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Constraints on local domestic water development in rural KwaZulu: The case of spring protection and rainwater harvesting

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CONSTRAINTS ON LOCAL DOMESTIC WATER DEVELOPMENT IN RURAL KwaZULU
THE CASE OF SPRING PROTECTION AND RAINWATER HARVESTING. D.G.B.Slade

Water is one of man's basic needs. However, aspects of the quality and constancy of supply are almost as important as its availability per se. Water is the major source of the most common health problems among rural communities dependent on untreated domestic water drawn from sources open to pollution and faecal contamination from man and beast alike in the drainage catchment environment. The unacceptably high incidence and recurrence of debilitating dysentery type ailments among children, particularly influential in contributing to their general malnutrition problems, besides widespread infection by bilharzia and the more dramatic outbreaks of cholera are all the result of water borne bacteria.

In rural KwaZulu the majority of people depend on local open springs, streams and rivers for their domestic water requirements. As both the water quality and constancy of supply are variable, unpredictable and often beyond their individual control, any consideration of improvement in quality of life of the rural poor in KwaZulu must raise questions concerning the people's dependence and utilisation of these natural unprotected sources of domestic water supply.

The questions fall into three categories:-
1) those seeking to identify the water problems as perceived and/or experienced by the rural community, 2) those seeking the specific causes of expressed or identified problems and their various manifestations and 3) those seeking appropriate means of ameliorating the undesirable conditions and local constraints on potable domestic water development.

IDENTIFYING THE PROBLEMS

The expressed need of many rural households is often in terms of a water supply per se rather than identifying problems of water quality.

It is not yet widely understood amongst the rural poor in KwaZulu that the unpurified, contaminated water supplies used by them are the source of the majority of their health problems, and particularly those of their young children. It is also indicative of the level of underdevelopment in most of the rural areas that the necessity for water as a basic need excludes consideration of its quality.

The relationship between local demand for domestic water and the constraints on local supply are such that users have no choice but to take what is available without consideration of its quality. In the majority of instances the only water available to rural communities is faecal contaminated water from unprotected springs, streams or rivers.

A distinction must be made between water that looks reasonably clear but may contain faecal bacteria and water that looks dirty, which is particularly the case after rains when runoff greatly increases the suspension load. Visibly turbid water is obviously not only undesirable for drinking whether or not it contains harmful bacteria, but is also a problem for other domestic uses such as washing.

Domestic water usage in rural KwaZulu may be classified into two spatially differentiated categories: 1) water used at the homestead for drinking, in food preparation and cooking, washing kitchen utensils and small household items, for personal hygiene and also water required to build or maintain the homestead such as for mud blocks, mortar and plaster and 2) water used at the source site for washing clothing and for personal hygiene.

In the first instance the water has to be physically conveyed from the point of natural supply to the homestead. Excluding use for building construction purposes, an amount of seven litres per person per day may be taken as the average required. As the majority of households have six or more members, some 50 litres or more must be conveyed daily to most homesteads. In practice this means three trips with a 20ℓ container. The time, effort and cost involved in obtaining this quantity depends on a number of factors such as the load, distance, nature of the route and means of conveyance.

In the second instance, clothing and a washing basin are taken to the water source. The loads involved are not excessively heavy and the wet clothing is often spread out to dry at the washing site, thus lightning the homeward load. Groups of women gather at the water sources to do their washing together. This meeting with friends involved in a common household duty also provides a certain social function which means that time and effort considerations should perhaps be discounted.

The source for local domestic water collection is usually where a spring or ground water seepage discharges into a small pool of two or three metres square from which the water can be scooped up in a small hand basin and poured into a 20ℓ carrying container. During the early morning and late afternoon peak drawing periods a considerable time is often spent waiting either for the pool to refill sufficiently or for the sediment to settle and the water to clear after others have caused turbidity from scooping out their requirements. This means that each 20ℓ container of water in a household collected from the nearest suitable spring source, very seldom represents a time investment of less than one hour and in most cases represents several manhours spent collecting and transporting.

Identifying the expressed priority of many rural communities as the provision of a reticulated water supply, highlights the premium placed on the time, effort and cost involved in obtaining their daily minimum water requirements. The problems of reliance on local undeveloped springs for rural domestic water supplies is thus not only a restricted quantity available in each household but also hourly and seasonal fluctuation in availability, manhours committed, the demanding physical effort and, in some cases, the financial cost.

CAUSES AND EFFECTS

Many factors including political, socio-economic and cultural aspects have contributed to the present problems of domestic water supply in rural KwaZulu.

Betterment planning was introduced to rationalise settlement and land use and three categories were established:
i) residential, ii) arable and iii) common grazing on tribal lands. Implementation of plans since the 1960s has meant that the dispersed nature of black rural settlement was replaced as scattered homesteads and small settlement clusters which had originally located themselves in relation to their needs for and accessibility to water and land resources were resettled and consolidated in large residential communities.

Theoretically the consolidation of grazing and arable lands into large blocks surrounding reasonably high density residential settlement blocks is fine. In practice the effect in the absence of the provision of a developed reticulated water supply was to change the spatial pattern of water demand from diverse dependance on many scattered sources to dependance on the few springs in or accessible to the population in the residential area. Inevitably the balance between demand for water and the supply of water has become strained as residential populations have grown while the number of springs has remained static or even declined during drought periods. Population growth on the other hand has been boosted in recent years by in-migration as a result of forced removals of blacks from elsewhere in Natal.

More people require more water. A crisis situation is reached however when the quantity of water required during popular drawing hours in the morning and afternoon exceeds the rate of flow over that time. The resultant queues at water sources are a familiar sight in KwaZulu. However, while this apparently desperate daily situation gives rise to much inconvenience and dissatisfaction, the overnight flow often seeps or runs to waste and is ignored although usually representing more than the daily utilised quantity!

Difficult access to a water source is another cause of time wasting and indirectly limiting the quantity of water fetched for household use. The nature of aquafers and the bedding of impervious rock often accounts for springs and groundwater seepage to appear along a "spring line" across a hillslope. Residential areas are located on the hill slopes to make use of this phenomenon and to be off the flatter land with arable potential. The result is that the majority of homesteads are located either upslope or downslope from their water supply. During the rainy summer months the steep paths up and down to the springs are eroded and treacherously slippery, demanding additional time and effort, particularly when carrying a 20 litre container of water on your head.

Runoff from paths leading to the seepage pool and from the usually trampled environment around the water source carries all manner of polluting debris. Further contamination is possible through seepage from the numerous pit latrines located among the homesteads upslope.

In the sandy flats areas of north eastern KwaZulu the causes and manifestation of domestic water supply problems are somewhat different. Early settlement in the area depended on local rivers, lakes and pans, but since the 1930s wells have been sunk and provided through Government aid to avoid considerable numbers of people and livestock leaving the area during drought periods. Settlement clustering has not however taken place in the vicinity of the wells, despite the lack of restrictions on mobility in this region. Many households remain three to five kilometres and further away from their source of water. It appears that together with a degree of inertia, proximity to arable fields and the ancestral sites of the spirits of their fathers takes preference over locating near a domestic water supply (Lind, 1984).

There may be cultural significance in the fact that while children and women fetch and carry the water for household use, it is the male head of household who is allocated arable lands by his chief and who wishes to remain close to them. The widespread ownership of cattle together with the sandy, flat nature of the terrain also promotes the use of an animal drawn sled by young herd boys to carry 210 litre drums of water from distant wells to homesteads.

The incidence of Mseleni Joint Disease amongst a high proportion of the population practically excludes those affected from collecting water and necessitates their payment for water delivered to their homesteads at a rate of R1.50 to R2.50 per 210 litre drum or 20 to 30 cents per 20 litre container if young, unaffected members of their family are not available for the task.

Other cultural factors also cause families not to become too personally involved in the development of any water source for their particular use. The fear of bewitchment by evil spirits living in an open water source is great. Similarly, a families' water source may be poisoned by

someone seeking revenge or acting under the influence of evil spirits whereas a greater degree of safety against such personal actions is secured through utilisation of a widely used communal water source. It seems that cultural constraints play a considerable role in perpetuating traditional water collecting and useage patterns, thereby stifling innovation and development. In the rural tribal communities few individuals perceive themselves as able to initiate change and development, particularly concerning a community facility. The establishment for example, of a local motivated group such as a water development committee seems seldom a spontaneous response from within a rural community despite individual acknowledgement of the local domestic water supply problems.

MEANS OF AMELIORATION

A reliable, strict quality controlled reticulated water system from main storage dams is an ideal that is far from realisation in many areas of KwaZulu in the short and medium term. Immediate practical improvements are needed in the meantime to ease the present unsatisfactory domestic water situation in many rural communities. Two low cost means involving simple technology are available to achieve improvements in supply, quality and availability and their implementation warrants more attention.

Firstly a considerable upgrading of water quality and improvement in supply availability at peak drawing times can be achieved in many rural situations in KwaZulu through a programme of spring protection and the building of easily erected concrete storage tanks at the spring source (Slade,1982 a).

Secondly, rainwater harvesting from roof runoff or in large, strategically located catchment tanks not only provides an additional supply, but also has locational advantages for accessible domestic use.

Spring protection involves the principle of reducing the possibility of water pollution, thereby removing a considerable cause of ill-health. Construction details of successful spring protection in KwaZulu vary slightly from group to group involved in promoting the

development, for example, the KwaZulu Department of Agriculture, the Valley Trust and Africa Co-operative Action Trust(ACAT). The main object, however, is to clean out the pool around the eye of the spring, removing loose soil, stones and plant material to ensure an unrestricted flow. A low V-shaped concrete retaining wall is built and the cleaned out area around the eye of the spring behind the wall is filled with crushed stone for filtration. A pipe going through the wall into the stones drains out the water. The surface area is then soil filled and grassed or concreted over to give added protection to the eye.

The next step is to optimise conservation of the 24hour water yield from the protected spring by linking the outlet pipe to a storage tank with an overflow and a supply tap. Steel shuttering is available to build simple two metre diameter reinforced concrete reservoirs to hold from 3 000 to 5 500 litres depending on height. Excluding the re-useable shuttering, the materials cost under R100. The work involved in digging a level foundation, placing reinforcing steel, casting the base slab, erecting the shuttering and pouring the concrete sides can be completed by five workmen in about six hours. The reservoir should have a concrete or heavy lid to ensure that the water remains clean. The size and the number of reservoirs linked to a protected spring must be in relation to its yield and the quantity of water required by the community.

Significant improvements in water quality and supply have resulted from the implementation of spring protection together with closed reservoirs in areas where priviously gross contamination of open water sources was recorded; for example, in the Valley of a Thousand Hills where projects have been promoted by the Valley Trust and in Vulindlela outside Pietermaritzburg where spring protection has been promoted by the KwaZulu Department of Agriculture (Slade,1982a).

Despite advantages for its acceptance being low costs and little required technical skill, spring protection and reservoir construction is not without implementation problems. Cracks and leaks in the reservoirs have resulted from poor mixing or insufficient cement in the concrete, incorrect erection of the shuttering and lack of compaction of the concrete to prevent air pockets forming in the

walls between the shuttering. The protection of weak springs involves the danger of their drying up during the dry winter months or drought periods and instances have occurred where the protection process has unjustifiably been blamed for the spring's failure. In simple rural communities where, to some extent, seeing is believing, the failure of weak or non perenial protected springs has led to prejudice in the community or adjacent communities against proceeding with a protection programme for fear of being deprived of what little polluted water is available and visible. It is important that advantages of spring protection be understood in objective perspective without raising false expectations that, miraculously, more and permanent water will be assured.

A feature of spring protection is that it lends itself to the principle of self help community involvement. Dr Irwin Friedman (1983) of the Valley Trust points out that before a spring is protected, it is important that the necessary organisation should exist to build, maintain and regulate the exploitation of the resource. It may be necessary to raise funds, obtain materials and organise labour and it is therefore usually a sound practice for a local committee to be formed from among the local residents. Ideally, the committee should be formally constituted with all the regulations pertaining to joining and membership laid down. Registration with the local Tribal Authority or a Government Department protects the community from abuse by unscrupulous members and keeps the Government informed about local development issues. However, in many areas today where inhabitants lack homogeneity and closeness of community spirit for reasons of recent population increase from in-migration, resettlement or whatever, the prospect for the establishment of a water committee to initiate the development is poor unless considerable stimulation and specific guidance is given by a development promoting body.

The concept of rainwater harvesting has great practical application potential in rural KwaZulu as the trend in house construction is away from the traditional thatched rondavel and towards a corrugated iron roofed "square type" western European style dwelling (Slade, 1982 b, 1984). Collection of roof run-off is sensible for the following reasons: 1) it provides a clean, convenient

domestic water supply at the place where it is needed. ii) During rainy weather it avoids the necessity to traverse slippery paths to collect water, from a muddy pool if dependant on an unprotected source and iii) prevents roof run-off eroding plaster around the base of the dwelling and causing rising damp.

Many houses have some rudimentary guttering, but considerable problems are experienced with adequately fixing and connecting lengths of guttering at a satisfactory slope to the irregular local wattle and gum roofing poles that are used. A further problem mitigating against widespread collection of roof run-off, is the present difficulty or cost of obtaining suitable large storage containers such as steel drums. Even these are not ideal, as they rust when left standing on damp ground and are seldom sealed, as they do not have a tap to draw off the water. The concrete reservoirs already described for building at springs are probably the most cost effective means of storing a reasonable quantity of roof run-off for domestic use.

Another form of rainwater harvesting receiving attention is the building of large tanks, partly set in the ground, with dished tops sloping down to a filter. Rainwater is caught and stored directly in the tank, protected from pollution and evaporation (Alcock and Lea, 1984).

CONCLUSION

Difficulties experienced in rural KwaZulu with domestic water quality, supply and accessibility can be considerably eased by active promotion and implementation of spring protection and rainwater harvesting programmes. Appropriate technology using small concrete reservoirs is available but there may still be some cultural and community organisational constraints.

REFERENCES

Alcock, P. and Lea, J.D. Personal communication. Research in progress on rainwater harvesting tanks. Department of Crop Science, University of Natal, Pietermaritzburg. 1984.

Friedman, I. "Spring Protection in Natal", S. A. Waterbulletin, February, 1983.

Lind, G.P. Personal communication. Research in progress on Settlement, Food Production and Consumption Patterns in a Rural Community in KwaZulu. Department of Geography, University of Natal, Pietermaritzburg, 1984.

Slade, D.G.B. "Aspects of Domestic Water Development in Vulindlela" in Bromberger, N. and Lea, J.D. (Eds), Rural Studies in KwaZulu, Pietermaritzburg, UNP, 1982 a.

Slade, D.G.B. "Types and Construction of Houses in Vulindlela", ibid., 1982 b.

Slade, D.G.B. "Changing Patterns of Housing and House Construction Amongst the Rural Poor in KwaZulu". Paper presented at the Second Carnegie Enquiry into Poverty and Development in Southern Africa, UCT, April, 1984.

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