against paid labour.

Comrudev policy is that supplies should be given to villages which are prepared to contribute cash and labour. It is assumed that the villagers, having contributed, will be motivated to look after the supply. It is hoped that involvement of the village with water supplies will lead to their undertaking other development projects. The second question is treated separately in Section 2.5.

Practically, contributions are:

- i) cash towards construction;
- ii) labour contribution in construction (mainly trench digging);
- iii) cash and labour towards maintenance as required.

### 2.3.1 Initial cash contribution

There is currently no formal policy on the amount of cash the village should contribute before it is considered for a water supply. The average sum contributed was R1.28 per household in the mountains and R1.70 per household in the lowlands, but some villages contributed very much more, and others very much less than these figures. Indeed, there are unusual cases of villages which have contributed no money at all being provided with a piped water supply by Comrudev. Comrudev have the figure of R2 per household as a working guideline for their DCDOs but they do not insist on this. While village financial contributions are proportionally small, being on average only 7% of the total materials' cost, we do consider that cash contributions are a measure of support for the projects. We tentatively recommend that a new figure of R5 per household should be adopted by Comrudev to be contributed by at least 60% of households to benefit from the supply.

### 2.3.2 The labour contribution

We find wide variations between different villages in the amount of labour which is contributed to the construction of the supply. However, the costing of construction using self-help labour, as against contracted or daily paid labourers shows that self-help is the cheaper alternative, particularly when technical supervision is minimised. It also shows that while on the job, self-help labour is more productive than contract labour or daily-rated labourers. We recommend therefore that the self-help labour contribution be retained.

To encourage a good turnout of labour we suggest that the role of the village chief and of the committee be specified in the constitutions of the village water bodies and that financial penalties for joining the water supply scheme without providing labour be instituted.

### 2.3.3 The self-help contribution to maintenance

In general, water supplies are not well-maintained and there are many cases of water supplies which remain inoperative for months and even years for want of a simple repair. We recommend therefore that the procedure described under the maintenance section (Section 3.5) be adopted whereby a village water minder and assistant receive training from Comrudev and return to the village to handle simple maintenance tasks. When the maintenance tasks are beyond them the job will be referred by them to the FTA who is located in the district, who in turn may refer problems to the technical section in Maseru. The current procedure of having no trained village water minders and no technical staff located in the districts is bound to lead to almost no maintenance being done.

The expectation that villagers will maintain the supply because they have contributed is over-optimistic on three counts. First, their reaction is often that having paid Government for the supply, the Government should maintain it. Secondly, even when responsibility is accepted in principle,

the individual responsibility for the maintenance is not specified. Thirdly, some of the technology is too advanced for people in the villages to maintain (see Section 3.2).

#### 2.4 Village institutions

We find that no clear policy for village management of water supplies has been drafted or carried out by Comrudev. If self-help policy is to be continued we strongly recommend that action be taken to build acceptable committee structures and allocate specific tasks and responsibilities in the villages.

##### 2.4.1 Politicisation of water supplies

Village leadership will always be competitive and factions are to be expected, but if competition follows accepted rules this need not be destructive. Unfortunately, the most active phase of water supply implementation and village development committee instigation in Lesotho coincided with a period of extreme political tension, and control of village water supplies became a tool for political manoeuvre. We estimate that about half the village committees which are responsible for managing water supplies are appointed through the Government party. These committees are not elected by all the villagers and are not always accepted as legitimate authorities. In most instances, rather than providing an organisational structure through which the aims of community development might be furthered, the present structure of village development committees has the opposite effect. Political divisions in the villages are reinforced; many villagers become distrustful of committee leadership; cash and labour contributions become difficult. Thus, the effect of politicisation of water supplies has been to nullify any social benefits that might be gained by implementing rural water supplies through a community development organisation.

One of our aims is thus to depoliticise water. We recommend that this be done firstly by ensuring the village level water supply management committee will be regarded as legitimate in the eyes of all villagers, and secondly by using a form of management which does not give authority over water supplies to an indefeatable power. If one faction gains control over a committee the other should not feel dominated. We see the need to allow some villagers to opt out where one dominant faction decides to implement a water supply.

Consequently, we recommend:

- i) that water supplies should take the form of associations - groups of water users who have the right to exclude non-contributors from the supply, rather than representatives of whole villages with the right to demand subscriptions;
- ii) that committees freely elected by all the villagers manage these supplies.

We feel strongly that Comrudev should regard freely elected village committees as a necessary condition for successful community development projects.

##### 2.4.2 Clarification of responsibilities

We find that the responsibilities of the various committees are poorly understood by committee members and villager alike. Further, there would appear to be a need for the roles of different committee members to be more clearly defined.

We recommend that:

- i) since the title "village development committee" (komiti ea ntlafatso) now refers to the statutory land allocation committees, this term should not refer to the committees which Comrudev establishes;
- ii) village committees should be set up for specific projects. A village water supply should be run by a water committee which manages the interests of an association of subscribers, rather than by a multi-purpose village development committee;
- iii) committees should be provided with model constitutions;
- iv) the existing key committee posts of chairman, treasurer and secretary should be supplemented by the post of water minder (moñlokomeli). As is the case currently with other posts the water supply minder should have an assistant.

#### 2.4.3 Comrudev support for village bodies

Comrudev should improve its support services to village committees:

- i) by training a village supply minder and assistant for every supply. As with other posts these should be elected by the villagers;
- ii) by training a treasurer and secretary in basic accounting and record keeping procedures;
- iii) by giving the DCDO enough power to be able to give a ready response to demands made on Comrudev by village committees.

The effectiveness of village committee leadership depends upon its ability to act in the villagers' interests. This, in turn, depends on the District Community Development Officer's ability to supply what is required. A necessary condition of effective institutions in the villages is therefore a continuing relationship with a DCDO who has the power to decide issues and allocate resources.

#### 2.5 The catalyst thesis

A large part of the rationale for implementing water supplies through a community development organisation relies on the theory that the implementation of a water supply in a village will stimulate other activities. This theory contains three arguments, which we discuss in turn.

- i) Once a village has access to an improved water supply this will lead to other development projects in which water plays a substantial part.

We found no specific projects such as communal gardens, tree gardens, clinics or pit latrines whose success could be attributed to easier access to safe water supplies. Water supplies might however be a necessary resource for integrated rural development in the future.

- ii) Villagers will gain from the experience of a successful water project the idea that they can help themselves and thus sustain an enthusiasm for future development initiatives.

We found that, in practice, enthusiasm has been dampened both by delays in implementation and by the fact that a majority of the villages which have applied are still waiting for supplies. An over-enthusiastic village response that cannot be matched by an administrative response has produced disenchantment.

- iii) The establishment of an alternative source of authority in the villages and the development committee structures will provide a base from which the village can go on to instigate further development projects as required.

We found widespread disillusionment about committees as currently constituted both amongst participants and other villagers. Confusion about village authority has become counterproductive. Under present circumstances villagers are reluctant to risk undertaking further development projects.

While these findings may appear unduly negative, we believe that if our recommendations about Comrudev procedures on the one hand and about the organisation of legitimate village committees on the other are followed, then successful community participation in development projects will be possible.

### 3. TECHNICAL FACTORS

#### 3.1 Water demand

We find that more water is not used by people having an improved supply and there is no association between distance from the source and water use. We find that the current mean water consumption figure is 18 litres per head per day. We recommend that future designs be based on 30 litres per head per day and associated daily and hourly peak factors which are presented in the report.

#### 3.2 Technology choice

We find that the Comrudev currently builds three main types of water supply:

- i) gravity fed spring supplies with storage and reticulation;
- ii) wind pumped supplies with storage and reticulation;
- iii) diesel pumped supplies with storage and reticulation.

We find that maintenance problems and running problems of the diesel pumps are often of an order of magnitude which makes them totally inappropriate for village water supplies in Lesotho and we recommend that they be completely discontinued. We find that windpumps, although preferable to diesel pumps, are still a difficult maintenance problem and are also expensive per capita because the lack of wind requires large storage volumes and pumping capacities. We find that the reticulated spring supplies are an excellent choice of technology and can bring water with good reliability at reasonable cost to villages which are suitably located.

We recommend that Comrudev should build, on a trial basis, a variety of other technologies including:

- i) boreholes with handpumps (one per 150 people);
- ii) boxed springs;
- iii) boxed springs with storage;
- iv) covered waterholes (shallow wells) with handpumps.

The boxed spring will be particularly appropriate in the mountains where springs are numerous and have good flows throughout the year. Alternatives (ii), (iii) and (iv) above are cheap compared to the other technologies, are quick to build and could be constructed by village builders if clear instruction manuals in Sesotho were available. Comrudev should not, as at present, see fully reticulated supplies as the only alternative, but should adopt a more flexible approach and promote a variety of cheaper technologies for water supply improvements.

### 3.3 Costs

The following are estimated materials costs for a lowlands supply serving 400 people:

Protected springs	R0.30 per capita
Boreholes with handpumps	R11 per capita
Protected spring, storage and reticulation ( with 1Km of trunk main )	R12 per capita
Borehole, diesel pump, storage and reticulation	R19 per capita
Borehole, windpump, storage and reticulation	R40 per capita

### 3.4 Storage

We find that for capacities of 40m<sup>3</sup> and above, brick reservoirs are more economical than the steel reservoirs currently being used. Storage should be calculated on the basis of 24 hours storage using the necessary peak factors, except in the case of windpump supplies where seven days storage should be allowed due to the uncertainty of the wind.

### 3.5 Maintenance

We recommend that every village should have at least one village water minder (mohlokomeli) who would be controlled by the village water committee and would receive training from Comrudev at the time the village water supply was constructed. A village might choose to have two or three bahlokomeli. They would often be women; they would receive a brief training from Comrudev and should be returned to their village with a basic tool kit. In the event of any minor maintenance problem the village water minder should deal with it.

We estimate the cost of repairs and maintenance to Comrudev at approximately R110 per gravity supply per year and R230 per pumped supply per year. Assuming that 33% of supplies are pumped, a mean cost of R150 per supply per year is obtained.

## 4. WATER POLLUTION

A total of 540 bacteriological tests were conducted on 180 different village water supplies. Tests were conducted for faecal coliforms and for faecal streptococci using a membrane filtration technique. It was found that

- i) All supplies in Lesotho, improved as well as unimproved, are subject to faecal pollution.
- ii) Improved supplies were very appreciably less polluted than unimproved water supplies.
- iii) There is some evidence that unimproved supplies are a little more polluted in the wet season than they are in the dry season. This effect is not marked however.
- iv) The dominant source of faecal pollution is non-human.
- v) Appreciable faecal contamination occurs between the collection and use of water even by households using good quality water from an improved supply. This contamination is sufficient to turn water which is almost bacteriologically pure into water of worse quality than would be obtained directly from many traditional springs.

This faecal pollution occurring between collection and use is mainly of human origin and it increases as the time between collection and use increases.

## 5. HEALTH

A study was made of water-related disease and the relationship between disease and water supplies in Lesotho using existing health records. Lesotho is medically very untypical of the rest of Africa. It is the only country on the African continent without schistosomiasis and in addition it has no malaria, cholera, sleeping sickness, filariasis or arboviral infections. The main cause for seeking hospital treatment for infectious diseases are respiratory and venereal diseases. The water-related diseases of importance in Lesotho are diarrhoeal diseases, typhoid, hepatitis, polio, infectious skin diseases and infectious eye diseases.

These water-related diseases account for 11% of hospital reportings overall and 20% of reportings in the under five group. Amongst water-related diseases the most prevalent infections are diarrhoeal disease and infectious skin disease. Diarrhoeal diseases peak in the under five age group whereas typhoid peaks in the teenage group. We find that both diarrhoeal diseases and typhoid have very marked tendency to peak in January in the middle of the wet season. A comparison of reported morbidity from villages with and without water supplies leads us to the following conclusions.

- i) That there is no difference in the prevalence of reported water-related disease in villages with and without improved water supply
- ii) That there is no difference in the epidemiology and seasonality of water-related disease in villages with and without improved supplies. In fact, villages with improved water supplies exhibit a wet season peak in diarrhoea in exactly the same way as is found both in village figures from villages without improved water supplies and in the national figures.

This data is strongly suggestive of a situation in which village water supplies, as currently built, have no measurable effect on health. The reasons for this may be as follows. Infectious skin disease and infectious eye disease fall into the water-washed category of water-related diseases. There is no direct relationship between distance from the source and volume of water used and villages with improved supplies do not use more water than villages with unimproved supplies. Villages with improved supplies have no differences in hygienic practices from other villages and so it is expected that water-washed diseases, in other words skin and eye infections, will be uninfluenced by the provision of an improved water supply.

The diarrhoeal diseases and typhoid may of course be either waterborne or water-washed or, more probably, both. The fact that diarrhoeal diseases and typhoid peak strongly in the wet season indicates the probability that these diseases are waterborne and are being spread by a sudden input of faecal pollution into the water sources. However, we have found this wet season peaking also in villages which do have a reliable piped water supply. We have also shown that the difference in water pollution in the wet and dry season is not particularly marked. 31% of sources tested were actually less polluted in the wet season than they were in the dry. Also, if these wet season outbreaks were truly waterborne, one would expect them to occur in certain villages in which the sources were particularly prone to water pollution in the wet season and not in other villages. However, all data that we have indicates that the wet season peaking occurs in all communities which leads one to suspect that it is due to factors other than waterborne pollution. This evidence taken together leads us to suspect that firstly most diarrhoeal disease and typhoid transmission in Lesotho is not waterborne, and secondly that the wet season peaking is not due to waterborne outbreaks. What then is the cause of the wet season peaking?



We can suggest only three alternatives.

- i) That the survival of pathogens in the moist, warm conditions of the wet season is significantly better than in the dry, cold conditions of the winter.
- ii) That the village environment is significantly less hygienic in the wet season, therefore exposing people to a greater risk of infection.
- iii) That the tendency to consume more bought food (particularly flour) than subsistence crops in the middle of the wet season is in some way connected with the peaking of these diarrhoeas.

We offer these explanations only tentatively and consider that the second is by far the most likely of the three given. This raises the question of what type of rural water supply construction programme might, in conjunction with other developmental activities, lead to measurable health benefit. The following package might be necessary.

- i) The installation of water supplies to an improved standard so that water of reasonable quality is piped to within 100m of all houses throughout the year, with the minimum occurrence of breakdown.
- ii) That there is a major change in excreta disposal practices (only 10% of households currently have pit latrines).
- iii) That there is a programme of health education to encourage improved personal and domestic hygiene. We are not able to positively identify the elements in Lesotho hygiene which are responsible for promoting water-washed disease transmission, but we suspect that lack of hand washing and defaecation habits are likely culprits. We recommend that a study be conducted to obtain more information on hygiene and disease transmission because no generalised health education programme will be effective. It is necessary to identify very specific unhygienic practices and to direct the education programme at these.
- iv) That personal body washing and clothes washing facilities should be constructed at some of the standpipes in villages so that women can wash themselves, their clothes and their children in hygienic conditions.
- v) An improvement in rural curative health services so that water-related diseases that do occur are more often reported and more effectively treated than is the case at the moment.

The current policy not to disinfect water supplies in Lesotho is one with which we wholly agree. We find firstly that water quality in improved supplies is very much better than in unimproved supplies, and secondly since it appears that diarrhoeal disease and typhoid are not primarily waterborne in any case, the costs and maintenance problems of treatment in village water supplies would be quite unjustified. The degree of pollution that is currently occurring in improved supplies is largely due to poor standards of construction and maintenance and it will be far cheaper and easier to improve quality by attending to these aspects than by introducing disinfection plant into the supplies.

## 6. BENEFITS

The following benefits from village water supplies were considered:

### 6.1 Health

As we have concluded above there are no measurable health benefits from village water supplies in Lesotho as currently constructed. However, the

possibilities of health benefits from a combination of water supplies and other inputs (see Section 5) cannot be denied.

#### 6.2 Time saving

The installation of a village water supply has saved, on average, 36 minutes per household per day in the mountains and 72 minutes per household per day in the lowlands. We find that in terms of the opportunity cost to productive activity, the value of this time saving is negligible. However, in the migrant labour economy of Lesotho, women often have to shoulder heavy domestic responsibility on their own for long periods of time. Water collection therefore has an opportunity cost to domestic and minor agricultural tasks which it is hard to value. In addition, a reduction in the effort involved results in some social benefit because women, quite justifiably, regard water carrying as an onerous chore.

#### 6.3 Brewing

Brewing is not more frequent in villages with improved water supplies and more water is not used for brewing in these villages. Although water from the tap will usually be used by brewers when such water is available there is no direct relationship between brewing and improved water supplies.

#### 6.4 Communal gardens

The success or failure of communal gardens depends on many complex social factors and we have not found it to correlate with piped water supplies. Piped water supplies will sometimes be used to irrigate communal gardens but it is equally possible and usual to irrigate them from nearby springs or with dam water. There are successful communal gardens in villages without piped water supplies and vice versa. We conclude that communal gardens receive no direct benefit from village water supplies.

#### 6.5 Community benefits

We have argued (Section 2.5) that the various social and institutional changes which would promote further development activity in the village with a water supply have not in general taken place. In fact, we have noted that various negative effects likely to discourage future development are more apparent. However, we stress that if our recommendations on Comrudev procedures and committee organisation are followed, we anticipate that successful water supply projects will indeed catalyse other development activity.