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Rural Water Supply in Developing Countries

dings of a workshop on
held in Zomba, Malawi,
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Rural Water Supply in Developing Countries

Proceedings of a workshop on training held in Zomba, Malawi, 5–12 August 1980

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The Development of Self-Help Gravity-Piped Water Projects in Malawi

L.H. Robertson[1]

Malawi covers 95 000 km^2, including a number of mountains which are the sources of perennial rivers and streams. Of the total population of 5 million, 420 000 live in the rural areas of Mulanje. These people are served by 2700 village taps, which they themselves have installed by laying 2000 km of piping. The total cost has been K2 million (K1 = U.S. $1.2484), an average of K750 per tap unit and a cost of K5 per head of population.

The majority of people get their domestic water supply from shallow wells or streams. When these dry up during the dry season, water has to be carried long distances.

With the growth of population and the increase in cultivation, rivers and wells dry up earlier in the year. Water supply, therefore, becomes more and more of a problem. As the population becomes more dense, the health hazard from polluted rivers becomes greater.

Technical Background

The design objective of the project is to pipe pure mountain water, by gravity systems, from mountain streams to villages on the fertile plain.

The design criteria are: (1) 27 litres per person per day; (2) one tap to approximately 160 people; and (3) a design flow of 0.075 litres/s at each tap (when all taps are open). All taps are public standpoints; water must be carried away (which limits consumption); and the water is free, so it is used by everyone.

Population figures are obtained from census maps. The layout and details of villages are obtained from aerial photographs. Alignment of pipelines is determined from 1:50 000 ordinance survey maps and profiles are plotted for each line.

The overall design capacity, as well as considering the existing population, takes into account the food production capacity of the soil, and is based on the (estimated) maximum population which the land can support.

From these data, required flows and pipe sizes can be calculated and the network designed.

The full range of pipe sizes is used: 12–90 mm PVC, and the larger sizes, 100–250 mm asbestos cement.

Pressures used are up to 10 atmospheres (10.3 kg/cm^2). A suitable site is chosen to ensure that the header tank is at the proper elevation, the intake being high enough to feed this tank. For large projects, the main pipeline will feed a number of branch line tanks, which will then be header tanks for the branch line systems, as well as providing night storage, thereby enabling the main line to be utilized throughout the night.

Because the streams used for water supplies come from mountain forest reserves, the only purification methods employed are screening and sedimentation. Work is now being carried out to introduce

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slow-sand filtration. This would greatly increase the number of rivers which could then be utilized and would extend the scope of this program.

Management and Planning

Development of Project Management

As a result of the first two pilot projects in 1968 and 1969, four things became apparent:

(1) The villagers and their leaders, having seen the possibilities, wanted more of these projects. They had become convinced that water could flow long distances through pipes (without the use of an engine) and that government was able to assist through the provision of pipes and expertise. Thus, the credibility gap between government and the villagers was bridged.

(2) Although it was essential to start with a small pilot project, until the people were convinced of its merits, it would become necessary to expand the project to cover a larger area in a comprehensive manner. This might involve as many as 100 000 people in one project.

(3) If projects of this size were to be attempted there must be proper technical supervision. Although the digging and backfilling of all the pipelines could be done using self-help labour, the actual laying and jointing must be done to a high standard and there are many aspects of the job which require the supervision of a technical assistant.

(4) The project leadership and organization would have to be such that it could maintain enthusiasm over a prolonged period (2 years), between the start of a project and the completion, when taps are turned on in the villages.

Project Leadership and Committees

The key to the success of these projects is the involvement of the whole community, and the setting up of an organization that can handle the large amount of work that has to be done and ensure that everyone does his share.

The first step is to hold a public meeting to announce the project. At this meeting all leaders are present: member of parliament, chiefs, and party leaders. The chief will ask his people if they want the project and are willing to work for it. In this way, the self-help commitment is established from the start. The meeting then appoints a project committee to organize the work.

The project committee has the support of the chiefs and all the leaders and people. It is, therefore, able to control the work that has to be done and to overcome any problems which may arise. It is important that these committees are not appointed by the government, but that they derive support from the people, chiefs, and party leaders.

For a large project, there will be a number of section committees within the main committee, which will be responsible for the different sections of the pipeline system.

Finally, there will be a village committee in each village to oversee the construction of the tap site and apron with soakaway pit, etc. This committee will be responsible for the cleanliness of the tap surroundings and for the maintenance of the tap (replacement of washers, etc.).

With this type of organizational structure, it will be clear to the people that the government's role is to assist the people with the installation of their project. This is very different from the government putting in a project for the people. It is now widely recognized that participation by the people is essential for the success of rural projects and that when a committee is given responsibility, it responds to the trust given to it.

It is, however, necessary for the project management to spell out the specific tasks that have to be done: digging of the pipeline, excavation of the tank site, collection of building stone, or digging of river sand. It is also essential that lines are marked out before digging starts. The technical assistant is the vital link between the project and the people.

Technical Assistant

The technical assistants are carefully selected for their practical experience and suitability for working with people in the field. They are trained in all the necessary skills, mainly through in-service training. They become very proficient at their work and are respected by the people. They are also personally involved in the success of their section of the project and become highly motivated.

Weekly staff meetings and annual refresher courses help to maintain high standards and build a strong team spirit. These also provide an opportunity for discussions and exchange of ideas on the problems of management in the field.

The Role of the Engineer

The necessary support for the field staff is provided by the project engineer, who has previously designed accurate and easily interpreted plans for the project. He is responsible for the coordination of the work, for setting out standard procedures, for programing the work to fit in with the seasons, for supplying pipes and other materials, and for solving all the technical and other problems which may arise in the field. In this way, he ensures that the whole project goes ahead with a momentum that can maintain the local enthusiasm.

In addition to being competent, the engineer should have a high degree of motivation, with qualities of leadership and sound judgement, which will enable him to evolve appropriate management techniques suitable for the rural project situation.

Conclusions

The basic principles which have contributed to the success of these projects can be summarized as follows:

(1) The system has evolved as a response to a real need.

(2) The community has been involved in the project at all levels and through the whole cycle of planning, implementation, and maintenance.

(3) As a result of this involvement and because of its basic importance to the success of the program, a sense of pride and ownership in the project is generated within the local community.

(4) Rural communities have always been conservative and cautious of innovations until the innovations have been shown to be appropriate to rural conditions. It has been possible to gain the confidence of the rural communities, through successful demonstration, and to involve them in a technical program of development, which then generated confidence for further projects.

The success of this project did not, of course, happen overnight, but has taken 10 years of patient understanding and persistent hard work from dedicated field staff.